

# A LULU of a Case: Gauging Property Value Impacts in Rural Areas

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THE DAYS WHEN WELL-INTENDED CIVIC LEADERS could develop and build necessary infrastructure without some type of regulatory review are long gone. One person's irrigation project is another's nuclear waste dump. In undeveloped rural areas, it seems a road cannot be widened without triggering an Environmental Impact Statement ("EIS").

Measuring and commenting on environmental impacts has long been the domain of civil engineers and scientists. However, today, the siting of any such locally undesirable land use; sometimes referred to as a LULU, may require expert comment on potential property value impacts.

The LULU is one of those serendipitous acronyms destined to join the vocabulary for land use disputes. This lexicon already includes NIMBY ("Not-in-My-Back-Yard") and the lesser-known BANANA ("Build Absolutely Nothing Anywhere Near Anything").

In many respects the expert is simply being asked to apply a before and after valuation theory to affected properties. However, the scope of alleged impact can be vast while the body of relevant observable market transactions non-existent. This lack of market data is most acute in rural areas where environmental concerns about encroaching infrastructure are strongest.

A partial list of LULUs could include any of the following: prisons, landfills, aggregate mines, power plants, power transmission corridors (including structures), Superfund toxic waste clean-up sites.

The first thing an expert must do is identify the type of impact the LULU might create. A short list of generally undesirable externalities might include noise, traffic, air or

water emissions, or simply the visual impact of a man-made structure into a pristine countryside. Yet another concern today could be the risk that a power plant or even a substation could attract terrorist activities.

Second, consider timing and duration. When will the siting occur? Is the impact a one-time event, perhaps confined to the construction activity, or will there be a sustained operation, continuing indefinitely?

Third, how broad will the effect be? Directly impacted properties may simply be acquired at market value from willing sellers or condemned outright through eminent domain. But what about nearby properties? How far can an effect be expected to extend?

Finally, is it appropriate to consider whether benefits or incidental amenities can offset a nuisance? A new prison may supply needed employment and accompanying economic development to a depressed rural community, yet

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does that benefit outweigh the perceived stigma and attendant risk associated with a penitentiary?

The criteria for approval in the EIS process, or similar land use forums, looks at impacts in the aggregate, as opposed to effects on specific properties. Without question impacts can vary from parcel to parcel. Yet at what point does personal preference or the peculiar characteristics of a given site constitute evidence of a general, rather than a specific adverse impact?

Case studies in urban areas have established that neither stigma, noise, nor even toxic emissions influence property values much beyond a two-mile radius. Further, the impacts diminish significantly with distance from the LULU. The adverse impact of structures on rural vistas is similarly limited, and diminishes with distance. In the final analysis, experts can use these studies with the same care that they apply more localized market data.<sup>1</sup>

Much depends on the facts of the situation and good judgment from the fence line.

### LITERATURE REVIEWED

Real estate appraisers, social scientists, environmental engineers and lawyers have long debated the question of measuring and evaluating the likelihood of negative property value impacts from adverse land uses or events. Often money damages are at issue if such diminution in value can be proven for a specific property, but what about in the aggregate?

The predominant activity stimulating academic and industry research over the past 30 years has been the emergence of large scale and public environmental clean-ups. Much of the available literature deals with the consequences of discovery and clean up of Superfund sites. Once remediated, a second question regarding the prospects of recovery back to some pre-event equilibrium raises concerns of long term "stigma." A follow-on question is whether such stigma is compensable as a consequential damage when government sanctions are involved.

Most of the studies focus on that most sensitive of real estate types, the single-family dwelling. Commercial properties can also be adversely affected by externalities but the nature of their investment value (i. e. passive rent collection) allows for capitalization of diminution affects through rent reductions and vacancy increases. The value of residential property is much more susceptible to con-

sumer preferences. The implication of these studies on rural properties will be explored here.

The literature available for review is somewhat limited. Most of the literature has focused on the consequences and costs of cleaning up so-called "brownfields." There have been few studies addressing how a LULU can affect property value; urban or rural.

