

# What is the impact of wind farms on house prices?

## FiBRE

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#### Sixty second summary

The UK government has committed itself to an ambitious target for reductions in carbon emissions, with a target of achieving a 60% reduction in emissions by 2050.

There are a number of initiatives aimed at contributing to this, but one key element of this is to reduce carbon emissions from energy production, by developing renewable sources of energy, with a recommendation that 20% of the UK's electricity should be generated from renewable sources by 2020. Prime among these is wind power, which has a high level of popular support. However, there is also considerable opposition to onshore (and to a lesser extent) offshore wind farms. A number of reasons are put forward by those opposed to them, but the negative impact on residential property values is often put forward.

This study, by Peter Dent and Dr Sally Sims of Oxford Brookes University, UK, tested this on a number of sites in Cornwall. Despite initial evidence that there was an effect, when they investigated more closely, there were generally other factors which were more significant than the presence of a wind farm. Insofar as there was any impact on prices, the results seem to show that it is most noticeable for terraced and semi-detached houses, with there being a significant impact on properties located within a mile of a wind farm. The effect seems much less marked – if at all – for detached houses. The research also highlighted that, to some extent, wind farm developers are themselves avoiding the problem by locating their developments in places where the impact on prices is minimised, carefully choosing their sites to avoid any negative impact on the locality.





## Background

The preliminary findings of the 4th assessment report of the Intergovernmental Panel on Climate Change (IPCC) have been released and they seem to confirm beyond all reasonable doubt that the activities of man are responsible for the changes in climate that we are seeing. It seems to be increasingly incontrovertible that manmade gas emissions (largely CO<sub>2</sub>) are having a noticeable effect on the earth's climate and it is predicted that over the next 100 years global temperatures could rise by between 1.4 – 5.8°C with devastating social, environmental and economic impacts.

Since the Kyoto Protocol, established in 1997, the UK government has been committed to reducing greenhouse gases, in particular carbon dioxide (CO<sub>2</sub>) known to be a major contributor to global warming. In response to this, the UK government set a very ambitious goal of reducing CO<sub>2</sub> emissions in the UK by 20% based on 1990 levels by the year 2010 (and a target of 60% by 2050). Part of its strategy is to reduce CO<sub>2</sub> emissions from energy production by developing renewable energy production from sources such as wind, wave power, solar energy and biomass fuel, recommending that 20% of the UK's electricity should be generated from renewable sources by 2020.

Whilst there are a number of alternative renewable energy sources, the government has focussed on wind power due to the abundance of suitably windy sites within the UK (both on and off shore). However, there has been opposition to this, based on the potential impact that the visual and aural presence of turbines may have on property values, particularly since the number of wind turbines sited around the UK continues to rise. Economic concerns as to whether the benefits outweigh the costs have been raised, but more recent concerns, however, have centred on the potential impact of wind turbines on property values. This issue was recently highlighted in the media after a compensation claim was successfully won by a buyer who had not been made aware of the existence of planning permission for a wind turbine next to the home he had just purchased.

While there have been a number of opinion studies undertaken within the UK which appear to show significant variations between locations (in particular between Scotland and southern England) and at different stages during the development process, it has not yet been possible to establish the actual impact on house values in the immediate proximity of wind farms. The aim of this study, carried out by Peter Dent and Dr Sally Sims of Oxford Brookes University in the UK, was to try to establish the impact of onshore wind farms on property values through the use of a case study approach, looking at three locations in Cornwall.

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## Government legislation

The Renewables Obligation for England and Wales and the equivalent for Scotland came into force in 2002 as part of the Utilities Act 2000. This places a legal obligation on all licensed electricity providers in England, Scotland and Wales (soon to be followed by Northern Ireland) to produce evidence that they, or other electricity suppliers linked to them, have generated a proportion of the electricity supplied to consumers from renewable energy sources such as, biomass, fuel crops and wind energy. Suppliers are issued with a tradable 'Renewables Obligation Certificate' (ROC) for each megawatt hour of renewable energy produced which they can then sell to other suppliers who have not met their own renewable obligation.

In 2003 electricity providers were expected to supply a total of 3% of their energy from renewable sources. The British Wind Energy Association (BWEA) state that this figure is expected to rise to at least 15% by 2015 which will require around 2000 onshore turbines fitted with the latest turbo technology.

