



Wind Farms and Landscape Values Foundation Report

Final Version 27 June 2007

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Overview of the Project

The Brief

The Wind Farms and Landscape Values – National Assessment Framework project is a joint project between the Australian Council of National Trusts (ACNT) and Australian Wind Energy Association (Auswind), funded by the Department of the Environment and Heritage under the Low Emission Technology and Abatement Program, to develop a framework for assessing landscape values of potential wind farm sites and related tasks.

This project builds on a project undertaken in 2004/05 jointly undertaken by the ACNT and Auswind called *Wind Farms and Landscape Values Stage 1 Report, Identifying Issues*, March 2005. That report concluded:

There is growing unity of the need for consistent, transparent and comprehensive consideration of the special values of the landscapes in which wind farms might be sited, and there is a desire for consistent and adequate community involvement in this.

It also outlined a business plan for a stage 2 project (this project). A copy of the final report from that project can be located on the ACNT website: www.nationaltrust.org.au

Objectives

The objective of this project is to provide a sound and transparent, nationally applicable framework for:

- Identifying and assessing landscape values;
- assessing the potential impacts of wind farms on landscape values;
- site impact assessment and mitigation; and
- community consultation procedures.

It will be based on, and consistent with, internationally recognised heritage principles as represented in the Burra Charter, which was developed by Australia ICOMOS to guide Australian heritage identification and conservation practice.

Auswind and ACNT

The outcomes of the project will be incorporated into the Auswind Best Practice Guidelines. The Auswind Accreditation Scheme, currently under development and to be based on ISO 14001 principles, will independently audit compliance with the Best Practice Guidelines.

The ACNT will consider adoption of the project outcomes as ACNT policy on the siting of wind farms.

The project's funder – the Commonwealth Department of Environment and Water Resources – wishes to support alternative energy initiatives provided they are founded on proper processes of community consultation.

Key Outputs of the Study (from the Brief)

The key outputs and requirements expected of the study were:

- A review of landscape values assessment methodologies, in particular related to wind power developments, and analysis of the merits of different methods and potential application within an Australian context.
- A draft national landscape assessment methodology.
- A wide-ranging regional and metropolitan consultation program to engage with stakeholders including state government agencies, the existing stakeholder database, experts, industry and the community groups to seek feedback relating to the appropriateness of the draft methodologies.
- A final draft set of national assessment methodologies.

It was agreed early in the study process that the nature of the final product would be a National Assessment Framework, rather than a set of detailed prescribed methodologies, tools or techniques. This allows for methods to continue to evolve and adapt, as is inevitable when professional consultants compete by constantly improving techniques, and regulatory panels in different jurisdictions around Australia interrogate and test 'best practice' at successive hearings.

Study Products Framework

At the beginning of the project the study team produced a diagram called a Study Products Framework. The purpose of the diagram was to secure agreement of the Expert Advisory Panel and the Steering Committee members about the precise scope of the study. The final version of the diagram is shown on the next page. The left hand column lists the questions the study needed to answer. The right hand column, which evolved more gradually, lists the main study outputs. The questions in the left hand column are grouped under the following headings:

1. Understanding landscape values
2. Describing and modelling wind farms in the landscape
3. Assessing the impact of wind farms on landscape values
4. Responding to the impact of wind farms on landscape values

These headings ultimately formed the basis of the four Steps upon which the National Assessment Framework is founded. The questions themselves form the structure of the Foundation Report, which underpins the methodological content of the Framework.

Study Process

The clients – Auswind and ACNT – formed a Steering Committee (SC) to oversee the study process; the Committee included observers from the Commonwealth department that funded the project. The clients also established an Expert Advisory Panel (EAP) to provide advice and comment on the technical and professional content of the study team's work. Membership of the SC and EAP is listed inside the front cover of this report.

The study has been undertaken by a multi-disciplinary team led by Planisphere with Context and Collaborations. The study team began work in October 2006. Sarah Jones, the project manager appointed by the two clients, played a pivotal role in organising the complex logistics that occurred throughout the project.

The national consultation occurred from February to early April 2007. It focussed on the emerging content of the National Assessment Framework, which was made available for comment, as was the draft Foundation Report.

At the request of the joint clients the consultation was planned to take place in the capital cities of each state and nominated regional locations with an experience of wind farms development, in consultation with industry representatives the following locations were chosen:

Victoria:	Melbourne, Crowlands, Meeniyan (South Gippsland)
NSW:	Sydney, Glen Innes, Queanbeyan
SA:	Adelaide, Burra, Millicent
QLD:	Brisbane, Atherton
Tasmania:	Hobart, Scottsdale, Smithton
WA:	Perth, Albany, Geraldton

Full details of the process used and the issues and feedback raised can be found in the study's Consultation Report.

Members of the study team also attended forums with wind industry representatives in Melbourne on 5 December 2006 and 15 May 2007, and in Sydney on 11 May 2007.

The final reports were submitted to the clients on 27 June 2007, comprising:
 National Assessment Framework
 Foundation Report
 Consultation Report

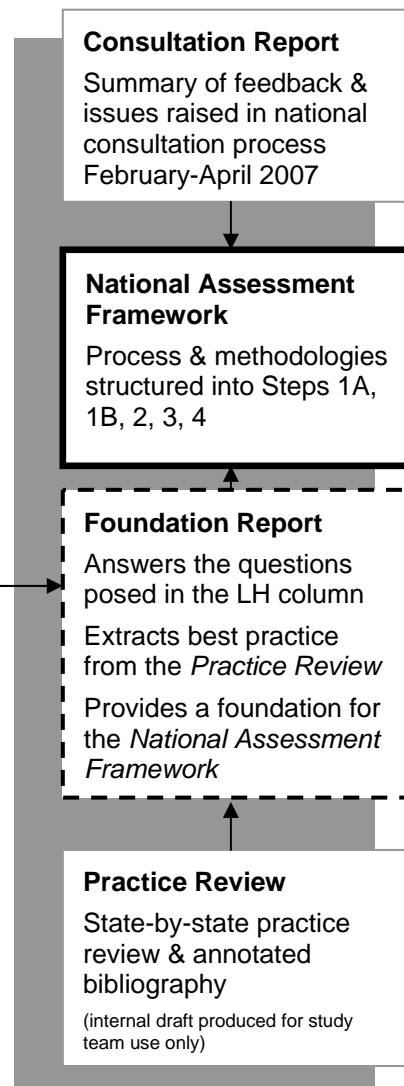
Study Products Framework

THE BRIEF: develop a sound & transparent nationally applicable framework

PROJECT SCOPE: THE QUESTIONS THE PROJECT MUST ANSWER

- 1 **UNDERSTANDING Landscape Values**
 - 1.1 What is meant by 'landscape values' for the purposes of this project?
 - 1.2 What different models are available for understanding landscape values?
 - 1.3 How should communities be involved in assessing landscape values?
 - 1.4 How should landscape values be evaluated or rated?
- 2 **DESCRIBING and MODELLING Wind Farms in the Landscape**
 - 2.1 What documentation is needed to inform community and professional assessment of the impacts of a wind farm on landscape values?
 - 2.2 What is the role of visual assessment? What relevant factors should be considered?
 - 2.3 What kinds of visual modelling should be used to inform the assessment?
- 3 **ASSESSING the Impact of Wind Farms on Landscape Values**
 - 3.1 How do wind farms impact on landscape values?
 - 3.2 How should the landscape impact of individual wind farms be identified and assessed?
 - 3.3 How should communities provide input to the assessment of wind farm impacts on landscape values?
- 4 **RESPONDING to the Impact of Wind Farms on Landscape Values**
 - 4.1 How can identified impacts on landscape values be avoided or mitigated?
 - 4.2 How should communities be involved in determining appropriate mitigation measures?

STUDY PRODUCTS



Not included in this project:

Assessment of actual landscapes or development proposals

Development of assessment or consultation frameworks for aspects of wind farm siting other than impacts on landscape values (eg biodiversity, noise)

Introduction to the Foundation Report

This report contains a discussion of findings and conclusions arising from a review of current approaches in landscape assessment in Australia and overseas.

This report forms part of the review of current national and international approaches to landscape value assessment required by the brief. It draws conclusions about the potential applicability of landscape assessment methodologies in the Australian context, drawn from a review of relevant landscape, heritage and environmental literature and an analysis of the scope and potential applicability of methods to the project objectives.

The 2005 Stage 1 Report

The discussion in this document builds upon the work of the Stage 1 project completed by the Australian Wind Energy Association and the Australian Council of National Trusts in 2005. The Stage 1 Report (Planisphere, 2005) provides an important starting point from which to approach a review of studies and the development of the Framework in this project.

Focus of this Study

The Stage 1 Report found that increased interest in landscape protection has led to the development of various techniques for documenting and reducing impacts on landscape values in the last three decades. Some of these methods have become well established, but none has been universally accepted. Although methods of identifying the significance of some landscape elements (such as rare flora and historic buildings) and assessing impacts on some identified values have been adopted at local, state and national levels, there is no nationally agreed framework for assessing less tangible landscape elements such as visual, aesthetic and cultural values. (The Burra Charter provides guidance for identifying and assessing these values).

Approach

The review of current practice focussed on the following sources:

1. Regulatory framework for wind farm impact assessment. We examined various government guidelines and protocols, in particular, guidelines for environmental assessment or development approvals processes, and where they exist, guidelines for development of wind farms. Some site-specific 'scoping documents' were also reviewed. The key question for this set of documents was 'what do governments require of wind farm proponents in order to understand and document landscape values and potential impacts upon them'.

Review was undertaken by jurisdictions, including each state in Australia, as well as at the Commonwealth level in Australia, and internationally. Government guidelines were not available in each jurisdiction reviewed.

2. Current practice in impact assessment for wind farms. Recent environmental assessment documents prepared by or on behalf of proponents (including the specialist landscape or visual assessment components of these, where available), were reviewed, as well as independent reviews of impact assessments by environment or planning boards and panels. The aim was to identify where and how landscape values and impacts are assessed.

At least two examples were sought from each state where wind farms have been subject to extensive environmental assessment or approvals processes (i.e. Tasmania, Victoria, South Australia, New South Wales and Western Australia), as well as internationally. No examples of Commonwealth (*Environmental Protection and Biodiversity Conservation Act 1999*) assessments relevant to landscape values (as defined by this study) were identified.

A particular body of knowledge exists in Victoria where independent panel reports considering public comment on wind farm proposals have researched and established key issues in landscape assessment of wind farms, and particular emphasis was placed on examining the conclusions derived from that work.

3. Current practice in understanding landscape values. We also examined studies and reports with a more 'strategic' focus to establishing the values of landscapes – that is, studies not related to development approvals or impact assessment processes. This included a review of heritage assessments of landscapes; and other broader landscape values studies, such as landscape character, visual values inventories and public preference modelling as well as those provided by the NSW Heritage Office and SA government policy statement.

In the main, landscape values examples were those known to the authors of this report, or in a few cases, recommended by Steering Committee or Expert Advisory Panel members, or other stakeholders. While we have endeavoured to include many different types of assessments by different authors, there are bound to be others which we have missed or of which we are unaware.

Structure of this Report

The discussion is set out in the following sections:

1. Understanding landscape values
2. Describing and modelling wind farms in the landscape
3. Assessing the impact of wind farms on landscape values
4. Responding to the impact of wind farms on landscape values

Within each section, a series of **questions** are posed to direct the review and evaluation of material relevant to understanding the topic of that section. Each question is answered in the following parts:

- an **outline of the issue**;
- a discussion of **current practice** relevant to that issue, including:
 - key topic areas as sub-headings; and
 - implications for the national assessment framework;
- **conclusions** relevant to defining the scope and content of the National Assessment Framework.

1. Understanding landscape values

Understanding landscape values involves identifying essential characteristics of the landscape and working with communities to understand the meaning of the landscape to them.

The critical questions investigated to examine current practice in understanding landscape values were:

- Q1.1 What is meant by 'landscape values' for the purposes of this project?
- Q1.2 What different models are available for understanding landscape values?
- Q1.3 How should communities be involved in assessing landscape values?
- Q1.4 How should landscape values be evaluated or rated?

