

# Research Report



## Report Title

Assessment of the Impact of Wind Farms on Surrounding Land Values in Australia

Report Prepared For  
AECOM

Report Date  
23 July 2013

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## 1 Executive Summary

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- A review of wind farms currently operating in Australia revealed that they have been developed in locations generally removed from densely populated areas. As a result the small samples of sales transactions available for analysis limited the extent to which conclusions could be drawn.
- The major empirical study in Australia (*Duponts – PRP 2009*) found that that wind farms do not appear to have negatively affected property values in most cases. Forty (40) of the 45 sales investigated did not show any reductions in value. Five (5) properties were found to have lower than expected sale prices based on a property market analysis.
- The *Duponts – PRP* study also suggested that a property's underlying land use may affect the property's sensitivity to price impacts. No reductions in sale prices were evident for rural properties or residential properties located in nearby townships with views of the wind farm. The results for rural residential properties (commonly known as 'lifestyle properties') were mixed and inconsistent; however, there appeared to be possible reductions in this sector where views and amenity were compromised.
- Further international statistical studies generally support the above observations.
- Anecdotal evidence of a decrease in values is not supported by empirical or statistical evidence, however it is recognised that large statistical studies may not account for all the variables that influence value.
- Some studies identify anticipation stigma as possible precursor to a decrease in values.
- Overall economic benefits of wind farms may lead to increased land values over a period of time.

## 2 Background

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The impact of wind farms on surrounding land values is a common source of conflict between proponents and objectors to proposed wind farms.

There are often community concerns emanating from perceptions about the impact a wind farm could have on the value of the surrounding properties. These perceptions are understandable as visual impacts that alter the aesthetics (ie views) of a property and noise are known to be able to affect property values (*Simons & Saginor, 2006* cited in *Hoen & Wiser, 2008*). Some examples of the potential influence of aesthetics and noise include:

### Aesthetics

- Properties with water views generally sell for a higher price than those without water views
- Views of high powered transmission lines can reduce the value of a property (*Des Rosiers 2002*)
- Our observations of the market over time indicate views of highways can reduce property values

### Noise

- Properties on main roads often sell for a lower price than those located away from main roads where there is less traffic noise
- Properties under aircraft flight paths frequently sell for a lower price than those nearby.

A wind turbine is a large structure commonly over 100 meters in height with three (3) blades with diameters almost as large as the height of the base tower. The aesthetics of a view of a wind farm are affected by the distance the observer is located away from the wind farm, the positioning, and the number of turbines. Turbines positioned closer together generally have a greater potential to impact on the aesthetics than those that are spaced further apart. As the density of turbine placement increases, the potential for the wind farm to take on more industrial like appearances increases. However, whether the view of a wind farm is considered to be a negative one or not is largely subjective and studies looking at people's perceptions often find varying opinions (*Bond, 2009; RICS, 2004*).

Wind turbines also generate noise that can be heard at varying distances, depending on a range of factors such as topography and weather conditions.

While wind farms can impact views and generate noise, statistical studies completed to date analysing sales transaction data have not found consistent evidence of obvious discernible negative impacts on property values due to the presence of wind farms.

Assessing the impact of wind farms is tempered by the fact that there is relatively limited objective information available on this issue. A review of the limited research that has been completed generally falls into two categories:

- Studies that have analysed property sales transaction data, and
- Studies that have investigated the opinions of residents and/or property industry professionals on the impact of wind farms.

### 3 Property Sales Transaction Data Research

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A number of previous studies that have analysed sales transaction data are presented below. The studies vary in size and methodology. While some studies have found slight negative impacts, the larger, more comprehensive studies have generally found no statistical evidence of reductions in value associated with the development of a wind farm.

***Preliminary Assessment of the Impact of Wind Farms on Surrounding Land Values in Australia: NSW Department of Lands, Duponts – PRP Valuers, Prepared for NSW Valuer General (August 2009)***

This major Australian report was undertaken for the NSW Valuer-General / Department of Lands for a NSW Cabinet submission on the social, environmental and economic costs and benefits of wind farms in Australia.