The case studies reviewed here include a University of Wisconsin paper measuring the impacts on suburban housing values from a coal burning power plant,<sup>2</sup> a report on housing values in the aftermath of the Three Mile Island nuclear power plant failure,<sup>3</sup> a series of studies on value and stigma impacts of a closed lead smelting plant in Dallas, Texas,<sup>4</sup> a study on the effects of wind turbine development on local property values<sup>5</sup> and a comprehensive analysis on effects of overhead transmission lines on property values.<sup>6</sup> The latter two cases do address rural property concerns, but without resolution.

These studies all relied on some form of statistical analysis using multiple regressions. The urban-area studies were able to construct hedonic models to predict outcomes.

A residential hedonic pricing model regresses a series of descriptive statistics regarding a population of observations. When data is available, this is clearly the preferred tool. For housing models, typical characteristics include house size, lot size, bathroom number, age, fireplaces, and distance from some node of value such as a downtown. The models are used to predict outcomes, testing variables for significance. Thus a researcher may take into account other variations in property characteristics in determining the impact of a LULU on property value.

The key to any reliable statistical model is a sufficiently large data pool, or population, to allow random sampling. In general, these studies have proven most effective in urban or suburban residential areas where a high number of transactions involving fairly homogeneous properties can be observed. Given a significant sample size, fairly conclusive outcomes can be predicted using this method.

Even in urban areas, statistical studies attempting to predict value impacts on residential properties lack consistency in model design and applications of uniform adjustments to the data.<sup>7</sup>

Sparsely populated rural areas are much more difficult to study because the population of transactions available for

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observation are so limited. More indirect methods must be used instead.<sup>8</sup>

While so-called "sensory cues" are key to impacts, (i. e. what can be seen, smelled or heard) the concept of stigma has much more to do with reputation and the intangible components of human desire that influence "marketability." Marketability is defined by appraisers as the state of being salable.<sup>9</sup> Thus anticipating the future impact of a LULU has as much to do with attendant publicity as with the event or source of contamination.

The breadth of the studies reviewed suggests that a continuum would be useful along which LULUs might be arrayed. At one end would be undisputed undesirable land uses, like a Superfund site, at the other end positive amenities like lake frontage or a panoramic view.

Overall, these studies provide little evidence that long-term stigma is widespread once sites are remediated and certified safe. Pursuing this continuum analogy, the infamous Love Canal site, once remediated and redeveloped, experienced resale prices only a net 10-15% below comparables in unaffected areas.<sup>10</sup>

### **BLOMQUIST- COAL BURNING PLANT CASE STUDY**

The seminal modern study looking at how locally undesirable land uses might impact property value was the Glenn Blomquist report in *Land Economics* (1974). He studied the impact of the siting of a coal-burning power plant on the suburban Chicago town of Winnetka, Illinois. The paper estimated the total impact of a "relatively small, clean power plant" which caused measurable damage over 2 miles away.<sup>11</sup>

The Winnetka Power Plant was located in a residential neighborhood with no other important disamenity sources located near it. The plant burned coal, had relatively small capacity at 26-megawatt (MW) capacity whereas most large plants at the time generated up to 300 MW. Other amenity factors in the area included Lake Michigan, the Chicago Loop and Northwestern Railway and the Chicago Central Business District (CBD). Other factors influencing value included social economic groups, parks, political boundaries and local commercial centers.

The study found that the power plant property value gradient was no longer a relevant influence at 11,500 feet or 2.18 miles (3.5 km). Further, the study found that property value was elastic with respect to distance, amounting to

an increase in value of 0.9 percent for each 10% increase in distance. Thus, the negative impact on property value closest to the powerplant would approach 10% of value compared with similar residential properties located outside an 11,500-foot radius from the power plant.

The findings are particularly helpful in setting an upper limit where value impacts may be said to extend. The powerplant could be isolated as a sole disamenity and the surrounding neighborhood was predominantly single family residential. The Blomquist study recommended that policy makers site structures like coal-burning plants in areas of non-residential activity where negative value impacts will not be imposed on nearby homeowners.