Q1.1 What is meant by 'landscape values' for the purposes of this project?

Outline of the issue

- The term 'landscape' is used in multiple ways and means different things in different disciplines, from design, to planning, to heritage and environmental management. It is important to explore these different uses, and determine which understanding is most relevant to identifying values of wind farm sites and assessing potential impacts.
- The scope of landscape values is often confused. Sometimes it is narrowly defined as visual or scenic qualities, while others more broadly defined as relating to human perception and attachment to a place.
- Specific challenges exist around understanding the differences between landscapes as place types, and landscape values as a relevant element of assessment procedures.

Current practice

What are landscapes?

The term landscape has multiple definitions. The Australian Concise Oxford Dictionary defines landscape as "inland scenery" or the painting, depiction or actual piece of that scenery. The Encarta online dictionary describes landscape as "visually distinct scenery – an expanse of scenery of a particular type, especially as much as can be seen by the eye", and lists synonyms as including: scenery, countryside, scene, setting, background, backdrop, panorama, topography, geography and surroundings.

However, the term landscape has become laden in both professional and colloquial language as the nexus between the physical environment and the perception and valuing of it by communities.

Common in both professional and colloquial language, landscapes are described as a kind of place, a place distinctive for its:

- scale – usually large extensive – not a single site, (often 'as far as the eye can see');
- complexity – comprising many smaller 'places' and often multiple values (natural and cultural);
- unifying characteristics – landscapes have unifying elements that distinguish them from adjoining landscapes;
- boundaries – a landscape may have boundaries (as opposed to the 'environment') created by the landform and land cover, or by how the landscape is read, understood and experienced (e.g. visual boundaries).

According to Cosgrove (1989) understanding the 'human' dimension of landscapes is essential. Landscapes are not about the physical place and what is seen, but a way of seeing

Landscape, in this view, is the external world mediated through subjective human experience. Landscape is not merely the world we see; it is a construction of that world. Landscape is thus a social and cultural product, a way of seeing projected on to the land, with its own techniques and compositional forms, a restrictive gaze that diminishes other modes of experiencing our relations with nature. Whyte (2002:11)

Often distinction is made between 'natural' landscapes, largely formed by natural forces and biodiversity and 'cultural' landscapes, strongly influenced by human processes. In Australia, distinction is also made between pre- and post-European cultural landscapes. Landscapes have both natural and cultural values, and in many cases these will be difficult to separate.

The three Categories of World Heritage Cultural Landscape

UNESCO identifies several categories of cultural landscapes demonstrating the integral importance of both cultural and natural processes in understanding landscapes (extract from paragraph 39 of the Landscape Operational Guidelines for the Implementation of the World Heritage Convention).

- (i) The most easily identifiable is the **clearly defined landscape** designed and created intentionally by man. This embraces garden and parkland landscapes constructed for aesthetic reasons which are often (but not always) associated with religious or other monumental buildings and ensembles.
- (ii) The second category is the **organically evolved landscape**. This results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. Such landscapes reflect that process of evolution in their form and component features. They fall into two sub-categories:
 - a relict (or fossil) landscape is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form.
 - a continuing landscape is one which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time it exhibits significant material evidence of its evolution over time.
- (iii) The final category is the **associative cultural landscape**. The inclusion of such landscapes on the World Heritage List is justifiable by virtue of the powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent. (Source: World Heritage Papers 7, 2002, p. 11)

What are landscape values?

A landscape is a place, but landscape values are held by people and communities. Understanding landscape values is also about recognising broader kinds of places – for example the relationships between sites, combinations of sites and setting to sites.

People value landscapes as places that give meaning to their lives, and for their historic, scientific, social, aesthetic and spiritual values or inherent natural qualities (e.g. biodiversity or geo-diversity). Landscapes also have intrinsic or 'existence' values.

Scenic, character and visual values are sometimes used interchangeably for 'landscape values'. The 2005 Stage 1 Report cautions this approach and recognises that some authors use 'landscape values' to mean only the visual character or values of a place (see for example, Amir and Gidalizon, 1990), while others use the term to include a range of values including social, indigenous, cultural, artistic and environmental values (see for example Appleton, 1975). In other cases, whether landscape values include diverse and intangible cultural values or specifically the

visual properties of the environment is not clear in the literature (the Macaulay Land Use Research Institute, 2004). **To address this dichotomy, a distinction between 'visual landscape' and 'total landscape' is now evident in the literature.**

Communities define their values of landscape based on a combination of memory, knowledge, associations and emotional response to the environment. The central component is working with communities to understand their values of the landscape.

Cultural heritage values

The cultural heritage values of a landscape means its aesthetic, historic, social, scientific and spiritual values.

The significant cultural heritage of a landscape might be embodied in the physical place (e.g. physical character) or elements within it (e.g. patterns of past occupation and land use) or in use (e.g. stage for important social events or functions) or in, associations, meanings, records, related places and related objects (Australia ICOMOS, 1999).

The Australia ICOMOS Charter for Places of Cultural Significance (The Burra Charter, (Australia ICOMOS, 1999) is the guiding document for understanding, assessing and managing cultural heritage in Australia.

Natural values

Landscapes also have natural heritage values. Natural heritage is those values embodied in the natural living and non-living components of the world that humans inhabit, that is the biodiversity and geo-diversity of the landscape. Natural heritage can incorporate a range of values from existence to socially based values (Cairns, 2002).

The Australian Natural Heritage Charter (Cairns, 2002) is based on the Burra Charter and provides guidelines for identifying and managing natural significance.

Indigenous values

Places, sites, landscapes and memories which provide evidence of the Indigenous past of an area are important to present day Indigenous communities. These can be represented tangibly as archaeological or heritage sites (e.g. scarred trees, stone tools, mission buildings etc.) or intangibly (places known to have been used by Indigenous people either prior to or following the European invasion of traditional lands). Present day associations to place are also important (for example, places which continue to be used by Indigenous communities, such as meeting places).

The identification of Indigenous heritage values and involvement of Indigenous communities is an essential component of any development, and involvement of Indigenous communities in understanding landscape values.

Understanding Indigenous heritage values in Australia is guided by the Australian Heritage Commission's publication *Ask First: A guide to respecting Indigenous heritage places and values* (AHC, 2002). This document advocates a consultative approach to sustain the relationship between Indigenous people and their heritage places.

Scenic, character and visual values

Scenic, character and visual values are cultural values of a landscape, essential to the communities who experience them. These values are offered separate consideration here because of the focus they have traditionally received in understanding landscape values, primarily in the fields of architecture and landscape architecture disciplines.

Planning panels considering environmental effects statements for wind farms in Victoria have deliberately and consistently separated landscape from visual amenity (see for example, Bald Hills, 2004:96). Landscape is a "resource enjoyed by the public as a whole" which lies "at the foundations of myriad individual decisions, for example about where to live, travel, tourism and recreation" (Bald Hills, 2004:96).

According to Reid (2006:14), "landscape and visual impacts are essentially different".

In UK examples of both environmental assessments for wind farms, and methodologies (see for example, Tendring District Council, 2006), landscape and visual effects are treated separately, although frequently required through the one assessment process (e.g. Landscape and Visual Impact Assessment, LVIA). Landscape effects include “changes to perception of the landscape, character of the area or experience”, while visual effects “include short distance views from nearby land, and long distance views including from the adjacent roads” (Tendring District Council, 2006:1).

Implications for Assessment Framework

The Framework should not include techniques for understanding natural or cultural heritage, but will be informed by the occurrence of these values.

The identification of Indigenous heritage values and involvement of Indigenous communities is an essential component of any development, and involvement of Indigenous communities in understanding landscape values.

For the purposes of this study ‘landscape values’ can be said to mean the aggregate community perception of the value and significance of a place at a broad landscape scale.

Landscape values include, but are not limited to, scenic, character, aesthetic and visual values.

The framework will need to provide a method (or suite of methods) which considers not just scenic and visual but also values that derive from people’s knowledge, memories, feelings and associations with a landscape.

The focus of this study

The values held by communities about landscapes can vary widely, and may straddle several technical or professional ways of categorising landscape values. For example:

- Different stakeholder groups can be expected to place different values on the same landscape and to weight common values differently – eg Indigenous groups may place a greater weight on associative or spiritual than on aesthetic values.
- In some cases, one group’s assessment of the aesthetic (or similar) impact of a wind farm may be influenced or even determined by their view of another value – eg people who see wind farms as elegant manifestations of a more sustainable energy future may perceive only positive impacts on a given landscape.
- People often confuse (in professional terms) landscape values with the concept of ‘amenity’.
- We must accept that values change over time; indeed, it is important (if perhaps difficult or impossible?) for any assessment of the impact of a wind farm on landscape values should consider the values of generations yet unborn.
- Often, but more narrowly, landscape values are used interchangeably with scenic and / or visual assessment. This issue is tackled further below.

One way to resolve this confusing state of affairs is to take the position: this study should focus on those aspects of landscape values about which there is little or no agreement about methodologies. In other words, it should focus on ‘contested methodologies’. With this in mind, particular emphasis is given in this project to understanding and developing methodologies associated with assessing aesthetic, visual and scenic values and other intangible community-held values of landscapes.

While there will clearly be overlaps between aesthetic landscape values and the aesthetic and social values referred to in the Burra Charter, and recognise that all other factors can come into play, this is probably the closest we can come to a defining the landscape values ‘territory’ of this study.

Implications for Assessment Framework

The focus of this project is on the assessment of broad landscape values held by communities. Particular attention is paid to contested methodologies, including assessment of aesthetic, visual and scenic values.

Conclusions

- The focus of this project is the understanding of community-held values which derive from an individual's response to the landscape's natural or cultural character, or otherwise arise from an individual's association, memory, knowledge or experience of that landscape.
- This project does not focus on the accepted methodologies for understanding natural or cultural heritage in that landscape, but any process for understanding landscape values will need to be informed by the occurrence of these values. Successful approaches for assessing natural and cultural heritage have been used to inform our study.
- Landscape values are primarily community defined, however, they are those community values that are inherently about the place (as opposed to, for example, economic benefits), and on the whole are broad, rather than site specific. However, it should be noted that there are many types of communities with relevant claims to be stakeholders, eg. artists, musicians etc who value landscapes for aesthetic and inspirational reasons.
- The emphasis of the project is those areas for understanding values of place for which methodologies for assessment are poorly defined, inconsistently assessed or are contested.

Q1.2

What different models are available for understanding landscape values?

Outline of the issue

- There are many approaches to understanding landscape values / the values of landscapes, in use in Australia and internationally. These derive from different disciplines (e.g. landscape architecture, heritage, environmental assessment) and vary in emphasis, scope and nature of assessment.
- The Stage 1 Report identifies (at page 12) that the scope of landscape values that wind energy facilities could affect is broad (may include: landscape character and scenery; Indigenous cultural values; amenity; cultural heritage; contemporary cultural values and sense of place) and notes that landscape assessment therefore requires an interdisciplinary approach.

A specific issue about the role of communities in identifying and defining landscape values is examined further in section 1.3 of this report.

Current practice

The central finding of the 2005 Stage 1 study was that, although a large body of literature exist, such as the practice and government policy which advocate different approaches to understanding landscape values, none has been universally accepted. It is also true that, with few exceptions, models to understand the values of landscapes are limited to specific values or issues.

The dominant models for landscape assessment in Australia are as follows¹:

- landscape character assessment;

¹ The Macaulay Land Use Research Institute (n.d., p3) defines three broad categories of assessment of landscape values: descriptive inventories (e.g. ecological / character assessments and formal aesthetic models); public preference models (psychological and phenomenological); and quantitative holistic techniques which use a mixture of subjective and objective and psychophysical and 'surrogate' models.

- scenic amenity assessment;
- visual impact assessment; and
- heritage landscape assessment.

To a large degree, these techniques overlap, and are often used in combination.

The key elements of these are set out as follows.

Landscape character assessment

Landscape character assessment is an approach derived primarily from the forest evaluation models of the US Forest Service in the 1970s (Litton, 1968).