A total of eight wind farm sites were selected for analysis comprising six (6) wind farms from Victoria and two (2) from NSW. Victorian wind farms selected were Waubra, Challicum Hills, Toora, Wonthaggi, Cape Bridgewater and Codrington / Yambuk. NSW wind farms selected were Blayney and Capital.

Wind farm sites were selected based on the availability of market data (ie property sale transactions) and the surrounding land use. The aim was to select sites from differing surrounding land uses including rural land, rural residential / lifestyle land and urban housing.

On investigation, it was evident that wind farms completed in Australia are generally located in rural areas, either inland or on the coast, but visually removed from densely populated areas. This limited the availability of property sales transactions data for analysis.

The report concluded that of 45 sales investigated, 40 did not show any reductions in value, 5 properties were found to have lower than expected sale prices, and urban blocks showed 6% reduction. Rural lifestyle properties in one location (Toora) had 6%, 24%, 25% and 27% reductions, as well as one sale that indicated a 15% increase.

In brief, the report concluded that:

- Wind farms do not appear to have negatively affected property values in most cases.
- A property's underlying land use may affect the property's sensitivity to price impacts:
  - (i) No reductions in sale price were evident for rural properties or residential properties located in nearby townships with views of the wind farm.
  - (ii) The results for rural residential properties (commonly known as 'lifestyle properties') were mixed and inconsistent; there were some possible reductions in sales prices identified in some locations alongside properties whose values appeared not to have been affected by the presence of the wind farm.

**Land Value Impact of Wind Farm Development: Crookwell NSW – Henderson & Horning (2006) – Australia**

Henderson and Horning Property Consultants prepared a report on behalf of Taurus Energy Pty Ltd (proponent) on the effect of the Crookwell Wind Farm in NSW Australia on local property values.

The report included an analysis of 78 property sales surrounding the Crookwell Wind Farm over a period of 15 years from 1990 to January 2006. Sales of properties in the view shed of the wind farm (using a 6 kilometre threshold) were compared with sales of those not in the view shed.

No reductions in property values were found for properties in the view shed of the wind farm.

**Wind Farms: The Local Experience – Hives (2008) – Australia**

Hives presented a paper at the 2008 API Country Conference providing an analysis of individual sales transactions from properties surrounding the Waubra Wind Farm near Ballarat in Victoria. The wind farm was being constructed at the time of the study, although many turbines had already been erected. Hives hypothesised that:

- Agricultural land with turbine leases would become more valuable
- Adjoining agricultural land values would not be affected
- Lifestyle properties and residential properties located in the town might be affected.

Hives concluded that lifestyle values had the greatest potential to be affected as a large part of their value is typically derived from the aesthetic qualities of the surrounding environment.

**Negative Affects [sic] to Property Values near Wind Farm Developments in South Gippsland – Jess (2008) – Australia**

In a separate presentation at the API Country Conference, Jess presented a range of sales transactions that had occurred around the Toora Wind Farm in south east Victoria. The sales transactions indicated that the wind farm developer had been purchasing surrounding properties following planning approval and completion. Also, a sale transaction of a “lifestyle” property, which sold both before and after the construction of the wind farm, was presented. The property was located close to the wind turbines with substantial views of the turbines. It was estimated that the sale after the construction of the wind farm was approximately 30% below the market value of the property had the wind farm not existed. However, this was a single transaction and such a decrease has not been evident in other sales nearby.

The *Duponts – PRP* study also investigated the sales surrounding the Toora Wind Farm and found varied results.

There have been no other statistical or transaction based reports published in Australia.

These studies were compared to independent studies throughout the world in countries where wind farms are more established and are generally in higher density areas than Australia, having a greater amount of data, the results of which are summarised below.

