Towers, Turbines, and Transmission Lines: Impacts on Property Value
Edited by Sandy Bond, Sally Sims and Peter Dent
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1 OVERWIEW

The primary audience for which *Towers, Turbines, and Transmission Lines: Impacts on Property Values* was written is property valuers, that is, real estate appraisers and others responsible for estimating the value of real property. The goal was to provide these specialists with a practical reference that would be helpful to them in understanding and analyzing the effects that nearby electric transmission lines, cell phone towers and wind farms might have on the value of properties they are asked to appraise. The authors indicate that given the unsubstantiated and overblown assertions that are often made about the potential property value effects of these classes of facilities, it was particularly important for them to "...examine the facts as they relate to property values in an unbiased and rational way, giving a balanced view..." (p. 34). To achieve this objective, the authors begin with a chapter that provides an overview of the methods used to determine property value effects (sales comparisons, regression analysis, hedonic modeling, spatial hedonic modeling and qualitative analysis and triangulation). This is followed by a very strong chapter that reviews the theory and research findings related to risk perception, stigma and behavior, with a focus on the relationship of this body of theory and knowledge to property value issues. The remainder of the book consists of a set of three sections that provide an overview of the potential property value issues associated with transmission lines, cell towers and wind farms, and a summary of the empirical research that has been undertaken in an effort to tie down the effects that these three facility types have had on the actual sales prices of properties in their vicinity. A conclusions chapter provides a systematic recap of the issues and research findings. The conclusions chapter ends with a brief discussion about the current state of knowledge and the implications of this knowledge for the approach that property value practitioners need to take when they prepare appraisals for properties located near these facilities.

Overall, *Towers, Turbines, and Transmission Lines* is clearly written, making it easy to read and to understand, even for the non-specialist. The three editors of the book are academics specializing in property value issues, one from New Zealand, and two from the United Kingdom. In addition, several of the individual chapters were prepared by researchers from the United States. Given the makeup of the editorial team, the book understandably focuses nearly exclusively on the theory and research generated in the English-speaking world, more specifically the UK, North America, Australia, and New Zealand. The sections on transmission lines, cell towers and wind farms each include chapters that focus on the research undertaken in the UK, New Zealand (and in some cases Australia as well) and North America. A downside of this effort to provide equal coverage of the research done on the three facility types in these three parts of the world is an unevenness in the relevance of the chapters. In some cases, the research done in a facility type in a particular region has been limited. As a result, the chapters prepared for regions where limited research has been done end up providing detailed presentations of studies for which brief summaries would have been adequate. In addition, the division of the research review into the sections on the three regions gets in the way of development of a more integrated and systematic review of what the available research can tell us. This criticism aside, the book is a reasonably accessible summary of much the available English language research.

A strength of this book is the three introductory chapters that provide the conceptual framework for understanding the role that facilities that could be considered to be potentially undesirable neighbors might play in affecting the sales prices of nearby properties and the concepts and analysis methods that are useful in analyzing the effects. As the methods chapter correctly points out, the sales comparison method, which has been the traditional tool of appraisers, does not always provide an adequate basis for establishing what these effects might be because it is not able to disaggregate effects and pinpoint the marginal effects of proximity to the facility types the book is concerned with. As a complement, if not replacement for, the sales comparison approach, the methods chapter emphasizes the application of more sophisticated analysis tools, particularly hedonic modeling and its variants. Hedonic modeling essentially entails regression analysis of a large sample of actual sales to tease out the effects on sales prices of specific attributes of the property. Using data that can be generated through field observations, and increasingly through use of ever more powerful GIS tools, the attributes analyzed can include proximity to nearby features like transmission lines, cell towers and wind farms, the visibility of these features from the property, and the effects of these facilities on the nature and quality of views seen from the property. The methods discussion concludes that these more advanced methods are essential "For a property professional to provide advice based on robust analysis of all the factors likely

impact on the value of a property. . .” (p. 22). In a way, this conclusion is incomplete in that it does not explicitly acknowledge the fact that for some time, the hedonic modeling approach has been the favored approach for research by professionals and academics for identifying the effects sales prices of proximity to transmission lines and similar facilities[1] and has essentially become the accepted paradigm for valid property value impact research.