It is concerned with describing the physical elements (landform, waterform, vegetation and land use) which make one landscape different from another. Landscape character assessment is primarily (though not solely) concerned with the physical and visible attributes of the landscape.

Recent approaches in Australia have included a 'community input' component to clarify or respond to professional opinions (see for example Planisphere, 2004).

Landscape character assessment has been extensively applied across the United Kingdom and the Republic of Ireland, where baseline mapping of landscape character has been achieved for all areas (see for example, the Countryside Agency <http://www.countryside.gov.uk/LAR/Landscape>).

Examples in Australia include, among others:

- *Landscape Character Types of Victoria* (Leonard and Hammond, 1984)
- *A Manual for Forest Landscape Management* (Forestry Commission, 1990);
- *Meander Valley Scenic Management Strategy* (Inspiring Place, 2002); and
- *Coastal Spaces Landscape Assessment Study* (Planisphere, 2006)
- *Reading the Remote: Landscape Characters of Western Australia* (CALM, 1994)

Benefits

Landscape character provides an approach to understanding landscapes and provides hypotheses for what might be valuable about a landscape and a framework for understanding the visual 'fit' of a development. It derives description from both natural and cultural elements.

Landscape character can be accurately mapped and modelled for places; specific valued characteristics are objectively defined; methodologies are transferable.

Limitations

Emphasises the physical environment, rather than 'values' associated with it. Often lacks a community input component, and assertions about value are frequently limited to the opinion of the professional undertaking the assessment.

Implications for Assessment Framework

Landscape character is a valuable input to understanding and describing the elements of a landscape valued by communities and will become an important component of understanding landscape values in the National Assessment Framework.

Landscape character assessment should be coupled with community-based activities to describe and rate valued characteristics, as well as a more holistic consideration of other values.

Scenic amenity assessment

A number of approaches to rating and evaluating the visual and scenic appeal of landscapes are contained under this heading, including scenic quality assessment derived from forest evaluation models (e.g. Litton 1968 for the US Forest Service) of the 1970s.

The key characteristics are methods which attempt to rate the elements within a landscape that contribute to higher or lower visual appeal. In this sense, it is primarily concerned with understanding values.

These approaches, are often undertaken in tandem with or informed by landscape character assessment and are primarily (often solely) concerned with the physical and visible attributes of the landscape. Generally they divide a state area into landscape character zones and give a high, medium or low rating based on characteristic elements and landscape diversity.

Successful methods have been applied in conjunction with landscape character in Tasmania (Forestry Commission, 1990) and in South Australia Lothian (2005). Other examples in Australia include:

- *Meander Valley Scenic Management Strategy*, (including character assessment, Inspiring Place, 2002);
- *Scenic South East Queensland* (incorporating Lockyer Scenic Amenity Project Forest Images Pty Ltd, et. al, 2002; and Scenic Amenity in the Caboolture Shire, DPI landscape analysis and visual modelling; Forest Images Pty Ltd, et. al, 2003).

Common to all approaches is the identification of features characteristics which contribute to higher scenic appeal. Lothian (2005) describes the following variables as influencing perceived scenic appeal of coastal landscapes in South Australia: water land edge; area of water; awe – tranquil scale; diversity; naturalness; beach quality; landform type. Frequently, these will be expressed in matrix or ‘frame of reference’ which will then be mapped.

A core area of difference is the extent to which what is ‘preferred’ in a landscape has been researched. In older studies, generic rules were often applied to rate higher quality landscapes (e.g. diversity, presence of water), often derived from public preference studies undertaken elsewhere. However more recent approaches derive ratings from modelling of community preferences (e.g. quantitative research approaches such as the sorting and ranking of photographs of different kinds of scenes, containing different kinds of attributes). See for example Lothian (2005); Green (2003).

Benefits

Offers transparent criteria for values assessments which can be reviewed and critiqued. Conclusions are promoted as being ‘objective’ and often transferable (particularly where based on public preference modelling). Values can be spatially mapped and modelled.

Limitations

Does not recognise associations, meanings or memories which might affect preference rating, nor does it provide a means for these to be considered relevant values. Unable to integrate non-visual elements, including sound, smell, taste or an individuals knowledge (or perceptions) of other elements of significance (e.g. historic, natural).

Landscape preference models determined by asking groups of people how they would rate images of landscapes have been criticised (Ramsay, 1999) as not being an assessment of landscapes but assessments of images.

Implications for Assessment Framework

Various models used to rate the visual and scenic quality of landscapes can be useful for helping to identify the specific elements of the landscape that are valued by communities, but should be used in conjunction with methods to understand other values of the landscape. They must be based on sound and robust methodologies, and should be specific to the subject landscape and communities which value it. The methodologies used should be clearly reported.

Measures such as public preference modelling, scenic quality ratings if they are to be relied upon, must be demonstrated to be relevant to the landscape of the proposed wind farm site and the communities who value it.

Visual impact assessment

Visual impact assessments have been undertaken as part of environmental assessment processes since the 1970s, and increasingly play a significant role in judgements about the acceptability of developments including wind farms. To varying degrees, all wind farm impact assessments reviewed in this study examined issues of visual intrusion, though not all included full visual impact assessments.

Visual impact assessment (VIA) is concerned with the physical environment, and scientifically modelling visual intrusions by assessing such factors as topography, distance, development size, and atmospheric effects. For this reason, visual impact assessments are always professionally defined. Some methods also use information about the human vision (e.g. proportion of a landscape visible in the human field of view) in making judgements about the likelihood and magnitude of potential visibility (see for example, ERM 1999).

Many authors will make judgements about the relative 'sensitivity' of different viewer types (e.g. residents, tourists etc.) in order to input an 'evaluative' element to visual impact assessment, (see for example, EDAW 2001). Various reviews have stipulated the need for rigour and relevance to the subject place and communities in making such value judgements (Portland Wind Energy Panel, 2002).

Similarly, methods which combine of visual attributes (distance, size, visual presence), with landscape quality (scenic amenity ratings) and viewer preference are available (see for example, Scenic Spectrums, 2005; ERM, 1999).

Benefits

Provides a structured approach to defining and describing the visibility, visual intrusion based on objective and definable factors (distance, topography, atmospheric effects).

Limitations

Does not offer an understanding of the underlying value of the landscape, but rather provides evidence of whether or not a development will be visible, and the likely magnitude of visual intrusion. Usually does not include community values.

Implications for Assessment Framework

Visual impact assessments are not intended to be comprehensive assessments of landscape values. VIA provides a relatively 'objective' and defensible source of information about one element of the development that might impact on its values – namely the visibility.

Visual impact assessments will be an important component of holistic landscape assessment for wind farms but should aim to input objective 'facts' to the assessment process, rather than making value judgements about acceptability.

Heritage landscape assessment

Heritage practice has also tackled the assessment of landscape values, particularly for cultural values. Studies have been undertaken at various scales tailored to suit the level of heritage assessment (local, state, national, world) as well as the scale of the landscape units being assessed (a hill or a valley, expansive area such as the regional forest studies or the Australian Alps area, or local shire landscapes).

Cultural heritage assessments of landscapes can be comprehensive covering all heritage values defined within the Burra Charter (Australia ICOMOS, 1999) – social, historic, aesthetic, spiritual and scientific – or specifically tailored to particular values (e.g. aesthetic).

Many local government heritage studies have identified landscapes of heritage significance for recognition and protection through Local Environmental Plans / Planning Schemes.

Some heritage studies have been criticised for being limited to a review of 'historical facts' rather than an evaluation of its cultural significance (heritage practice defined by the Burra Charter requires the latter).

Comprehensive assessments of cultural values of forest areas were undertaken for the Regional Forest Agreement process (see for example, AHC and CNR, 1994). The assessments involved primary research as well as desktop work. They used community consultation and involvement in the assessment of heritage values at numerous heritage workshops. Aboriginal heritage values also involved extensive community involvement through numerous workshops.

More targeted assessments include landscape assessment of aesthetic values of places, for example for inclusion on the Register of the National Estate (National Estate Identification and assessment in the Gippsland Forest Region, Victoria) or, more recently the National Heritage List (e.g. Glass House Mountains and the Warrumbungles at <http://www.deh.gov.au/cgi-bin/ahdb/search.pl>)

Benefits

Cultural heritage practice provides a framework for understanding a range of cultural values of landscapes, and provides examples of techniques for obtaining evidence for a range of values (social, aesthetic, scientific), including community involvement.

There is a strong emphasis on thresholds, and significance provides a useful framework for decision-making.

Limitations

Tend to be large, resource and time-intensive processes, particularly where the range of community-derived (aesthetic, social, Aboriginal, spiritual) and professionally-derived (historic, scientific) values are included. Emphasis on significance may be limiting (e.g. values of landscapes that might not meet strict thresholds for heritage significance might be worthy of recognition / protection in landscape assessment for wind farms).

Implications for Assessment Framework

Heritage assessment provides valuable frameworks for understanding and rating cultural values of a place, providing well argued frameworks and threshold tests for rating significance to communities (e.g. AHC and CNR, 1994).

A number of cultural heritage methodologies (particularly those concerned with social, aesthetic and / or Indigenous values) provide sound examples for good practice in researching community-held values of landscapes.

Conclusions

- There are many methods and approaches, and no particular method provides the 'whole answer'. The framework will need to both innovate and to adopt valuable components from a number of sources to produce a composite method
- Understanding landscape values for the purposes of wind farm siting will need to be derived from various disciplines with claims on the territory of landscape assessment.
- Issues such as personal aesthetic taste, tolerance of sound, preferences for smells and tastes, life experiences, philosophies, interests, education and knowledge are relevant to understanding landscape values. The framework will need to provide a method (or suite of methods) which considers not just scenic and visual but also values that derive from people's knowledge, memories, feelings and associations with a landscape.
- Values are not necessarily transferable from one landscape or one community to another. Measures such as public preference modelling, scenic quality ratings and proxy assessments of community-held values, if they are to be relied upon, must be demonstrated to be relevant to the landscape of the proposed wind farm site and the communities who value it.
- Methods to investigate 'personal values' need to be made transparent (see below).

Q1.3

How should communities be involved in assessing landscape values?

Outline of the issue

- There is apparent consensus that landscape values are primarily (though not solely) community-held values. However, there are considerable methodological differences in how such values ought to be identified and documented.
- Some methods reviewed advocate direct community input for each specific site as the only effective method for gauging values. Others use community preferences surveyed in other places to indicate likely values in a different place (e.g. quantitative preference modelling) or derive an understanding of relative importance from 'surrogates' such as tourism or recreation visitation or artistic endeavour. A third category bases assessment on professional opinion, held to be a voice close to a 'consensus' community view.

Current practice

The vast majority of wind farm landscape and/or visual impact assessments both in Australia and internationally derive both their landscape description and evaluation from professional assessment. Instead of consulting directly with the community, these assessments tend to derive community values from 'surrogate' sources such as the level of tourism in an area, or levels of visitation for recreation; or from a professional opinion on the essential valued qualities of the landscape.

Nonetheless, this is not necessarily held as best practice. Independent planning panels reviewing impact assessments for wind farms in Victoria, for example, note that analysis of landscape values would ideally be conducted through social research instead of or in addition to expert opinion (Bald Hills EES Panel Report, 2004).

Government guidelines and regulations all require community input to any wind farm proposal, but rarely with specific reference to understanding landscape values (though more often when rating impacts on them). In Tasmania, for example, guidelines for a Development Proposal and Environmental Management Plan (DP&EMP) emphasise professionally-derived visual assessments. The Guidelines give strong emphasis to public consultation for certain values, for example, Aboriginal heritage values. However, the role of engaging communities for visual impact assessments was not articulated in the minimum standards outlined for visual impact assessment.

The guidelines for the preparation of a Public Environmental Report in South Australia, on the other hand identify aspects that are professionally-derived (description of landscape character and identification of landscape sensitivity) and others that need to be described by different sections of the public, e.g. identification of aesthetic responses to the proposal.