### **THREE MILE ISLAND- NUCLEAR UPSET EVENT CASE STUDY**

Twenty-five years ago (March 27, 1979) an accident at the Three Mile Island nuclear power plant near Harrisburg, Pennsylvania generated great concern for the health, safety and welfare of nearby residents. While no actual meltdown occurred, attendant publicity and national media reporting raised concerns nationally about the safety of such plants. As a result there have been no new nuclear power plants constructed in many years, while other existing nuclear power plant projects have been closed, or mothballed.

Reduced residential property values in the Harrisburg area were alleged and the U.S. Nuclear Regulatory (NRC) together with Pennsylvania State University examined the effects of the accident on residential property values and sales within a 25-mile radius of the plant. Regression analysis was performed on 583 sales of single-family residences which sold between 1977-1979. The study looked at the effects before and after the event. This statistical data coupled with interviews of knowledgeable market participants found no measurable effects, positive or negative, from either the placement of the plant, or the event.<sup>12</sup>

It should be noted that the event did not create any short or long-term physical damage to property (compared with emissions from a lead smelter for instance) and there was no "cleanup" required following the event.

What was discovered was that for a 4-8 week period immediately following the event residential home sales fell off precipitously, but then returned to normal, or recovered to equilibrium once it was clear there was apparently no long term adverse physical effects.

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Perhaps taking into account the findings of Blomquist, Three Mile Island was sited in an area of relatively sparse population where property values were already lower than the average. Thus, the event did not trigger any long-term drop in value.<sup>13</sup> The study acknowledges that local residents were indeed concerned that their property values would drop following the incident and the adverse publicity. However, the study found that any effect Three Mile Island might have had was swamped by the impact of rising interest rates and the shortage of mortgage funds that affected real estate markets, nationally, in 1980-81.

### **MCCLUSKEY- DALLAS LEAD SMELTER CASE STUDY**

For her doctoral dissertation, Jill McCluskey, now a Washington State University economics associate professor, together with University of California Berkeley's Professor. Gordon Rausser completed a series of articles relating to an extensive study they undertook at the RSR lead smelting plant site in Dallas, Texas. The studies were undertaken in 2000 looking at transactions from 1979-1996.

The smelter operated from 1934-1984 and emitted airborne lead which contaminated soil in surrounding areas. The U. S. Environmental Protection Agency (EPA) found health risks in 1981 and RSR agreed to remediate using standards considered protective of health at the time. Additional controls imposed by the City of Dallas and State of Texas, followed. In 1984 the site was sold to Murmur Corporation, who shut the smelter down. Although the site was ruled clean by the courts in 1986, the Center for Disease Control reported additional health hazards in 1991. In 1993 the site was placed on the Superfund National Priorities List. The RSR smelter was located 6 miles west of the Dallas Central Business District (CBD) and was surrounded by residential neighborhoods.

At issue was the cumulative impact of pollution, in this case soil contamination from lead air emissions over a fifty-year period. While the public may not have been aware of the danger for much of this period, everything changed once the EPA got involved and mandated a clean up. The clean up took five years before the area was pronounced clean. McCluskey and Rausser then studied how quickly the real estate market recovered and whether a stigma, associated with the smelter might have longer-term impacts.

Interestingly, the studies are careful to distinguish between actual damage to a property (such as presence of a contaminated substance that must be removed or remediated) and the mere perception of danger or risk. The latter they discovered can be magnified by media coverage. Publicity regarding the risks contributes to long-term property value diminution. One paper argues reasonable risk of contamination is not required for a nuisance claim if "community effects" caused by contamination are present. {14} Elsewhere McCluskey and Rausser express concern that compensation paid for perceived risk may distort real estate markets.<sup>15</sup>

Other studies<sup>16</sup> were noted which documented that the impact of the waste site on property values dissipates rapidly with distance. This study used a continuity price gradient for distance and found that the distance from the smelter was a positive factor affecting values, but that its sphere of influence was limited. A modeling function allowed the influence of the smelter to diminish with distance.

The findings of McCluskey and Rausser concluded that negative impacts could be measured up to 1.2 miles from the site and the diminution in value was up to 20% of property value in that radius. The diminution in value actually varied over intervals, approaching equilibrium, in the late 1980's after the site was pronounced clean, then spiking down again when the CDC raised more red flags about health issues.