2 TRANSMISSION LINES

Transmission lines are the facility type for which most of the research has been conducted and the overwhelmingly largest percentage of that research has been conducted in North America. As a consequence, the chapter that reviews the transmission line research in North America is the meatiest of the research review chapters in the book. In the US and Canada, a dozen or two studies have been prepared that use hedonic modeling to analyze the data on the sales of large numbers of residential properties located near transmission lines to identify the role of proximity to a transmission line has on the prices at which the properties were sold. The chapter's summary of this research notes that the set of studies reviewed has found that for properties located proximate to transmission lines, there can be a decrease in property values that ranges from 1% to 12%, and that the degree of impact decreases with increasing distance from the transmission line. The summary also highlights a number of studies that have found that when the transmission line rights-of-way provides an open space value (in areas between transmission towers where there is an unobstructed, open view, and in areas where the right-of-way has been landscaped and provided with walking paths and other amenities), there can be a positive effect on property values. A limitation of the chapter on the North American transmission line research is that by packing the reviews of all of the research studies into a single 12-page chapter, it does not do justice to the richness of this body of research. For example, there is not enough description of the data used in each of the analyses, how it was generated, and of the physical settings in which the research took place. In contrast, the chapters on transmission line research in the other two regions describe the research in extensive detail and use maps and photographs to convey a sense of the appearance of the neighborhoods in which the studies took place and the physical relationships between the transmission lines and nearby residences.

The introduction to the section on transmission line impacts explains that in New Zealand and the UK, the legal status of the land on which transmission lines are sited is different from what it is in North America. In the U.S. and Canada, transmission lines are generally located in rights-of-way, where building construction is restricted, while in the UK and New Zealand, because there is no requirement for a right-of-way, development can take place under transmission lines. As a result, because the situations are so different, it is hard to compare the results of transmission line property value impact studies conducted in North America with those conducted in these two countries.

The chapter on transmission line impacts in New Zealand describes two studies: one, an analysis of sales prices using hedonic modeling, and the other, a survey-based study of resident perceptions of the effects of a transmission line in their neighborhood. Both studies replicated the study designs of similar studies previously undertaken in North America. The analysis of sales prices found that for properties located within 10 to 15 meters of a transmission structure, sales prices were decreased by 20%, but that with increasing distance, the impact tapered off, and at 50 meters, the decrease in sales price was 5%. The perception study found that the respondents think about the transmission line in negative terms, that those who live close to the transmission line are more likely to think of it in negative terms than those who live further away, and that the respondents' primary concerns about the transmission line were its potential effects on property values, health and aesthetics.

In the UK, the research on the impacts of transmission lines on property sales values has been limited because until recently in England and Wales, the data on property sales prices and property characteristics that is necessary to conduct such studies have not been available. It is still difficult to obtain information on property characteristics, which can only be assembled through time-consuming research using other sources. As a consequence, putting together the kind of data set required to conduct a large-scale and thorough property value impact study using hedonic modeling is very time-consuming and expensive, which has discouraged the execution of the kinds of hedonic modeling studies that have become the norm in North America. The chapter on transmission line impacts in the UK presents the results of a single study, which is documented in some detail. It evaluates the impacts of a transmission line on the sales prices of residences in a suburb of Glasgow, Scotland where there is a 275 kV transmission line located in a green strip that has an appearance comparable to that of a North American transmission line right-of-way. This study found that the values of properties located within 100 meters of a transmission tower were decreased by 17% to 24%, and that the degree of impact decreased with distance from the tower. It also found that residences located in areas along the transmission alignment that

were not close to the towers experienced an increase in value, presumably because of the increased privacy and amenity provided by the open strip in which the transmission line was located.