Author (Year)	Nation	Methodology	Finding
Jorgenson (1996)	Denmark	Sample: 102 locations Analysis: Hedonic price modelling.	Slight reduction in value found.
Sterzinger et al (2003)	USA	Sample: 25,000 Analysis: Hedonic price modelling.	Increases in values found.
Sims & Dent (2007)	UK	Sample: 1,052 Analysis: Hedonic pricing modelling.	No conclusive statistical relationship found.
Hoen & Wiser (2008)	USA	Sample: 450 Analysis: Hedonic price modelling with physical inspections of each sale.	No statistical relationship found. Some isolated cases of value reduction.
Hoen & Wiser (2009)	USA	Sample: 7,500 Analysis: As above but expanded and utilised three different models over 24 separate sites. Considered the "definitive" study and is the most cited paper on the subject.	No statistical evidence for area, scenic or nuisance stigma found. Possible "anticipation" stigma.
Hinman (2010)	USA	Sample: 3,581 sales over 9 years and 12 sites. Pooled hedonic regression analysis.	Strongly rejects wind farm stigma on property values. Some evidence supports "anticipation" stigma.
Carter (2011)	USA	Sample: 1,298 sales over 12 years. Hedonic price study.	No statistical evidence to support wind farm stigma.
Sunak & Madlener (2011)	Germany	Sample: 1,405 sales over 18 years; two models.	Mixed results but some evidence for negative local effects in close proximity to turbines.
Heintzelmann & Turtle (2011)	USA	Sample: 11,331 residential and agricultural properties between 2000 and 2009. Fixed effects hedonic analysis.	Significant reduction in values in two out of three wind farms studied.



Generally, the statistical and independent studies found little effect on values, however conceded that some “anticipation” stigma is probable, ie in the planning and concept phase but disappearing after time. All models indicate that any effect disappears beyond a distance of 1 to 2 kilometres.

The Sunak & Madlener report identified a decrease in close proximity to turbines where the physical and audible effects were present in the order of 10% discrepancy to nil at a distance of 2 kilometres from turbines. Other studies indicate visual proximity was negligible.

#### 4 Anecdotal Dissenting Evidence

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Most dissenting views to the above appear to use anecdotal evidence or singular sales as the basis for the contention of negative impacts. One study (McCain (2010), USA) by a real estate professional stated a decrease of 20% to 25% would be expected, however this was in support of a proposed objection to a wind farm and not peer reviewed.

The study by Heintzelmann & Turtle (2011) used a repeat sales fixed effects hedonic analysis and found negative impacts on nearby properties in two of three site studies, but some models indicated a positive impact within close proximity of turbines (0.5 miles).

#### 5 Perceptual Studies

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In addition to the above research utilising property sales transaction data, there has also been research conducted into local residents' and industry professionals' opinions on the effect of wind farms. Perceptual research generally indicates that a smaller proportion of the public, both in Australia and internationally, believes that wind farms negatively affect property values.

##### ***A Tale of Two Windy Cities: Public Attitudes towards Wind Farm Development – Bond (2009) – Australia***

Bond (2009) researched public attitudes towards wind farms and property values among residents living in the towns Albany and Esperance, Western Australia. Responses indicated that residents generally considered wind farm developments to be positive providing they were located a sufficient distance away from homes as to not disturb them. The distance reported to be acceptable was generally over 5 kilometres away. Approximately two-thirds of Albany residents and one-third of Esperance residents felt more in favour of the wind farms after the farms were completed.

Over two-thirds of survey respondents indicated that a wind farm would not influence the price they would be willing to pay for a property. On the other hand, nearly a quarter of survey respondents indicated that they would pay less, with 38% indicating they would pay 1% to 9% less, while 22% of respondents indicated they would pay 10% to 19% less.

##### ***Impact of Wind Farms on the Value of Residential Property and Agricultural Land – RICS (2004) – United Kingdom***

A survey of members of the UK Royal Institute of Chartered Surveyors in 2004 found that 60% of the 405 respondents believed residential property values decreased if the property was in view of a wind farm. Further, 72% of respondents believed wind



farm developments had either no effect or a positive effect on the agricultural value of the land. Visual impact, fear of blight and the proximity of a property to a wind farm were considered the main drivers to reductions in property values.