Objective or subjective

Arguments about objectivity or subjectivity are not the same as whether values are professionally or community-derived. Rather there is a methodological question as to whether 'absolutes' can be identified for a place or region to give certainty to understanding values of another place.

Lothian (2005) also describes landscape quality as subjective; a qualitative resource, dependent on human perception. However, he challenges the perception that the subjective quality of landscapes cannot be measured objectively, arguing rather, that it is possible to measure the landscape quality and predict visual ratings and impacts (p.9).

Professional assessments are held by Victorian Planning Panels to be 'another subjective assessment', rather than an objective truth about what others might also see:

Landscape evaluation that is not based on sound social research is inevitably a subjective process. Training, for example as a landscape architect, rural or natural resource planner or as a fine artist, may inform and refine the exercise

of such subjective judgments. However, in the absence of reference to wider social values, the opinion of an individual remains just that – an interesting and informative guide but nothing more. (Bald Hills Wind Farm Project Panel Report, 2004:97)

No examples of social research into landscape values conducted as part of environmental assessments or planning permit processes for wind farms were reviewed in this study. However it is recognised that some do exist.

According to Scottish Natural Heritage (SNH), there is a clear distinction between 'objective' impact assessment and 'subjective' values assessment:

Environmental Assessment is about the appraisal of components of the landscape, appreciating the character or distinctiveness of landscape and how changes may affect all of these things. It is not about how individuals may respond to the landscape. People's responses to the landscape will vary as a result of their own personal aesthetic taste, tolerance of sound, preferences for smells and tastes, life experiences, philosophies, interests, education and knowledge. Environmental Assessment should not try to consider people's responses to landscapes. One person's landscape of wild beauty and tranquillity is another person's landscape of featureless desolation. Environmental Assessment should look at the physical aspects of the landscape and what is experienced but should not attempt to describe or assess people's reactions to these. (<http://www.snh.org.uk/publications/online/heritagemanagement/EIA/appendix1.shtml>)

However, there is a clear case position emerging in Australia which integrates understanding of values with the impact assessment process (see for example, Bald Hills Wind Farm Project Panel Report, 2004). Furthermore, heritage assessment of landscape values in Australia (for example the Regional Forest Agreement projects of the 1990s) recognise that aesthetic, social and other values are informed by an individual (or collective) taste, preferences, life experiences, philosophies, interests, education and knowledge.

Various models for understanding landscape values discussed above seek to integrate the 'subjective' into objective assessments though quantitative research (see for example, Andrew Lothian's landscape quality studies in South Australia, Caboolture Shire Scenic Amenity project). Others pursue community preferences through direct community input.

In cases of direct involvement of community members, advocates of strong community engagement maintain it is important to facilitate a two-way exchange of information between the wind farm proponent (or their consultants undertaking values studies) and the communities whose values might be affected by the wind farm. Information provided to communities will contribute to the communities understanding and values of the landscape.

Implications for Assessment Framework

While considerable weight can be given to the insight of a person trained in landscape, design and visual disciplines these should be augmented with community-based activities which allow the perspectives and values of members of associated communities to be contributed.

Issues such as personal aesthetic taste, preferences, life experiences, philosophies, interests, education and knowledge are relevant to understanding landscape values. Approaches for understanding these values include direct community input.

There is expectation amongst communities that they will be involved in understanding values of landscapes. There is also emerging agreement in many methods, case law and academic discussion that direct community input is highly valuable if not essential in understanding values.

It is important to maintain a two-way exchange of information between the wind farm proponent (and their consultants undertaking values studies) and the communities whose values might be affected by the wind farm. Information provided to communities will contribute to the communities understanding and values of the landscape.

Professional role

The investigation of the values of landscapes is a preoccupation of several fields of professional endeavour including planning, heritage and landscape architecture (among others).

Values belong to people, but technical specialists can perform a useful role in understanding, interpreting and applying values. Carried out effectively, this requires the use of methodologies that are tried and tested, and based in a transparent manner on observed behaviour or recorded information.

Professionals contribute layers of information relevant to understanding landscape values.

- landscape and visual character;
- flora and fauna;
- identification of places that are scientifically and historically important; and
- understanding significance of other heritage values.

Australian environmental impact assessments for wind farms (more frequently undertake visual assessment, rather than landscape assessment) derive their understanding of landscape values from professional assessments using one or a combination of landscape character assessment, scenic quality assessment and visual amenity / visual impact assessment. Often, 'surrogate' models for understanding values (e.g. visitation, tourism and recreation locations, occurrence in publications, materials, arts) are used to supplement assessments. However, recognised limitations and inconsistencies have driven this project.

Implications for Assessment Framework

Landscape values are held by people and communities, but professionals can play a role in understanding, interpreting and extrapolating those values. However this needs to be done in ways that are rigorous and transparent.

Which community(ies)?

Recognising that value is fundamentally derived from people who appreciate the place, various methods and literature note that identifying communities who might hold these values is a difficult task. Communities might include the people who live within or near a particular landscape, have holiday homes, pass through or value the place remotely. Edwards (2005) recognises that landscape values belong not only to a defined local area, but are a "resource claimed by many".

Furthermore, no one community is homogenous and will comprise varied people and elements. Often, for example, the farm owners on which a wind farm may be placed will need to be treated differently from their neighbours, or others who live around the proposed wind farm. Furthermore, personal preference, taste, knowledge and experience will all vary, influencing the perception of landscape values and impacts on these.

There are multiple communities who may hold values of the landscape of a potential wind farm site. These will at a minimum include local residents and visitors to a place and future generations for whom the landscape is held in trust. In some cases a landscape will also be more broadly valued by non-resident communities for its 'existence' value, and this may include people who have never visited a place, or do so only rarely.

More significant landscapes may hold wider appeal to communities (e.g. communities of the region, state or nation and communities of like type such as artists).

Implications for Assessment Framework

The range of communities with associations with the landscape may be quite diverse, and include local and non-local communities, and community sectors with particular associations and traditions for example.

Methods must provide scope for understanding and responding to values of multiple communities for whom the landscape of a wind farm site is valuable. This may include resident and non-resident communities

How should community values be obtained?

Methods to understand community values of landscapes are varied. Some practitioners advocate that it is essential to work directly with the communities who hold the values to allow them to define and express their values in their own words. Others use a more anthropological approach, that is, study people or a group of people to discern their values and then extrapolate these values to other situations. Another approach is to derive an understanding of relative importance from 'surrogates' such as tourism or recreation visitation or artistic endeavour.

No wind farm impact assessments reviewed had undertaken detailed public preference modelling, and very few used community input as a large component of identifying baseline values. Three different example approaches from Australian wind farm impact assessments are summarised here. (It should be noted that these are for information not comparison - each responded to a different brief, budget and other constraints).

1. The *Musselroe Wind Farm Visual Values Inventory and Impact Assessment*, applied a methodology for defining and assessing community landscape values from professional assessments and surrogates. An approach determining patterns of viewing and the level of public sensitivity was developed based on professional assessment of public use areas and frames of reference for scenic quality. Provision of criteria and thresholds to rank the relative importance of scenic values was included in the methodology that was professionally-derived and rated. Some surrogate-approaches such as the importance of places for tourism and recreation, the number of vehicles travelling on roads etc. were used to inform 'public sensitivity' of various locations and impacts.

2. *Myponga Sellicks Hill Wind Farm Visual Assessment*– The visual assessment and potential visual intrusion of the proposal was again solely professionally-derived. Levels of significance of impact were rated against the magnitude of visibility (e.g. zone of visual influence), although somewhat incongruously, reference was made to the public perception of the benefits of renewable energy in this section. A separate section of assessment was devoted to the public perceptions of the proposal, including aesthetic. This involved quantitative surveys of 209 residents of surrounding towns and covered a range of perceptions about the acceptability of the proposal. However, the surveys did not address questions of underlying landscape values of the place, nor were the visual impact assessments provided to respondents.

3. RFA Aesthetic Community Values workshop (values assessment not for wind farm project).

The RFA process was a large-scale regional assessment of heritage values of forest regions. Within regional locations, workshops were held at selected centres of community catchments. Representatives of all the community social organisations, industry, recreation and other users groups were invited. To ensure the extent of the region was covered as much as possible, individuals familiar with the more remote areas were invited. In order to obtain information from representatives of the peak recreational organisations and other stakeholder groups who regularly use the region, one workshop was held in the State capital.

The topic of the workshops was kept to a general level designed to understand the spectrum of heritage within which aesthetic value was included. Initially, participants were asked to identify what they understood heritage to mean and hence themes of heritage importance were established. Within those themes, aesthetic value was clearly present and interwoven amongst the understanding community members held for heritage value. Words used by community members containing an 'aesthetic value' meaning were 'beauty', 'important', 'unique', 'recreational', 'nature', 'enjoyment', 'original', 'inspirational', 'unusual perception', 'ancient', 'pride', and 'scenic'.

The range of group techniques employed has included:

- Community gatherings of various kinds: focus groups (hand-picked); focus groups (self-selected); groups with a single community represented or mixed
- Site-based: back-to the place (White Bay); visits (Ingleburn, Maribyrnong Defence etc); walks (Condah); self-directed and documented trips (like M Walker method)
- Map-based: "walking down the coast" mapping as you go; defining cultural or traditional activity boundaries (Upper Mersey)
- Individual responses in the form of questionnaires (written) and phone interviews/surveys as a way of gathering data across a widely dispersed community (numerous examples).

Implications for Assessment Framework

Methods for obtaining or researching community-based values need to be adequately designed to identify particular and general attributes that are valued and measures to assess the extent and strength of this value.

Methods should also be flexible and appropriate to the communities being involved. This may involve consulting with these communities to determine the best ways for them to be involved, considering their resources, priorities and cultural protocols. Different methods may be needed for different communities.

Appropriate timing of community involvement

The timing of community involvement and contact is a critical question for both understanding landscape values and for engagement of communities in a development process. A number of development processes reviewed for this study encountered heightened community resistance because of a prolonged period of non-disclosure – for example cases when land owners who might have a wind farm on their property were notified many months or years in advance of information going out to the wider community.

Early and open community involvement is strongly advocated in the literature. Questions remain within the development community about the commercial sensitivity of some information. It is recognised, however, that many wind farm proponents have made substantial efforts to include communities early in the process, with considerable success.

Conclusions

- Methods must provide scope for understanding and responding to values of multiple communities for whom the landscape of a wind farm site is valuable. This should include resident and non-resident communities.
- Recognition also should be give to future generations for whom the landscape is held in trust (e.g. future generations).
- In seeking to understand values of landscapes held by members of communities, direct input is favoured.
- Consideration needs to be given to identification of 'shared' or 'collective' values and the identification of these, their strength and importance.
- The use of surrogate methods including tourism or recreational visitation should be encouraged as an adjunct to community-based activities and professional assessment. However, these will not on their own constitute a full understanding of the values of a landscape and the limitations of such methods need to be carefully identified (for example, a remote landscape may receive low numbers of visitors, but may still have high landscape values).
- Other relevant sources for understanding the significance of the landscape include peer or expert opinion, appearance in artistic endeavour, tourism material or media.
- Values are not transferable from one landscape or one community to another. Public preference modelling should be directly related to the place, and not derived from elsewhere.

- Issues such as personal aesthetic taste, tolerance of sound, preferences for smells and tastes, life experiences, philosophies, interests, education and knowledge are relevant to understanding landscape values. Approaches for understanding these values include direct community input.
- Techniques which seek to understand values using modelling and other data (e.g. photographs) can be valuable, but their limitation should be acknowledged.
- There is expectation amongst communities that they will be involved in understanding values of landscapes. There is also emerging agreement in many methods, case law and academic discussion that direct community input is highly valuable if not essential in understanding values.
- It is important to maintain a two-way exchange of information between the wind farm proponent (or their consultants undertaking values studies) and the communities whose values might be affected by the wind farm. Information provided to communities will contribute to the communities understanding and values of the landscape.
- In both development and values assessment processes, early community involvement is beneficial, builds trust within the community and is more likely to provide useful community input later in the process.

Q1.4 How should landscape values be evaluated or rated?