In the years following the clean-up (1987-90) no sales were reported within one mile of the site even though no further danger could be documented, clearly an indication of stigma. Later, in the 1991-95 period, sales within the one-mile radius did occur, but at lower prices than similar properties located further away from the smelter.

An earlier publication of a study of the smelter impacts by Larry Dale,<sup>17</sup> found that each one-mile interval located beyond the site accounted for approximately 2% of the home price. The Dale study concluded that increased publicity did not cause property values to further decrease and that initiation of the clean up offset the publicity issue.

The Dallas smelter studies are important because they confirm that the adverse impact of a local undesirable land use (LULU), such as a lead smelter, is confined to a relatively limited sphere of influence. This sphere of influence is perhaps no more than two miles from the offend-

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ing site. Further, the McCluskey study documents how stigma can persist even without demonstrable risks simply through continued bad publicity.

### **THE EFFECT OF WIND DEVELOPMENT ON LOCAL PROPERTY VALUES**

Wind turbines, the tall elegant windmills of European design, have begun to punctuate skylines and rural vistas where natural wind energy can be found. In the Pacific Northwest a significant wind project is planned for Kittitas County near Ellensburg, WA, about 90 miles southeast of Seattle. Installed capacity, nationwide, has grown at a compound rate of 26% since 1998. The turbines can be 60-100 meters high (200-330 feet, the height of a 10-12 story building).

Opponents, however, have questioned whether property values will be lowered when in view of the turbines. Systematic research was undertaken to establish whether there is any basis for the claims. The Renewable Energy Policy Project (REPP) (Sterzinger et al 2000) reviewed data on property sales in the vicinity of wind projects and used statistical analysis to determine whether and to what extent the visual presence of turbines has had influence on prices of properties which have been sold.<sup>18</sup>

The REPP report hypothesized that if wind development can reasonably be claimed to hurt property values, then review of sales data should show a negative effect on property values within view sheds of the projects. The study found no significant empirical support that property values were diminished in any of 10 test cases from around the country.

View sheds or visual impacts were defined as areas within 5 miles of a wind farm where the turbine clusters can be seen. The limitations of the study involved the siting of these wind projects in remote rural locations where numerous homogenous sales were unavailable, compared with the urban areas referenced above. The simple regression model cannot explain all influences on property values. The REPP study authors suggested that future studies might expand variables. Refinements might include consideration of relative distances.

A regression analysis used monthly average change in price for all aggregate sales in the defined view shed areas and a control community unaffected by the view. Comparable communities were selected based on compa-

rable demographics and discussions with local assessors and was admittedly subjective.

In the Ellensburg case, we did use paired sales before and after the siting was announced and found that appreciation rates appeared to keep pace with unaffected areas in the county. Specific properties were found with view impairments. However, the area was already impacted by overhead transmission lines and towers. The wind turbines are typically sited in power transmission corridors.

Visual impact cases may be a better type of indicator to track consumer reactions to undesirable land uses. Knowledge of invisible emission impacts is contingent on the perception, attendant publicity and appreciation of the science.

### **THE EFFECT OF OVERHEAD TRANSMISSION LINES ON PROPERTY VALUES**

Overhead Transmission Lines have received the most scrutiny from the standpoint of their visual impact in rural areas. A 1992 study by Cynthia Kroll and Thomas Priestley concluded that fee appraisal offices have the longest history of evaluating line-of sight impacts, but lack any in-depth statistical analysis to verify obtained results. Interviews and personal opinions can produce dramatically varying results (and do not have the finality of actual transaction data).<sup>19</sup>

Proposed overhead transmission line projects often raise concerns about their potential effects on property values. In general, there are two types of property value impacts that may be experienced by landowners affected by a new transmission line. The first is a potential economic impact associated with the amount paid by a utility for a Right of Way (ROW) easement. The second is the potential economic impact involving the future marketability of the property. Although somewhat interrelated, these two effects are discussed below.

Just compensation for a transmission line easement has been typically interpreted as the difference between the fair market price of the land with and without the encumbrance of the line. Economic impacts to landowners may occur if they are not compensated for the "highest and best use" of the affected parcel or if the effective "taking" is larger than the actual easement.