### What has happened to date?

To date, there are currently 131 onshore and 5 offshore operational wind farms within the UK (see Table 1). This equates to 1,733 turbines producing 1962.86 megawatts of electricity which is enough to supply 1,097,525 homes. Based on estimates calculated by the British Wind Energy Association, this should result in CO<sub>2</sub> reductions of 4,436,198 tonnes per annum.

**Table 1** Operational wind farms

| Onshore    | Number | Output Per annum (MW) | Offshore | Number | Output per annum (MW) |
|------------|--------|-----------------------|----------|--------|-----------------------|
| England    | 56     | 311.12                | England  | 4      | 243.8                 |
| N. Ireland | 12     | 112.45                | Wales    | 1      | 60.0                  |
| Scotland   | 39     | 934.89                | Total    | 5      | 303.8                 |
| Wales      | 24     | 300.6                 |          |        |                       |
| Total      | 131    | 1659.06               |          |        |                       |

In addition, there are 30 wind farms under construction, totalling 386 turbines. There are also 88 projects with 1,233 turbines that have received planning consent and another 224 sites are currently seeking planning permission. It should be noted that a significant number of these date back to 2,000 or earlier. Obviously, it is not known how many of these will actually be constructed.

Of course, one question to ask is how efficient are they? Wind turbines start producing energy at wind speeds of around 10 miles per hour and reach their maximum capacity at around 33 mph. A modern wind turbine produces electricity 70-85% of the time, but it generates different outputs dependent on wind speed. Over the course of a year, it will generate about 30% of the theoretical maximum output compared to a conventional power station (coal or gas) which will generate around 50%. Since the fuel to provide wind energy is free the primary concern is not efficiency for its own sake, but to improve productivity in order to bring the price of wind energy down. Based on this, to obtain 10% of the UK's electricity from the wind would require constructing around 12,000 MW of wind energy capacity. Depending on the size of the turbines, they would extend over 80,000 to 120,000 hectares (0.3% to 0.5% of the UK land area). Less than 1% of this (800 to 1,200 hectares) would be used for foundations and access roads, with the other 99% still available for productive farming.



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### A few facts about electricity generation

- Wind turbine size is normally referred to in terms of generating capacity which is measured in kilowatt-hours (kWh).
- 1 kW = 1000 watts of electricity produced or consumed in one hour.  
A 1 x 50 watt light bulb will consume 1 kWh in 20 hours.
- 1000kW = 1MW.
- A 10kW wind turbine can generate about 10,000 kWh (10MWh) annually at a site with wind speeds averaging 12 miles per hour which is about enough to power one typical household for a year.
- One 1.8 MW wind turbine at a reasonable site would produce over 4.7 million units of electricity each year, enough to meet the annual needs of over 1,000 households.

Of the various forms of renewable energy that can be harnessed, wind energy seems to be the one that is being developed most quickly. Opinion surveys regularly show that just over eight out of ten people within the UK are in favour of wind energy. However, the growing number of campaign groups opposed to the siting of wind farms might suggest that public opinion may not be as supportive towards wind power as industry research suggests.

So far, most of the investigations that have taken place have been supported by campaign groups that are either in favour of or opposed to wind farms. What has this work shown?

### What do we know?

One of the main studies undertaken in the UK has been by the British Wind Energy Association, who commissioned Knight Frank to investigate this. One of their findings was that there is a general consensus amongst agents that there is a 'detrimental effect on values either due to close proximity of the wind farm or its visibility'