3 WIND FARMS

There has been considerably less research on the property value impacts of wind farms than there has been on the effects of transmission lines. The most substantial work analyzing the relationships between wind farms and property values has been conducted in the United States. The chapter on wind farms in North America was written by Ben Hoen of Lawrence Berkeley Laboratory (LBL), who was the lead researcher for a very large LBL study of wind farm effects on property values. The North American chapter makes a brief review of approximately 20 or so studies of various kinds and levels of quality that had explored wind farm property values, primarily with an eye toward identifying the kinds of variables these studies found to be important and the kinds of relationships among them that were found. Most of the chapter consists of an exposition of the LBL study that evaluated property values in the areas around 24 wind farms located in a range of locations across the US. Because of the number of study sites used, the data set was large, consisting of nearly 7,500 sales transactions. For each sale, a large set of variables was assembled on the characteristics of the property involved. An innovative and very important dimension of this data set was the two view variables that were created, one that classified the relative visibility of the turbines in the nearby wind farm, and the other, called "vista," that classified the visual quality of the view. The data set was subjected to intensive and sophisticated analysis. The analysis tested the potential effects of three kinds of stigma that might be associated with proximity to wind farms.

1. Scenic vista stigma was defined as the concern that the value of a home would be decreased by the visibility of a wind facility within an otherwise scenic vista seen from the property.
2. Area stigma was defined as the concern that a wind facility would make the overall area surrounding it appear more developed and that this perception that the area has become more highly developed could adversely affect home values, regardless of whether any individual home has a view of the wind turbines.
3. Nuisance stigma was defined as adverse impacts such as noise and shadow flicker that would only affect residents of homes located very close to turbines. It is important to note that in analyzing nuisance stigma, there was no use of data based on actual noise measurements in the study areas or identification of areas in which shadow flicker is experienced. Instead, distance was used as a surrogate, and the analyses of nuisance effects focused on the changes in sales prices in the zones within 0.25 mile to 1 mile from the closest turbines.

The results of the LBL analysis determined that there is no statistically significant relationship between any of the three stigma conditions and the sales prices of residential properties in areas around wind farms.

The chapter on wind farm property value impacts in the UK includes summaries of a number of studies of public opinions about wind farms and their impacts, including impacts on property values. Because these studies captured opinions about wind farms in general and about what the impacts of several proposed wind farms would be, they provide a window on public concerns about wind farms, but they do not provide data useful in establishing what actual effects wind farms have had on the sales prices of nearby properties. The chapter also includes a summary of a small study of sales price impacts in the area around a 16 turbine wind farm in Cornwall where 201 property sales were evaluated. This study found that there was no significant relationship between home sales price and either distance from the turbines or views of the turbines. The chapter on wind farm impacts on property values in Australia and New Zealand was also handicapped by a limited body of research. This chapter's research review consists nearly entirely of a summary of opinion surveys conducted in three communities in Australia, two in which wind farms have already been developed, and one in which a wind farm has been proposed. The surveys gauged respondent perceptions of the existing wind farms and of the proposed wind farm and their effects. The findings provide a general idea of the kinds of issues that residents living near existing wind farms and proposed wind farms are concerned about and the intensity of their concerns. Interestingly, the residents of the two communities near existing wind farms were generally not concerned about the aesthetic, noise, property value, radio interference or shadow flicker impacts of wind farms, while the residents of the community where a wind farm had been proposed but had not yet been developed expressed somewhat higher levels of concern.

4 CELL PHONE TOWERS

It would appear that considerably less research has been conducted on the property value impacts of cell phone towers than the property value impacts of the other two facility types. The overview chapter on cell phone