Outline of the issue

- The Stage 1 Report recognises that there is much debate about whether and how the relative significance of landscape should be measured, but concludes that applying a rating of significance to values is essential to defining the acceptability of otherwise of impacts upon those values.
- Understanding relative significance of values (e.g. strength or extent to which a value is held) is important for environmental assessment and planning approvals processes.
- Understanding the context (geographic or otherwise) in which values of places ought to be rated will have implications for the way assessments are undertaken.
- Reviews of landscape and visual impact assessments of wind farms have in the past criticised a lack of strategic identification of appropriate sites (from a landscape perspective).

Current practice

Significance

The 2005 Stage 1 report notes rating the significance of landscape values assists decisions about the acceptability or otherwise of impacts of a development on those values.

There is much debate about whether and how the relative significance of landscapes should be measured. Few of the existing approaches comprehensively address all potentially significant values.

Based on a review of current practice, there are at least two dimensions of significance to consider in rating the landscape values of the wind farm site:

- strength and importance of the values within the community who holds them; and
- extent to which they are likely to be held across communities or cultural groups (e.g. at local, regional, state, national, international scales).

In many studies reviewed, significance has tended to be rated on the extent to which values are held. For example, landscapes might be held in high regard across a State or nation. The Planning Panel report on community reaction to the Portland Wind Energy Project in Victoria recommended that future landscape assessments of wind energy facilities rate landscapes “in international, national, state, regional and local

significance terms” and identify the features that contribute to their significance in each case (Planning Panels Victoria, 2002). Heritage practice has an established tradition of rating significance using local, state, national and universal rankings.

Nonetheless, conflict arises where assessment fails to understand that a value considered to be relatively common might have special meaning to a local population. The qualities of local significance – reflected in the places where we lead our daily lives – can contain strongly held values important for consideration in wind farm developments. Often landscape-based protests are about the impacts on the “familiar landscapes” in which people live and the experience, attachment and memory experience associated with the place.²

The strength of a value might be indicated by the occurrence of shared values, however, it is also recognised that understanding landscape values involves multiple communities with potentially disparate views about a landscape.

AHC & CNR (1994, adapted in Context 2007) outline a range of relevant factors to understand significance of aesthetic values which can be adapted for landscapes:

- the extent to which the value or combination of values is special or particular to this landscape;
- the extent of recognition of the place for its landscape characteristics across geographic and cultural boundaries;
- the length of time that this landscape can be demonstrated to have been valued by a community or communities;
- the occurrence or depiction of a landscape for these values in art, literature or tourism materials.

Context (2002) explored the concept of significance for understanding landscapes that inspire communities.

Implications for Assessment Framework

Rating the significance of landscape values will assist in assessing the acceptability of impacts on these values.

In rating significance, both the strength of value (its importance to the community who values it) and the extent to which the value is held by different communities (e.g. at local, state or national levels) will need to be considered.

Assessment context

To varying degrees, all Government guidelines reviewed in Australia include reference to understanding values of both the wind farm site, and “the surrounding area” (State of Victoria PPG-WEF). This is particularly important for understanding the visual and aesthetic values to recognise that landscape values are expansive, and often have fluid boundaries.

Furthermore, in order to adequately understand and rate significance, a context for understanding and comparing values needs to be defined to provide a context for assessment of values, to understand for example the relative uniqueness or otherwise of a particular landscape character, feature or value within a particular locality or region (this is addressed further below).

Cultural heritage practice has led the way in setting significance assessment within a context through ‘comparative analysis’. Comparative analysis considers similar places, or places with similar values and rates the extent to which the place being assessed best embodies the value, or whether there are other, better examples of its

It is worth noting, however, that in a recent (2007?) decision in NSW (Taralga Landscape Guardians Inc. v Minister for Planning and RES Southern Cross Pty. Ltd.) it was held that a change to a locally held landscape value (the village outlook) should be balanced against “significant public interest... in adoption of alternative, more environmentally friendly, energy generation sources.”

type elsewhere. This approach works best for places or items which are of a readily definable 'type' or 'set' (for example, a building style) and relies on complete, or near-complete knowledge of the occurrence of other types of places which may be valued for the same reasons. Successful comparative assessments of landscape aesthetic values have been carried out by the (former) Department of Environment and Heritage, for the National Heritage list. The Glass House Mountains were compared with Mt Warning, Mt Napier, and the Warrumbungles for example, prior to their listing on the National Heritage List.

Implications for Assessment Framework

- Thoroughly undertaken comparative analysis is a sound way to ensure a robust and defensible understanding of relative significance. However, it is reliant on the adequacy of information available for other sites or places and at present this is lacking in Australia for most landscape values.
- Methods developed overseas where more comprehensive baseline assessment of landscape values has been completed (e.g. the United Kingdom) may not be directly applicable to the Australian context if applied nationwide. However they may work for smaller regions because substantial gaps exist in the knowledge of landscape characteristics and values within which to base a framework for rating of significance.

Strategic selection of sites

The vast majority of impact assessments for wind farms are site specific. That is, their brief is not to survey a range of sites and identify those that are more or less appropriate for wind farm developments from a landscape perspective.

Nonetheless, community comment on developments tends to emphasise the need for strategic selection. Several planning panels in Victoria have considered the issue of strategic selection of sites. Bald Hills Wind Energy Project Panel, for example, undertook to provide a strategic review of landscapes as part of its recommendations.

Lothian (2005) recommends the following strategic planning advice to the South Australian Government (pp. 54-55).

- planning for wind farms requires a map of wind resources; a map of landscape quality and acknowledgement of community's view about visual impact of wind farms, and should occur in all states;
- State Governments identify suitable areas for wind farms and define restricted areas;
- undertake a mapping of landscape quality at a national scale.
- avoid high rating coastal sites or, locate slightly inland to avoid visibility from coastline edge;
- avoid high-rating inland areas – low to middle ranking agricultural land is suitable for wind farms.

While several studies in the UK have sought to identify appropriate locations for wind farm development across jurisdictions (e.g. County of Lancashire, Lovejoy, 2005) using a range of physical, perceptual and value characteristics (see also section 2.2), the same issues about lack of complete information as discussed above applies to strategic selection of sites in Australia.

In absence of this information, the Victorian Government guidelines (Planning and Policy Guidelines for Wind Energy Facilities) require a two-stage approach. The first, a scoping phase, assesses the landscape significance of the place, and is used by the relevant Minister to determine whether or not a full Environmental Effects Statement is required. In practice, this step also allows industry to identify highly significant landscapes, which might be avoided.

Increasingly, strategic assessments of landscape values consider the relative importance of values, for the purpose of informing the application of controls or guidelines for management. Some states have completed partial strategic landscape evaluation studies across regions, including Victoria (e.g. Planisphere, 2006); South

Australia (e.g. Lothian, 2005); Queensland (e.g. Caboolture Shire, n.d.), which aim to identify highly significant landscapes (or to provide frameworks for their identification). In each case, these assessments are primarily concerned with visual character and scenic values, however they all have some relevance to assessing the potential landscape values of wind farm sites.

In Victoria, the Coastal Spaces Landscape Assessment Study (Planisphere, 2006) identified landscapes along the Victorian coast of local, state and national importance (with state and national being the highest priority for application of planning controls). The Caboolture shire scenic amenity study in Queensland rated scenic preference against visual exposure to provide hierarchy or important landscapes (Caboolture Shire, n.d.). A similar approach is advocated by the Victorian Department of Primary Industries (2004).

Valuable resources are also contained in the Register of the National Estate (www.deh.gov.au) and various National Trust significant landscapes registers (see for example, <http://www.natrust.com.au>). However, these are sporadic and place-specific (as opposed to providing a strategic overview of a state or region).

More complete landscape evaluations are available overseas, for example the landscape character documentation undertaken by English Heritage (<http://www.english-heritage.org.uk/server/show/nav.1293>).

Implications for Assessment Framework

- The ongoing development of knowledge about landscape values and significance through strategic studies should be advocated and encouraged to inform landscape impact assessments and provide a context for assessing significance.
- Preliminary assessment of significance is important to allow for early identification of highly significant landscapes, to inform site selection and locational decisions, and to assist Governments determine the level of assessment required.

Conclusions

- Assessment should seek to identify levels of significance associated with a landscape as a basis for decision making about the development.
- The value and significance of the place ought to be assessed in the absence of the proposed development. That is, as far as possible, landscape values that exist prior to the development being proposed should be sought and documented.
- Assessments should seek to find and integrate other sources for understanding the landscape value of the proposed wind farm site, including previous landscape values assessments, heritage studies, environmental and impact studies as well as occurrence in media, art and literature.
- Assessment of landscape significance will need to be made in context, by both understanding the surrounding landscape (potentially to the extent of visibility) and also by way of comparison of the landscape with other places.

2. Describing and modelling wind farms in the landscape

The critical questions investigated to examine current practice in describing and modelling the wind farms in the landscape were:

- Q2.1 What documentation is needed to inform community and professional assessment of the impacts of a wind farm on landscape values?
- Q2.2 What is the role of visual assessment? What relevant factors should be considered?
- Q2.3 What kinds of visual modelling should be used to inform the assessment?

Q2.1 What documentation is needed to inform community and professional assessment of the impacts of a wind farm on landscape values?

Outline of the issue

The description and modelling of a wind farm is a key step prior to impact assessment. In many assessment processes, modelling and description occurs hand-in-hand with impact assessment. While this has many logical and practical benefits, a challenge arises where descriptive material (e.g. visual montages or assessments of highly visible, less visible) is confused with an assessment of impact on values. Similarly, many assessments have been criticised for over-emphasising the descriptive (particularly visibility) components with only limited consideration given to the values that likely viewers hold (see for example Portland Wind Energy Panel Report, 2002 which criticised the consultant for assumptions about the 'sensitivity' of different types of viewers).

A key question is what information is required by communities and professionals (consultants) to understand the development and its potential impacts on landscape values.

Current practice

Logically, in order to understand the likely impact of a wind farm both communities and professionals need adequate information about the nature of the development, and its ultimate appearance and effect in the landscape. However, the needs of community and professional assessment may be different. For example, professional assessment will need to consider the wind farm in a variety of conditions (from highest visibility to lowest), based for example on atmospheric conditions. However, as the Bald Hills Planning Panel noted in Victoria, the presentation of visual modelling in low-light or less visible conditions can create a sense within communities that there is 'something to hide' and recommended 'worst-case' scenarios be presented to communities.

Wind farms have a number of attributes which contribute to their landscape impacts, including location, the height of towers and turbines, the number of turbines, movement, colour and materials, ancillary infrastructure (see also Q3.1: How do wind farms impact on landscape values?). Each of these needs to be accurately described and depicted in order to understand impacts.

The better visual or landscape assessments reviewed included accurate information about the type, size, location and design of the wind farm turbines and all ancillary infrastructure (e.g. sub-stations, transmission lines, roads, buildings) associated with the development as well as other (direct or indirect) landscape changes (e.g. vegetation clearing) which will result from the development.

In practice, the visual models will be developed and refined during the assessment of and response to impacts in Steps 3 and 4 of the Assessment Framework, with revised models responding to the requirements of the process, there appears strong justification for the logic of 'description' to be separated from 'evaluation'. That is, where a proponent (or their consultant) compiles information about the development to provide objective information for both professional and community evaluation.

Included in this descriptive step is visual assessment, which is discussed further below.

Implications for Assessment Framework

- A descriptive step in which the proponent (or their consultant) describes and depicts the development (graphically and in words) should precede the assessment of impacts on landscape values.
- Adequate information would include modelling and other material, develop to highest standards to ensure reliability and acceptance by both community and professional reviewers.

Q2.2

What is the role of visual assessment? What relevant factors should be considered?

The information contained in this section is derived from the current research of the consultants. Recognising this is a relatively recent and quickly-developing field, we acknowledge that some information may be limited or out of date by the time of publishing.

Outline of the issue

A key area of criticism of existing impact assessments of wind farms is in the confusion between visual and landscape assessment.

Visual intrusion is frequently cited as one of the key impacts of wind farm developments, and many State government assessment guidelines require visual impacts to be considered.