### **Bald Hills Wind Farm Panel Inquiry (2004) – Australia**

In June 2004 the Victorian Minister for Planning appointed a panel to examine a proposal for a wind farm at Bald Hills, near Tarwin Lower in South Gippsland, Victoria. The Panel considered a number of submissions from property valuers and real estate agents. The Panel's response to the submissions was:

*"All that appears to emerge from the range of submissions and evidence on valuation issues is the view that the effect of wind energy facilities on surrounding property values is inconclusive, beyond the position that the agricultural land component of value would remain unchanged. On this there appeared to be general agreement. It therefore follows that it has not been demonstrated to the satisfaction of this Panel that significant value changes, transfers or inequities would result from the project proceeding."*

### **CSIRO – Exploring Community Acceptance of Wind Farms in Australia – Hall, Ashworth & Shaw (2012)**

A qualitative survey of residents around nine existing wind farms in NSW, Victoria and South Australia that concluded:

- Communities benefit from a local wind farm through increased local business, community funds and local government revenue.
- Turbine hosts can use rental income to remain on the farm post-retirement, conserve biodiversity, and prevent subdividing.
- Property prices have not been found to increase or decrease, although the potential market of buyers may be decreased.

This conclusion was based on interviews and literature reviews available at the time. No empirical study was undertaken.

### **The Social and Economic Impact of Rural Wind Farms 2011 – The Senate Community Affairs References Committee**

Within Chapter 4 of the above enquiry, the effect on property values was explored by the committee. In response to submissions, the committee concluded:

*"Although there were conflicting views expressed, there were sufficient indications in the evidence to suggest that the value of rural lifestyle properties in close proximity to wind farms may be adversely affected by the establishment of the wind farms. Agricultural properties near wind farms which do not host turbines may not be similarly affected, although there could be some diminution of values if dwellings on the properties are situated very close to turbines. There might also be some negative effects on agricultural property values if those properties could not utilise aerial applications of fertiliser, seeds and pesticides."*

*The value of properties that are hosts to wind turbines should increase provided of course that the rights to rentals for the turbines are transferable with the sale of the property. It was argued by wind farm developers that turbines occupy only a minute percentage of the land and may improve it to*

*the extent that tracks are maintained and that some electric facilities might be available in areas of properties where they had not been before”.*

**Public Attitudes Towards Wind Farms – A Trans Tasman Comparison – Australian and New Zealand Property Journal (December 2010)**

In a survey published in the Australia and New Zealand Property Journal, the results indicated 70% of New Zealanders and 74% of Australians supported wind farms in their area and 72% thought a wind farm over 3 kilometres from their property would have no effect on value.

Whilst it is apparent that a quantifiable proportion of the public perceive that wind farms will affect land values, apart from isolated anecdotal evidence, this is not supported by statistical or empirical evidence based on transaction data or major peer reviewed studies by independent or academic organisations.

This is further reinforced in Australia by both NSW and Commonwealth of Australia enquiries.

## 6 Conclusion

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An uncertainty surrounding results appears to be a common finding in many of the studies. Studies of property markets will always be influenced by the subjectivity that often accompanies the property purchase decision. Additionally, a very wide range of (often interacting) property features affect the price paid. These factors often militate against statistical analysis.

From the analysis of independent studies, the majority of wind farms erected in Australia appear to have had no quantifiable effect on land values. A relatively small number of residences and “lifestyle” type properties located very close (less than 500 metres) to wind farms in Victoria were found to have lower than expected sale prices, and it is possible that audio and visual aspects of wind farms contributed to this. Evidence available at the date of this report suggests that any such wind farm related impacts on land values can be readily alleviated by ensuring a suitable separation distance between the wind turbines and any nearest residential dwellings, and a general consensus of this is within the 1 to 2 kilometre range, although this can differ from project to project and site to site.

Any effect that may be apparent will be predominantly determined by the proximity of a turbine to an actual residence. Proximity to a property boundary does not appear to have any quantifiable effect.

A number of studies have identified a “perception” stigma that usually manifests itself in the initial or planning stages of a project when the impact of change, uncertainty and opposition is at its highest. This generally subsides as the project progresses to the stage where the economic benefit starts to flow to the community and values can actually increase at a rate greater than “unaffected” land.

An increase in the time it takes to sell a property might be a possible effect of wind farm developments. As people can sometimes be polarised around wind farms, with some in support and some refusing to live near one, the potential market may be reduced. However, this does not seem to be translated into reduced sale prices for the majority of sales data investigated in this study.

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