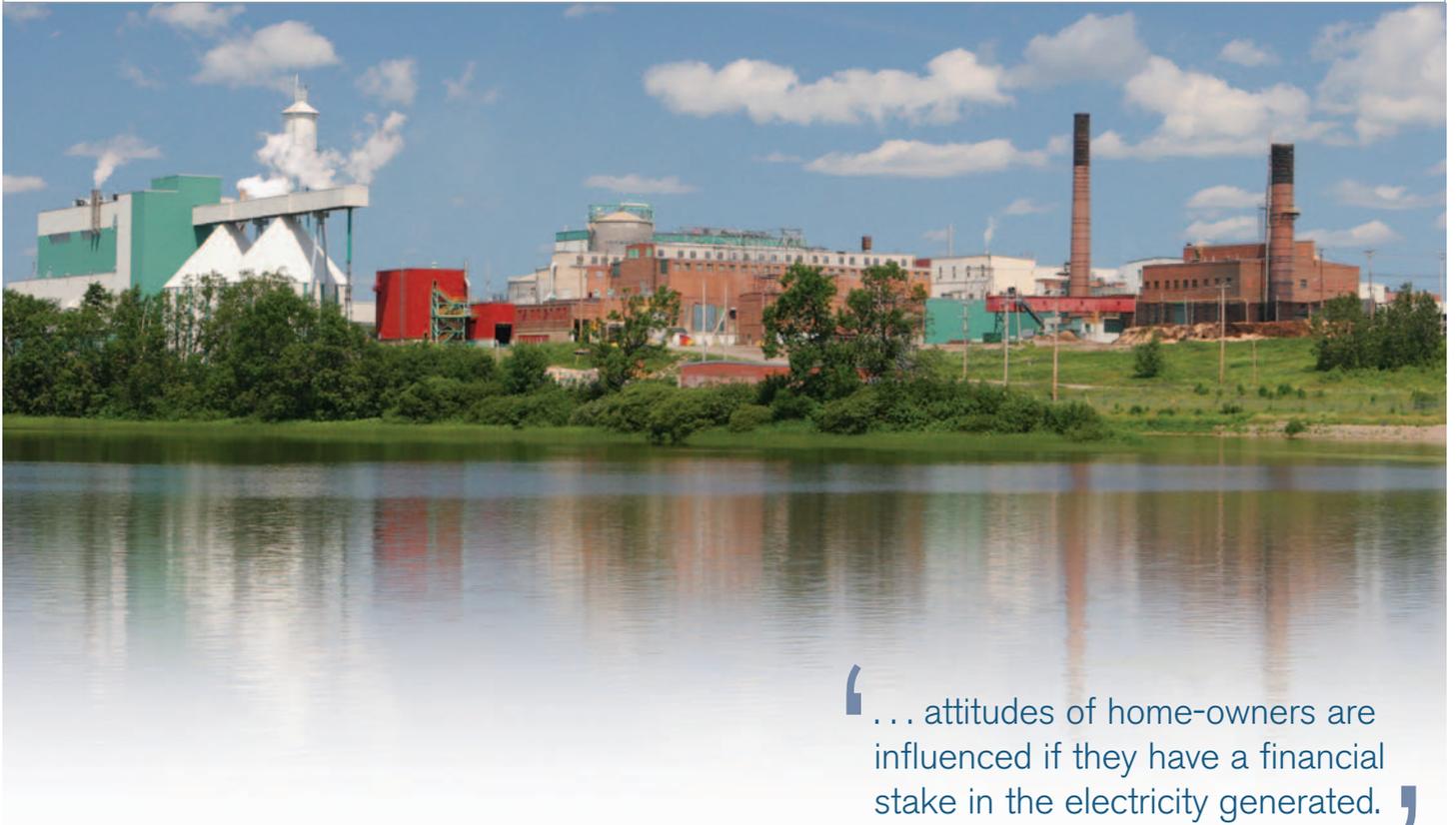
A survey of RICS estate agents carried by RICS at about the same time found that 60 per cent of the 405 respondents suggested that proximate wind farms would decrease property values when the turbines are in view. The results also suggested that 67 per cent believe that this depreciation starts at the planning stages of a wind farm and lessens with time.

A major study has been carried out in the USA by the Renewable Energy Policy Project (REPP). This was in response to public opposition following claims that wind farms were having a negative impact on the value of property within view of the turbines. The researchers set out to determine whether the presence of wind turbines had any impact on proximate property values. They examined 24,300 property transactions from 10 locations within the US, over a period of six years; in some cases, this period spanned the three years prior to the siting of the wind turbines and three years following installation. They concluded that there was no evidence to suggest that wind turbines sited within a 5 mile radius of property had a negative impact on value. In fact, to the contrary, property values appeared to rise above the regional average within the case study locations, suggesting that wind turbines actually had a positive effect on value.

An interesting finding has emerged from studies in a number of European countries, that attitudes of home-owners are influenced if they have a financial stake in the electricity generated. Those home-owners who owned or co-owned turbines expressed little or no objection to the presence of a wind turbine.

So, to date, the evidence base is patchy and ambiguous. With the passing of time, is the situation becoming any clearer? With funding provided by the RICS Education Trust, this study by Peter Dent and Dr Sally Sims at Oxford Brookes University in the UK sought to find out.

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### The study

The focus of this new study was to look in depth at the actual transactions of residential property sold in the vicinity of a wind farm. Once any price variations had been identified, the next step was to try to determine the underlying reasons – to see if they were caused by the presence of the wind farm, or whether other factors were behind the variation. This was done by analysing the planning application objections and by interviewing local estate agents.