Varied success with visual assessment is evident in case-law in Australia. Many consultants have developed their own unique approach to assessing visual factors. None of these have been critiqued in detail, however, several common factors are discussed below.

Current practice

A tradition of visual assessment dating back to the 1960s strongly informs current landscape assessments of wind farms (see for example, US Department of Agriculture). Some of these (the expectations and aesthetic concerns of viewers, pursuit of desired character) have been addressed under Section 1 above. Other factors, are purely descriptive, and provide useful information against which to judge impacts on identified values. For example:

- How many people will see a development?
- What is the likely duration of the view (e.g. from a residence / town, c.f. a highway)
- From what locations will the development be visible?
- From what distance(s) will the development be visible?
- What is the nature of the view (e.g. along a road axis, at an angle)

Various professional assessments have sought to add sophistication to visual assessments, by learning from and undertaking research (for example understanding the 'normal field of view' of the human eye, and using this to rate the likely dominance or otherwise of a development, ERM, 2002).

Perhaps the most significant development is the use of digital information systems to inform visual assessments; some of the key elements of these are described below.

Digital terrain models

In virtually all cases, wind farm proponents will use Geographic Information System (GIS) software or similar to create a three-dimensional digital terrain model (DTM) of the landscape in which a wind farm is to be located. This is derived from contour data for the wind farm site and surrounding area, and can be enhanced using the

application of aerial photography (draping) or construction of three-dimensional landscape elements (e.g. vegetation, buildings).

Zone of visual influence

Also called 'seen area' mapping, zone of visual influence is concerned with modelling the point-to-point visibility of a development. A visibility (or ZVI) map shows the extent and pattern of visibility of the wind farm development based on topography alone. ZVI maps are prepared using a DTM and Geographic Information System (GIS) software. The Digital Terrain Model (DTM) on which the Zone of Visual Influence (ZVI) and visualisations is based should be prepared using the most detailed (smallest cell size) terrain data available. The accuracy of the data used should be provided in the assessment documentation.

The ZVI represents visibility regardless of local screening (buildings or vegetation) and atmospheric conditions (weather), and therefore represents theoretical rather than actual visibility. The ZVI does not take into account the nature (positive or negative) or magnitude (significant or insignificant) of visual impacts.

Virtually all visual and landscape impact assessments reviewed in this study (both Australian and international) included some ZVI mapping as a component of understanding the visual impact of the wind farm. Modelling the ZVI is usually first step to assessing visual impact (followed for example by the selection of viewpoints and the preparation of visualisations).

ZVI mapping can be done in at least two directions:

- from key viewpoints (describing which parts of the landscape are seen from key locations); and
- from the development (to determine locations from which the development will be visible).

In preparing a ZVI from the development, separate ZVI calculations should be run for the overall height of turbines (to blade tip) and for height to the hub/nacelle.

ZVI maps can also show how much of the wind farm is visible (e.g. with different numbers of visible turbines displayed in different bands of colour). It can also show how much of each turbine is visible in terms of visibility up to the hub or up to the blade tip (SNH 2005, p.22). Other characteristics that may be calculated are the proportion of horizontal view occupied by the wind farm, and the number of turbines that will be viewed against the sky.

Theoretical vs. actual visibility

A key consideration in ZVI mapping and other visual assessment is the difference between theoretical and actual visibility (and the implications this has for the extent of landscape considered in an assessment).

Theoretical visibility will always be greater than actual visibility and to tackle this issue, assessors have analysed and modelled a range of factors to create more accurate assessments, including:

- atmospheric effects;
- curvature of the earth; and
- refraction of light.

Some researchers have compared the modelled visibility with 'real world' situations (the most famous of these is the, Sinclair-Thomas Matrix, referenced in CPRW, 1999). The Sinclair-Thomas matrix suggests that (then) current generation turbines (overall height of up to 95m) are potentially noticeable up to 35 kilometres away, and recommends this distance as a suitable extent for zone of visual influence (ZVI) mapping.

It is possible using some sophisticated techniques to model visibility including local screening, for example existing buildings and vegetation. However, some approaches warn against this because of the relative 'temporariness' of buildings and vegetation

as compared to the topography, and suggest this should only be done in addition to the 'bare ground' visibility, not as an alternative to it.

Viewpoint selection

Viewpoint selection is critical to visual assessment, and also has a role in describing and evaluating landscape values. According to SNH (2005, p.43) a number of viewpoints should be chosen, in order to assess:

- the existing visual resource,
- the sensitivity of this resource to the wind farm development,
- the proposed design
- the appearance of the final development.

It is important therefore that viewpoint selection is an iterative process and relates to known values. Most assessments reviewed, for example, have undertaken consultation with the responsible authority and the community should be undertaken so as not to miss any key views (eg. the view from a popular beach).

In terms of assessing and describing visibility, viewpoints should be selected to show a representative range of views and viewer types. There may also be a need to show views from specific significant viewpoints (SNH 2005, p.43), for example:

- High landscape significance and scenic value
- Visual composition
- Distance
- Aspect
- Extent of wind farm visible
- Sequential

Viewpoints would have a role in both ZVI modelling and in development of visual models (e.g. photomontages). In viewpoint selection and production of photomontages the limitations of a limited number of static viewpoints should be acknowledged. The entire visual impact of a development should be considered. It is usually inappropriate to alter the design of a development to address visual impact from a single viewpoint (SNH 2005, 45).

Implications for Assessment Framework

- Visual assessment on its own does not constitute an assessment of impacts on landscape values. Rather, visual assessment provides descriptive information to inform the understanding of impacts which should be rated against landscape values.
- The ZVI does not take into account the nature (positive or negative) or magnitude (significant or insignificant) of visual impacts.
- Adequate information would include modelling and other material, develop to highest standards to ensure reliability and acceptance by both community and professional reviewers.

Q2.3**What kinds of visual modelling should be used to inform the assessment?**

The information contained in this section is derived from the current research of the consultants. Recognising this is a relatively recent and quickly-developing field, we acknowledge that some information may be limited or out of date by the time of publishing.

Outline of the issue

Visual modelling involves preparation of material to assist communities and professionals to understand the likely appearance of a wind farm (also called visualisation). Visualisation techniques include photomontage, animation, real time models and video camera matching. Other approaches to communicating the development may also be used. For example, some proponents have found that taking tours to similar existing wind farms has been a useful way to demonstrate the proposal to communities.

Current practice**Visualisations / visual modelling**

There are a number of visualisation techniques that can be used to communicate the visual impact of the proposed wind farm. There are several kinds of visualisation / visual modelling available. Four are discussed here:

- photo montages
- animations
- real-time models
- video camera matching.

Photomontages of the development are usually prepared for every wind farm development as a matter of course, and are particularly valuable for understanding impacts on landscape values. In addition, some wind farms may have particular visual impact issues that require the preparation of animations, real-time models or video camera matching. These methods can be very useful but are expensive and time consuming to prepare.

Photomontages

A photomontage combines a photograph on an existing view with a computer rendered image of the proposed wind farm development (SNH 2005, p.84). These will be of most value for views within 15km of a wind farm (SNH 2005, p.85). Important factors which have been described as important for consideration include:

- the geometry of the overlain image of the wind farm is an exact match of the existing conditions photograph.
- the effect of light and shade on turbines (The lighting of the rendered image should match the light conditions of the existing conditions photograph – the direction of light should be matched to within 10 degrees).
- the type of camera used (a good quality SLR Camera or high resolution digital camera should be used to take the original photograph); tilt or roll should be minimised and reported.

The turbines depicted in a visualisation should represent the actual design of the intended turbines. Ideally they should be based on line a drawing of the model proposed. In most cases case visualisations will depict the exact hub and rotor height, though some approaches which use higher models to account for errors in the underlying contour information are known to be used (e.g. for a contour base with accuracy plus or minus 10 metres, exaggeration of the height of the turbine by 10m may be undertaken).

Some approaches recommend that when preparing photomontages rotor blades are displayed at random stages of rotation. However if a wind turbine in a photomontage will not be visible if the blades are at a diagonal, consideration should be given to showing the blade pointing up.

In a photomontage, turbines may be shown as facing different ways:

- every turbine facing the viewpoint, (a variation is every turbine facing the same direction, with the central turbine facing viewpoint), or
- every turbine facing the prevailing wind (SHN 2005, p.75).

There are various advantages and disadvantages. Turbines are considered to have more visual impact 'face on', however they are more visual comprehensible. It may also be considered less realistic to always face the turbines toward the viewpoint. The decision must be justified in the assessment documentation.

Animations

Animations are of particular use when demonstrating the appearance of a wind farm travelling along a particularly sensitive road. Animations have the advantage of being able to simulate effects such as movement – a major shortcoming of still photomontages.

To create an animation the entire landscape must be developed as a three-dimensional model. In addition to the terrain, every element in the landscape needs to be modelled such as trees and buildings. Landscape is difficult to model because it does not consist of straight lines and repetitive textures which are inherent in three-dimensional modelling software. Cameras are created which simulate the journey of the viewer and the view from the camera is rendered out as a video. The rendering process is time consuming and therefore the length of the animation is a constraint. Animations must be prepared with the same care as still photomontages with regard to factors discussed earlier such as atmospheric effects, the focal length of the three-dimensional model camera, and the height of the camera and viewpoints or journey selected.

Real-time models

Another tool available to assess the visual impact of wind farm developments is a real time three-dimensional model. In three-dimensional models the viewer can move around the landscape and examine the visual impact from an unlimited number of viewpoints. Three-dimensional models and animations are partner technologies with animations being easily created once the model is developed. Within a three-dimensional model differing turbine layouts, heights and atmospheric effects may be assessed and compared. In this capacity it is an effective tool for testing design options. In a similar shortcoming to animations, the entire landscape must be modelled and so the visual result may be relatively crude when compared with photomontages.

Video camera matching

Video camera matching is a form of animation. Video camera matching combines the photorealism and detail (such as atmospheric effects) of photomontages with the movement of animations.

In this process video footage is taken along a journey and the wind farm is superimposed into the video. This method is very time consuming, and therefore expensive, because the foreground needs to be cut out of every frame in the video.

General considerations

In preparing photographic montages or other visual modelling (e.g. animation, video matching, scale models) consideration will need to be given to the following:

- in photography, lens size and resolution that most closely represents the actual seen view from a selected viewpoints;

- depicting the development in a variety of weather and atmospheric situations, including a 'worst case' or 'most visible' scenario (information about the likely frequency or occurrence of a particular scenario should be provided);
- accurately modelling the height, type, colour and other features of structures and buildings (including turbines);
- in digital models, making adjustments for potential inaccuracies in digital data (e.g. limitations of contour data);
- use of high quality, high resolution production, hard and soft copy impacts, digital print or photo production.

Implications for the Assessment Framework

- The proponent (or their consultant) will need to prepare photographic montages or other visual modelling (e.g. animation, video matching, scale models) to current best practice standards that accurately depict the wind farm in its landscape context.
- Digital terrain models should be based on the most accurate contour data available and their limitations described.
- The zone of visual influence should be calculated to a distance appropriate to the development. This may be to the extent of potential visibility (but in practice, is likely to be less).
- Viewpoints should be selected using an iterative process that involves consultation with the community and the responsible authority. Viewpoints should be representative of a range of views and viewer types.
- Photomontages must be prepared according to a number of specific technical standards to ensure an accurate depiction of the wind farm.
- Animations, real time models and video camera matching are additional tools that may be employed where extra information is required.

Conclusions

- A descriptive step in which the proponent (or their consultant) describes and depicts the development (graphically and in words) should precede the assessment of impacts on landscape values.
- Adequate information would include modelling and other material, developed to highest standards to ensure reliability and acceptance by both community and professional reviewers.
- Visual analysis (modelling) forms one component of the visual assessment.
- Visualisations and visibility maps inform the VIA process to show from where a development will be seen, and how it will appear. The visualisations and visibility maps must be prepared to a high degree of accuracy, however they cannot replicate the experience of seeing a wind farm in a landscape. It is important to visit the site of a proposed wind farm as part of the VIA. However, these tools are important as predictions made without the benefit of visualisations and visibility maps are unlikely to be accurate.
- Visual assessment on its own does not constitute an assessment of impacts on landscape values. Rather, visual assessment provides descriptive information to inform the understanding of impacts which should be rated against landscape values.