towers and the chapters devoted to issues and research in New Zealand, North America and the UK contain good general overviews of the issues associated with cell phone towers, particularly public concerns about health risks they might pose. The New Zealand chapter reports on a perception study and hedonic modeling study that Sandy Bond, one of the book's editors and the author of the chapter, had conducted in neighborhoods near cell phone towers in the suburbs of Christchurch. The perception study had mixed results. In general, it found that the respondents had negative perceptions of cell phone towers, but that those who lived in the control areas far from the cell towers had higher levels of concern than those living close to them. The property value analysis evaluated the prices of property sales occurring before and after the construction of the cell towers in each of the neighborhoods evaluated. The analysis of this data determined that in four of the five neighborhoods, the values of properties in close proximity to the cell towers decreased by 15% after the towers were built, and that this effect decreased with increasing distance, becoming nearly negligible after about 300 meters. In the fifth neighborhood, there was a positive increase in price. The chapter on cell tower research in North America summarizes a property value study undertaken in Orange County, Florida that analyzed the sales prices of properties located in the vicinity of 20 cell phone towers. The study found that the cell phone towers had a statistically significant impact on the sales prices of nearby residences, but that the impact was less than 2%, an impact level the researchers considered to be minimal. The chapter on cell phone towers in the UK describes a perception study undertaken in the UK, and a property value study undertaken in Germany. The perception study, which was based on a survey of 161 respondents, found that the concerns expressed about cell phone towers were similar to those often expressed about high voltage transmission lines. The German property value study assessed the effects of nearby cell phone towers on the asking price of condominiums in Hamburg. The study found a decrease in asking price of 2.3% for condominiums located within 100 meters of cell phone towers and a decrease in asking price of 5.7% for units located within 100 meters of clusters of towers. The serious limitation of this study is that it was based on asking prices rather than the actual sales prices. A point underscored in the discussions of potential application of the findings of the available research on cell phone towers is that care is required because the design of cell phone towers has been changing, making the more recent generations of towers shorter and less visually intrusive. As a consequence, the tower type whose effects were evaluated in a given study may be very different from the tower whose impacts on the value of a nearby property an appraiser needs to assess.

5 NOISE AND PROPERTY VALUES

The value of this book for the noise specialist is probably limited. Noise is mentioned in a general way in the overviews of the potential issues associated with each of the facility types and the results of several opinion surveys may be of interest to some. The noise specialist may find the introductory discussion on risk perception and risk communication of interest. It identifies several factors influencing the fact that "...despite the public's general familiarity with taking risks, some environmental hazards consider to be 'low risk' or to have a 'low probability' of occurring...provoked the most illogical and negative reactions from the public when compared to high-risk activities such as smoking."

Noise receives the most extensive treatment in the review of wind farms in Australia and New Zealand. That chapter devotes several pages to noise and metrics. However, this discussion is lacking in depth that would be of interest to the noise specialist. For example, it does not distinguish between a broadband source of noise which has both low and high frequency content and the classic low frequency noise problem which are typically tonal. For a complex topic, the authors may have been better served to rely on the expertise of an acoustician to summarize the acoustical literature.

Of all of the hedonic modeling studies summarized in the book, the only one that made an explicit effort to consider the potential effects of noise on sales prices was the LBL analysis of wind farm impacts on property values. As mentioned above, it used distance from the closest turbine as a surrogate indicator of potential exposure to turbine noise. It found that even when properties were located within 0.25 miles from wind turbines, where presumably the potential exposure the turbine would be the greatest, there was no statistically significant adverse effect on property values.

Although this book may not be a high priority for addition to the library of most noise specialists, the overview that it provides of the existing body of research on the property value effects of the three facility types sends an important message to the noise impact assessment community. The book's summary of the existing research makes it clear that to date, the role of noise associated with transmission lines, cell phone towers and wind farms in influencing the value of nearby residential properties has not been established in an explicit way. Noise is also mentioned in the summaries of the findings of some of the perception studies that are reported on. The mention of these noise findings is in a way incidental and there is no place in the book where the findings of the perception studies related to noise are summarized in one place and compared, contrasted and related to what is known empirically about the

noise generated by each of the facility types and its typical spatial distribution around these facilities.

6 REFERENCE

1. W. Kinnard and S. Dickey, "A primer on proximity impact research: residential property values near high-voltage transmission lines", *Real Estate Issues*, **20**(1), 23–29, (1995).

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