Previous research on other types of environmental impact suggested that price effects tend to be negligible beyond a distance of about five miles, so the first task was to identify case study areas where there were a significant number of property transactions within five miles of wind farms. This narrowed the choice down to three areas in North Cornwall – Delabole, St Bereock and St Eval (Details shown in Figure 1).

However, on closer examination, it was found that Delabole was home to the largest open cast slate mine in the UK – this would almost certainly have had far more of an impact on house values than the presence of a wind farm. So, Delabole was discounted from the examination. This left St Bereock and St Eval, where 1,026 transactions had taken place within five miles of the wind farms since April 2000. Inevitably, there were other factors that the researchers had to take into account – for example, some of the houses sold also had sea or waterfront views, which are well known to enhance property values. So, these ones had to be removed. Once the researchers had also removed outliers (properties costing more than £400,000 or less than £50,000), they were left with 919 transactions to analyse.

Figure 1

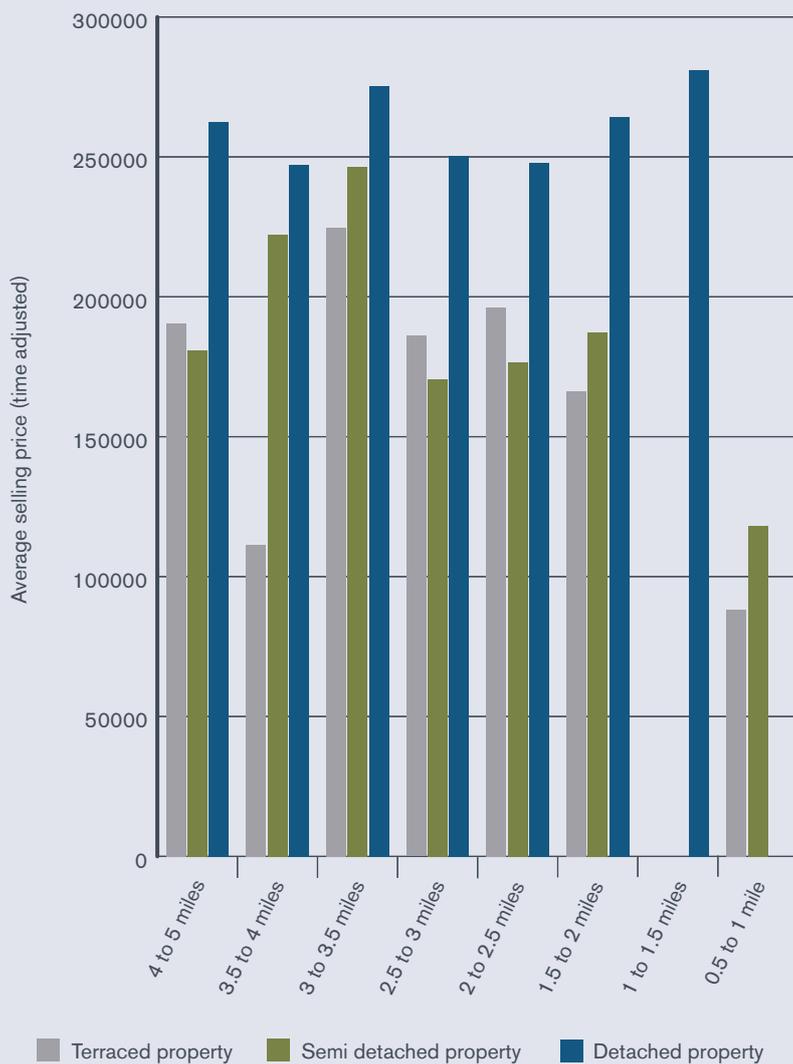
| Wind farm Location | Number of turbines | Power MW capacity | Homes equivalent | Developer               | Date PP granted |
|--------------------|--------------------|-------------------|------------------|-------------------------|-----------------|
| St Bereock         | 11                 | 4.95              | 3100             | PowerGen                | Aug 93          |
| St Eval            | 16                 | 9.6               | 6007             | National Wind Power Ltd | Nov 00          |
| Delabole           | 10                 | 4.00              | 2237             | Windelectric            | Nov 91          |

## What did they find?

By sorting the properties by type and location, they were then able to see – statistically, at least – if proximity to wind farms had any effect on transaction prices.