3. Assessing the impact of wind farms on landscape values

The critical questions investigated to examine current practice in assessing the impact of wind farms on landscape values were:

- Q3.1 How do wind farms impact on landscape values?
- Q3.2 How should the landscape impact of individual wind farms be identified and assessed?
- Q3.3 How should communities provide input to the assessment of wind farm impacts on landscape values?

Q3.1 How do wind farms impact on landscape values?

Outline of the issue

- The 2005 Stage 1 Report identifies that wind farms have a range of impacts on landscape values, including landscape character and scenery; Indigenous cultural values; amenity; cultural heritage; contemporary cultural values and sense of place.
- These impacts are identified as being influenced by the wind farm's location; the height of towers and turbines; the number of turbines; movement; colour and materials; and ancillary infrastructure.

Current practice

Characteristics that influence impacts

The 2005 Stage 1 Report identified a number of factors which influence the impact of wind farms on landscape values. These are summarised as follows.

Location

Wind energy facilities are planned for locations in which take advantage of available wind resource and proximity to electricity transmission infrastructure. In most Australian examples these have included locations on or near the coast, in open inland areas or on ridgelines. All of these environments tend to be highly visible and often (particularly coastal areas) exhibit other natural and cultural values (e.g. recreational use, Indigenous sites, migratory bird species, scenic landforms etc.).

High-wind environments are also found offshore. Although wind farms have been developed offshore in other countries (most notably in Europe) to take advantage of this, no offshore wind farms have as yet been built in or proposed for Australia.

The height of towers and turbines

Turbines built in Australia frequently exceed 100 metres in height from base to blade tip. Current generation (2007) turbines such as the Vestas V90 have towers 60-90 metres and three blades each 45 metres long. The height of individual turbines can make them visible for long distances, and they can be prominent features on the horizon when viewed with the sea or sky as a backdrop. The turbines can also stand in dramatic contrast with the height of features of the surrounding landscape.

The number of turbines

Groups of wind turbines offer the opportunity for greater power output with reduced infrastructure requirements per megawatt of installed capacity. But, just as individual turbines can be dominant landscape elements by virtue of their height, collections of turbines can be highly visible because of the combination of their height, repeating elements and the geographical area they cover.

Lothian (2006) assessed the responses to photographs of constructed scenes containing between 6 and 13 turbines. With this scale of difference, no clear trend for the influence of number of turbines on visual preference was identifiable.

The largest approved wind farm in Australia is Macarthur with a total installed capacity of 329MW (approximately 180 turbines), while the largest installed wind farm is Walkway in Western Australia, with 54 turbines.

Movement

Wind turbines differ from other types of development in the landscape because they have large moving parts—the rotor blades—which naturally draw the eye. Numerous functioning turbines can have a particularly strong visual impact. The moving rotors also produce some noise, which, although only audible when one is close to the turbines, could affect some people's enjoyment of a place. Noise levels are, however, regulated by standards, planning controls, and environment protection authority requirements and are beyond the scope of the recommendations of this project.

Colour, materials and lighting

The colour and materials used in wind turbine design are also characteristics that can contribute to landscape impacts.

In some cases, the mandatory installation of aircraft warning lighting has caused significant impacts. In others, a condition of permit has been that no lighting be added to the turbines or other infrastructure.

Implications for Assessment Framework

Accurate description and identification of all wind farm attributes will need to be made in order to inform impact assessment.

Technological and feasibility constraints on the size, type and nature of infrastructure (including turbines) should also be considered.

Ancillary infrastructure

Several studies indicate that ancillary and supporting infrastructure – such as roads, transmission lines and substations – can have a considerable impact on the landscape values of a proposed wind farm site, in particular on visual and scenic values.

To a large degree current practice for identifying landscape impacts focuses on the turbines themselves, which by virtue of size and number have a larger scale of impact on landscapes than supporting infrastructure. Further, the assessment of the landscape impacts of ancillary infrastructure is usually not mentioned in the scope of work for most wind farm assessments, except by implication.

However many studies have identified substantial landscape impacts contributed by ancillary infrastructure. While wind turbines themselves might benefit from a 'scenic interest' element, no such aesthetic benefit is associated with the more ubiquitous and / or industrial ancillary infrastructure such as transmission lines, substations and roads etc (Gipe, 1996; Inspiring Place, 2002). Indeed, not only do these elements have their own visual and landscape impacts, but if poorly designed and sited, they may also detract from the aesthetic of the wind farm itself and therefore contribute in a substantial way to the relative acceptability of the wind farm itself.

Implications for Assessment Framework

Landscape assessment should include a review of the potential visual and landscape impacts of (at least) transmission lines, roads, substations and any permanent buildings to be located on the site, and make recommendations as to their appropriate design and siting.

Cumulative impacts

Landscape and visual impacts can also be cumulative. Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts of wind farms on landscapes, including:

- combined visibility (whether two or more wind farms will be visible from one location);
- sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail);

- the visual compatibility of different wind farms in the same vicinity;
- perceived or actual change in land use across a character type or region; and
- loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

Australian wind farm landscape and visual impact assessments have in only a few cases considered cumulative landscape impacts. The Victorian Planning Panels held that developments that have not been approved are not relevant to analysis of landscape capacity (Bald Hills p. 126). That is, it is not appropriate to speculate on the potential cumulative impact of an unapproved scheme as it may never be approved, but that cumulative impact assessment of the current scheme (if approved) should be undertaken to account in considering cumulative impacts of the future scheme.

Alternative policy guidance from state governments has directed developers to report on potential cumulative impacts with other wind farms in 'public knowledge' to assist in decision-making where several wind farms are being considered at once.

In the UK, cumulative impact is to be taken into account in considering applications for consent, recognising the increasing rate development of on-shore wind farms means cumulative impact is becoming more pertinent (SNH, 2005).

Cumulative impacts may also occur where there are no other wind farms in the area, but by virtue of combination with other landscape changes which alter the overall character or values of an area (e.g. through rate or scale of landscape changes). No examples of perceptions research undertaken for such cumulative landscape impacts were available for this review.

Particular consideration might be given to cumulative impacts within an identifiable region or travel route (e.g. main road between two major towns, tourism trail or walking track).

Implications for Assessment Framework

It will be relevant for assessment to consider all dimensions of potential cumulative impacts on landscapes, when considered with other wind farms or different development types in the area.

Positive landscape impacts or landscape benefits

Wind turbines are said to be a powerful symbol in the landscape, exhibiting a modern design aesthetic that may itself be valued.

The 2005 Stage 1 Report defines positive landscape benefits of a wind farm as potentially including:

- Aesthetics – The clean lines of the turbines, their contrast with the landscape and the uniformity of their appearance; sleek aerodynamic and sculptural forms; starkness and modernity of design; consistency and repetition of features; a sense of order; a strong presence.
- Symbolic – A symbol of new technologies and sustainable electricity production. Some people welcome the 'machine element' of a wind farm in the landscape and see it as an example of humans working in harmony with nature.
- Function – deriving from their ability to provide a public good (electricity) using renewable means.
- Substitution – the trade-off with alternative developments that produce the same product by different means and often in different locations.

The Portland Wind Energy Project (Planning Panels Victoria 2001) suggests that wind farms in a highly modified cultural setting cause less damage than in a 'natural' setting and may actually improve the landscape. Lothian (2006) identified that in certain inland areas of South Australia (those with low 'scenic quality') the addition of a wind farm may in fact improve an individual's impression of the scenic or visual values of that landscape.

Landscape benefits are not the same as providing off sets or landscape improvements in addition to the wind farm development to improve its overall acceptability (e.g. rehabilitation, restoration or other management measures). These are addressed in Section 4 of this report.

Implications for Assessment Framework

Consideration, evaluation and reporting of positive impacts of wind farms on landscapes should be made in assessment processes.

Conclusions

- Landscape impacts of wind farms can be direct, indirect, cumulative; of short or long duration.
- Landscape impacts of wind farms can be positive or negative.
- Wind farms have unique impacts associated with their size, location, potential for positive landscape benefits and other characteristics that mean they need to be considered differently to other land uses, such as other industrial land uses.

Q3.2

How should the landscape impact of individual wind farms be identified and assessed?

Outline of the issue

- Various approaches are currently used to identify and rate the relative impact of a development on established values.
- Evaluation of the level of impact (positive or negative) is essential to making decisions about the acceptability of the wind farm, and the need for measures to mitigate impacts.
- Transparency and rigour will be important to back up conclusions about impact as these will have major implications for the ultimate acceptability of the wind farm, and the application of mitigation measures.

Current practice

Relevant considerations

Environmental impact assessments in Australia and overseas take a range of factors into consideration in rating the potential impacts of wind farms on landscape values.

At a general level, landscape impact assessments evaluate and identify the severity of an impact by using a combination of:

- the significance of the underlying landscape value (e.g. high moderate or low 'scenic quality'); and
- the degree of impact (e.g. through objective measures such as distance from viewers etc.)

Primarily, the assessments reviewed in this study used descriptions of scenic or visual character to define the significance of landscape values on which the wind farm might impact. Similarly, the degree of impact was typically defined using visual intrusion modelling, coupled with assumptions about the expectations of community members who will view the proposal.

Specific examples used in assessments reviewed in this study include:

- the underlying landscape:
 - existing character (degree of modification to the landscape, occurrence of features of high scenic quality);
 - sensitivity (landscape sensitivity is frequently used term and generally a factor the development type, and the underlying

character and significance of the landscape. Less sensitive landscapes are more able to accommodate a particular type of development without altering the character or values of that landscape.)

- environmental conditions (e.g. soil colour, erosion potential, slope);
- the nature of the development proposal:
 - scale, size
 - consistency (or otherwise) with existing character;
- viewing situation
 - number of viewers, viewing time,
 - distance from viewing;

Other factors sometimes taken into account include availability of mitigation options, costs of mitigation options and community input. The role of community members in assessing impacts is discussed further below.

Evaluating impacts

There is limited holistic work to understand and rate the impacts of landscape values, as defined by this study. What becomes clear is that the assessment of impacts against values established for the place is essential. Some Australian and international examples are explored here.

The use of matrices to assess impacts is common practice. These vary in complexity and in content. Scenic Spectrums (e.g. 2005), offer an approach which combines sensitivity and value by overlaying viewing distance (e.g. near foreground, middle foreground to far background) with assessment of scenic quality (defined by type and form of topography, vegetation, waterform and land use within a character area). This is closely related to the Visual Management Systems developed for forestry operations in the 1970s (and reviewed above). Closer locations with higher scenic quality, have the highest significance, and the most stringent management priority under this system.

Grimm and Keats (n.d. awaiting publication) have developed a method for quantifying the visual impacts of wind farms by combining a quantification of the underlying landscape values with a separate assessment of the visual effect. The underlying value of the landscape in this method is informed by:

- relief (presence or absence of topographic variation);
- vegetation coverage (extent, frequency, density and character);
- infrastructure and built form (the relative dominance of natural or built features in the landscape);
- cultural landscape (a survey of existing cultural, heritage, natural and social overlays that exist in recognised state or national designations – e.g. development plans or heritage registers).

The authors also acknowledge in the paper that quantitative landscape assessment outlined in this method ought to be paralleled by qualitative assessment based on subjectivity and psychological variables.

Detailed visual effects of the development form (using photomontages and other methods) considers:

- percent of landscape absorption (the landscapes ability to absorb and screen the development form);
- horizontal visual effect (the percentage spread and extent of the development in the field of view);
- vertical visual effect (height of the development as a percentage of the vertical field of view);

- distance of visual effect (the distance between viewpoint and the development).

This method has been applied to visual landscape assessment of the Drysdale Wind Farm in South Australia (WAX Design and Grimm, 2007).