The results seem to show that the effect is most noticeable for terraced and semi-detached houses, with there being a significant impact on properties located within a mile of a wind farm. The effect seems much less marked – if at all – for detached houses. (Figure 2)

Figure 2



A comparison of the mean value of property showed that the value of a terraced and semi detached house tended to be lower than a similar house type sited further away from a wind farm in the case study locations. Terraced houses sited within 1 mile of a wind farm were observed to be 54 per cent lower in value and semi detached houses within 1 mile of the nearest turbine were 35 per cent lower than similar houses at a distance of four miles. However, beyond that one mile zone no clear linear relationship between physical distance to the wind farm and transaction price was observed. For example, the findings suggest that living in a terraced house within 3.5-4 miles of a wind farm could have a more significant and negative impact on value compared to either a semi-detached or a detached house. But there was little similar evidence for the distance in between (i.e. 1-3.5 miles).

However, when they started to talk to local estate agents, the situation became a bit less clear. As Peter Dent says, 'We wanted to know why semi-detached and terraced houses close to a wind farm seemed to be less desirable'. The view of the estate agents was that proximity to a wind farm simply was not an issue. What they did say, though, was that the properties close to one of the wind farms – St Eval – were, in fact, ex-Ministry of Defence properties, and so less desirable than similar properties.

So, the views of estate agents have brought another dimension to the debate, making it less clear that wind farms have any discernible impact on property values at all. What can we learn from objections made to planning applications? Between 1989 and 2004, there were nineteen applications in North Cornwall District Council relating to wind farms. So far, only six of them have been approved. While a wide range of objections were put forward – only some of which cited impact on property values as a reason – a new phenomenon seems to have emerged. While we have become familiar with NIMBYs, the objectors in Cornwall seem to be NISEBYs – Not In Someone Else's Backyard. For, when we look at where the objectors are actually from, an interesting pattern emerges. As Dr Sims points out, 'In very few cases are the objections from local people. People from Scotland are objecting to wind farms in Cornwall'.

It also served to show that, to some extent, wind farm developers are themselves avoiding the problem by locating their developments in places where the impact on prices is minimised, carefully choosing their sites to avoid any negative impact on the locality. As Peter Dent concludes, 'Maybe the developers have pre-empted the answer to the research by avoiding the possibility of impacting on house prices. If this carries on, perhaps we may never know what the impact on house prices might be.'

If anything, this research has served to show that trying to assess the impact of wind farms on property values is a complex and emotive subject. Apparent changes in value disappear when examined more closely and the objections that are raised are often found to be less about genuine local concerns and more about wider ideological issues.

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### Concluding remarks

The study set out to examine the impact of wind farm development on proximate residential property. Because of the limited data available the findings require a degree of caution. However, there is evidence to suggest that the ‘threat’ of a wind farm may have a more significant impact than the actual presence of one. Even this may not translate into lower house prices if the community are actively involved in the process and enjoy some of the benefits through lower, or greener, fuel costs.

The study itself may be seen as inconclusive as there was limited linear relationship between house prices and distance. But, it does suggest that other variables related to the presence of wind farms, not included in this particular analysis, may be amongst the main drivers of house price in these locations

The general findings were supported by a number of interviews with estate agents from the area who had not encountered any negativity towards the wind farms when marketing proximate houses. However, this is only one study, and as more wind farms are built, more property will become proximate. Therefore, a cautious approach should be adopted until a larger and more in-depth study can be undertaken.

Despite the limited scope of this study, it does raise some interesting questions as to future research directions. This study concentrated on the question of distance and value effect. This, of course, is only one element of the equation. A more holistic examination could be undertaken to consider not only the impact on assets external to the wind farm but also the impact on the land on which the wind farm is situated. This could then lead to a technologically based study of the net benefits of wind farm output compared to other forms of alternative energy sources from the same land take (e.g. biomass production).

### About the study

The study was carried out by Peter Dent and Dr Sally Sims of the Department of Real Estate and Construction, Oxford Brookes University, UK. The work was supported with a grant from the RICS Education Trust.

RICS (Royal Institution of Chartered Surveyors) is the largest organisation for professionals in property, land, construction and related environmental issues worldwide. We promote **best practice**, regulation and **consumer protection** to business and the public. With 130 000 members, RICS is the leading source of property related knowledge, providing independent, **impartial advice** to governments and global organisations.

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