In a local government study in the UK, the County of Lancashire identified several underlying factors affecting the sensitivity of the landscape to wind farm developments:

- physical (scale, openness, landform, land cover);
- perceptual (wildness / remoteness, degree of change);
- visual (views, skylines, distinctive backdrops); and
- value (rarity, designated scenic quality, artistic associations etc.).

These factors were rated across the entire shire, and appropriate locations for wind farm development identified (Lovejoy, 2005).

Implications for Assessment Framework

The National Assessment Framework will need to recognise the important distinction between identification of values (e.g. landscape character, natural or cultural values) and the measurement of impacts on these values (e.g. quantified visual effect).

Consideration will need to be given in the Framework to the identification of:

- the significance of the value that is being impacted;
- the degree to which the value is lost or altered;
- the duration and reversibility of the impact;
- the availability of mitigation measures; and
- evaluation by community members, ideally those involved in identification of values of the subject landscape.

Conclusions

- In understanding impacts, consideration should be given to several related factors: significance (value); sensitivity (the 'robustness' or otherwise of values to the proposed development); type, nature, scale of development (including all turbines, roads, ancillary infrastructure).
- In evaluating visual impacts, clear separation between identification of values (e.g. landscape character, natural or cultural values) and the measurement of impacts on these values (e.g. quantified visual effect) is important.
- An understanding of the characteristics of the development, as well as underlying landscape values and sensitivity, is essential to assessing impacts.
- Negative impacts should be defined against a value established for the place.
- The evaluation of the acceptability of the wind farm as a whole will include consideration of the individual impacts, and their combined effect, as well as the wind farm's contribution to cumulative impacts on the landscape; the extent to which negative impacts are balanced by positive landscape benefits.
- It will be important to rate the acceptability of each impact, and of the impact of the wind farm as a whole.
- Impacts may be rated individually for different types of impacts on specific values. However, a conclusion of the overall combined impact of the wind farm on landscape values (including any balancing positive benefits) will need to be reported.
- The acceptability of the landscape impacts of the wind farm when balanced against perceived (non-landscape) benefits, or lack thereof (e.g. clean energy, economic benefits) is not a relevant consideration for landscape assessment in this study. However, these factors are clearly important to considering the acceptability of

landscape impacts of wind farms in the minds of many stakeholders and may be relevant to more general development approvals process.

Q3.3

How should communities provide input to the assessment of wind farm impacts on landscape values?

Outline of the issue

- Direct input from affected communities is important in understanding impacts on landscape values, particularly those communities involved in identifying the values of the place.

Current practice

Given the central role of local and other communities in understanding values, it follows that a involvement of community members in impact assessment will also be important, supported by information from consultants and the proponent.

Community involvement in wind farm assessments reviewed in this study varied in the extent to which communities are engaged in considering impacts. It is common practice for environmental impact assessments to be made public and reviewed by community members, though this is often late in the process.

In virtually all cases, visual and landscape assessments assert to report on impacts on values that are held by community members (whether these values are defined by direct community input, or through professional assessment or in combination). The degree of community input to evaluating impacts themselves, however, varies. Some methods used to assess impacts on landscape values apply conclusions derived from social research different 'sensitivities' to different types of communities (e.g. locals, tourists, workers, land owners). However, these assumptions have been criticised in cases where the research or conclusions underlying them are limited, or sourced from locations remote to the subject site.

In Victoria, the Portland Wind Energy Panel EES process also highlighted the importance of community consultation in landscape impact assessment, and in the siting and design of the wind farm development. The importance of effective consultation with the community is emphasised by a number of essays in the recent publication *Wind Power in View - Energy Landscapes in a Crowded World*, (Pasqualetti *et al.* 2002). Community consultation has a valuable role in informing the visual impact assessment process, in testing the results, in informing the community about wind energy projects and allaying fears in relation to potential impacts. However, perhaps even more important is the involvement of the community in the wind farm design process, and the ability in some cases to respond to individual concerns as a result of the consultation process.

Some assertions are made in literature and consultation that the perceived landscape impact is affected by how a person perceives the overall benefit of the wind farm. How this focus is interpreted differs between viewers with some enjoying the experience and others perceiving it as an intrusion and damaging to the landscape.

Communities may also vary their impression of impacts depending on the availability (and suitability) of mitigation measures. This is discussed further below.

Implications for Assessment Framework

- Direct input from affected communities is important in understanding impacts on landscape values, particularly those communities involved in identifying the values of the place.
- Adequate information about the development and understanding of values need to be provided to community members
- The research and methodological basis for claims about public perception or sensitivity to change should be made utterly transparent if they are to be relied upon to understand impacts.

Conclusions

- Direct input from affected communities is important in understanding impacts on landscape values, particularly those communities involved in identifying the values of the place.
- Careful consideration needs to be given to the way that communities are involved, taking in to consideration the provision of adequate and accurate information, the opportunity to discuss other (non-landscape) issues of interest to community members.

4. Responding to the Impact of Wind Farms on Landscape Values

The critical questions investigated to examine current practice in responding to impacts of wind farms on landscape values were:

- Q4.1 How can identified impacts on landscape values be avoided or mitigated?
- Q4.2 How should communities be involved in determining appropriate mitigation measures?

Q4.1 How can identified impacts on landscape values be avoided or mitigated?

Outline of the issue

- Various strategies are available to respond to the negative impacts of wind farms on landscapes. These may aim to avoid, remedy or minimise the identified impact, or offer ex-situ offsets.
- Many mitigation measures (e.g. localised screening and other measures) occur at the detailed design stage and may be required as conditions of a permit rather than during the assessment process.
- However, responding to impacts may include substantial changes to the location or design of the wind farm, to avoidance of the proposed site altogether, all of which need to be considered as part of the assessment process.

Current practice

Two broad approaches to mitigating impacts are used in current practice:

- Respond directly to the impact by avoidance or other steps which remedy or minimise the impact on the value of concern.
- Provide other (e.g. off-site) remedies or benefits which balance the impact (this may include enhancing or celebrating any positive landscape benefits of the proposal itself).

Note: consideration of the acceptability of the landscape impacts of the wind farm when balanced against other (non-landscape) benefits, or lack thereof (e.g. clean energy, economic benefits) is not addressed in this study. However, these factors are clearly important to considering the acceptability of landscape impacts of wind farms in the minds of many stakeholders and may be relevant to more general development approvals process.

Mitigation hierarchy

Various strategies are available to respond to the negative impacts of wind farms on landscapes. These approaches are ordered in accordance with the degree to which they may affect the viability of the proposal (most to least), although this will vary from development to development.

- Changes to the location of the wind farm as a whole;
- Changes to siting of turbines within the proposed wind farm site;
- Changes to the scale, size, height of turbines;
- Changes to location or siting of ancillary infrastructure;
- Design of turbines (including colours, materials, logos, lights);
- On-site landscaping;
- Off-site landscaping;

- On-site landscape improvements; and
- Remote off-sets.

Mitigation options

Site selection and location

The scale of wind turbines ensures that mitigation options are inherently limited in effectiveness. Planning panels have emphasised that some landscapes are so significant and so sensitive that a mitigation strategy of avoidance is warranted (Bald Hills).

Siting and layout

Once it has been determined that a site is appropriate for the development of a wind farm, there are a number of strategies that have been employed to mitigate the landscape and amenity impacts.

In South Australia, a government committee (ERDC, 2004) looking at wind farm assessment recommended some blanket mitigation considerations for wind farms including buffer zones and setback distances to reduce the impact of wind farms including visual, blade glint and shadow flicker.

Changes to siting can also enhance the visual acceptability of impacts, by improving their legibility. These strategies include rectilinear, linear or geometric siting patterns. The employment of this strategy is highly dependent on the topography and landscape.

Size, scale, height

Another strategy is reducing the size of turbines. This strategy is in most cases not an option. Smaller numbers of larger turbines are more efficient, generating more electricity for the investment when compared to larger numbers of smaller turbines. Indeed wind farms are often not economically viable if the turbine design is altered. The size of turbines may be seen as an engineering constraint. In addition, panels have concluded that from a landscape and amenity perspective it is smaller numbers of larger turbines that are preferable. (Bald Hills, p.125)

However, Bishop (2001) notes that reduction in size of turbines does not necessarily equate to a reduction in perceived size or lessened visual impact.

Landscaping / screening

Screening wind farms from key vantage points is a way of lessening the landscape and amenity impact. Panel reports have included screening programs as a condition of planning approval. These programs are typically a voluntary program of screening that is developed in conjunction with nominated landholders and is at the proponent's expense. This may include planting outside the property boundary of the nominated landholders.

Other measures

Other measures which do not respond directly to impacts might also be considered, including landscape improvements in and around the wind farm site or off-sets (the protection or management of other landscapes). However, these should not be considered to mitigate identified impacts.

Decommissioning

The 2005 Stage 1 report posed the question as to whether impacts might be mitigated by the reinstatement of the landscape at some future point in time, following decommissioning of the wind farm. In current practice reviewed in this study, little emphasis has been placed on decommissioning in considering impacts (very few assessments raise decommissioning and reinstatement of the landscape, and only one public review process was found to have addressed the question).

Decommissioning is seen as having lesser weight because:

- The life of wind farms (around 20-25 years) itself is a substantial (generational) impact;

- There is uncertainty as to the regulatory situation in the future;
- It is unclear whether the wind farm will set a precedent for landscape change that will affect the way land use decisions are made for that place in the future.

It is possible, however, for decommissioning and reinstatement of the landscape to be required as a permit of approvals. Many wind farm developers set up trust funds to provide for the decommissioning and / or reconditioning of the facility.

Implications for Assessment Framework

All of the above measures may be relevant to assist the avoidance, minimisation or mitigation of impacts on landscape values.

The degree of action to mitigate impacts should respond to both the magnitude of the likely impact, and the significance of the value or values being impacted upon.

Conclusions

- The development of management and mitigation measures will be iterative, responding to the identification of impacts, the identification of potential solutions to these impacts, and the testing of the acceptability of solutions with communities, proponents and Government authorities.
- Impact ought to be mitigated using the approach most appropriate to remedying that impact. Where two or more mitigation measures are appropriate, the measure with least impact on the viability of the proposal will be preferred.
- In cases where changes to the location of the wind farm itself or the siting of turbines or ancillary infrastructure are required in order to mitigate an impact, these should be identified and reported early on.
- Consideration of mitigation measures should take into account the extent to which they address the impact of concern, and in order of their likely impact on the viability of the proposal.
- Decommissioning of the wind farm should be given low weight (if any) in assessing impacts on landscape values.

Q4.2

How should communities be involved in determining appropriate mitigation measures?

Outline of the issue

- Direct input from affected communities is important in understanding impacts on landscape values, particularly those communities involved in identifying the values of the place.

Current practice

The process of developing revised options for a development is complex and takes into account a range of factors, of which landscape values and community concerns are part.

However, the ongoing involvement of communities in understanding how impacts have or might be responded to is important.

Some good examples of ongoing community liaison by developers in finalising their layout options have been described for this study. Similarly, lack of transparency and engagement has also been criticised – particularly where this ends up in costly tribunal or court cases which by virtue of cost can be prohibitive for communities.

A clear area of improvement in the documents reviewed by this study is the reporting of community input to changes to the development, particularly where these changes are intended to respond (in whole or in part) to community concerns. It is essential that consultants and developers articulate the extent to which changes to the

development remedy impacts on values (and on which values this has occurred), and also any residual community concern.

Technical and other constraints which influence mitigation measures also need to be reported on and communicated to community members.

Implications for Assessment Framework

Provide opportunities for the continued involvement of affected communities in addressing (mitigating) impacts, particularly where they have been involved in their identification.

In involving communities in understanding mitigation measures, provide sufficient information to communities about technical and other constraints which influence options which can be pursued.

Require full and adequate reporting of community input, and any residual community concern.

Conclusions

- Direct community involvement in understanding and responding to mitigation options is important, for transparency of decision making, for continuity of involvement, and to ensure that proposed changes to the development respond effectively to community concerns.
- However, this does not necessarily mean that members of affected communities will have a direct say in developing options. This is unnecessary given they will lack the skills and knowledge of other constraints necessary to produce such options.

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