The presence of a transmission line may not affect some individuals' perceptions of a property's value at all. Some

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people tend to view transmission lines as necessary infrastructure on the landscape, similar to roads, water towers, or antennae.

In general transmission line studies have found that agricultural values are likely to decrease if the transmission line towers are in a location that inhibits farm operations. But this is a direct impact which is frequently compensated and recognized as a taking.

Positive impacts may also occur, where the ROW is attractively landscaped open space and/or developed for recreational use.

The most sensitive rural properties were found to be those located in areas of recreational or second homes. Thus, more remote farming communities will be less impacted than those near recreation or scenic destinations.

Effects are most likely to occur to property crossed by or immediately next to the line, but some impacts have been measured at longer distances.

This overview on transmission lines suggests that the most serious impact is physical impairments of views for higher valued residences or vacation homes.

### **APPLICATION OF TRADITIONAL APPRAISAL METHODOLOGIES**

Valuation is as much a subjective art as it is an empirical science. Every parcel of real estate is unique given that it is fixed in place, in finite supply, immobile, durable and of use to people.<sup>20</sup> The behavior of market participants is as determinative of price as physical attributes of the property.

Diminution in property value from some defect is typically measured on a cost-to-cure basis. When there is no demonstrable physical risk, such as direct contamination of a property, value can still be adversely affected by stigma and perceived risk.

Real estate appraisers have long recognized that outside factors, or externalities, can adversely affect property value as a form of depreciation referred to as economic or external obsolescence.<sup>21</sup> Economic obsolescence is incurable, at least in the short run. Analogous to external obsolescence is the concept of stigma, which might be termed in a real estate context as the failure of a property to recover its value once a defect is, in fact, cured.

Property value impacts created by an external incident or environmental factors can be measured through development of an hedonic model. For the model to function accurately, however, a data set must be established that is sufficiently large and homogeneous to isolate the impact influence within acceptable levels of variance.

Ideally there would be a body of data consisting of properties, which had recently sold in rural areas influenced by a cement plant to compare with another set of sales in otherwise similar areas without such influence. Further, these observations would involve otherwise similar properties so that the difference in transaction prices could be attributed to the influence, positive or negative, to the nearby location of the cement plant. The collection of these so-called "paired sales" might provide an appraiser sufficient information to derive a measure of diminution (or enhancement) attributable to the suspected influencing factor. However, it is clear that, in no time a list of distorting elements grows as the appraiser takes into account how different one property might be from another.

The paired sales technique is commonly used by appraisers to derive appreciation calculations. Sales and resales of properties are paired with any change in price attributable to passive appreciation (or depreciation). The appraiser must adjust for any changes to the property, over time, between the sales.

An hedonic model provides an alternative approach to recover the implicit value or diminution in value which an adverse LULU may cause. The hedonic regression of sale prices with a set of characteristic attributes, including one for distance from the LULU, can then be used to predict the probability of adverse impact that a similar LULU in the subject location might have. Simply put, the hedonic model applies a statistically rigorous process to the paired sales technique relied upon by real estate appraisers to explain price differences for varying features.

The hedonic model attempts to sample randomly from a large population of observations. The models work best in mature urban areas. The key is to hold as many variables constant as possible to better gauge what increment a fireplace or additional bedroom adds to house values. Alternatively, a control area may be selected with a similar population of properties but in an area considered unaffected by the particular nuisance or any others.

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In the case of rural areas, such a model would require a significant sampling from a large homogenous population of comparable property sales in areas with similar LULUs. The lack of data poses the principle obstacle for appraisers or land use consultants attempting to measure property impacts, either way.

First, it is likely the analysis will be restricted to residential sale data, since other property types have too much variability. However, residential property serves as the proverbial canary in the tunnel, in so far as dwellings are most sensitive to environmental impacts.

Second, any one or a combination of external factors can swamp the influence attributed to a particular LULU. These externalities include, but are not limited to: local employment opportunities, the costs and availability of mortgage funds or the presence of offsetting amenities (like a view or water frontage). For example, demand for homes on golf courses remains high even though there are risks from striking golf balls and noise from sprinkler systems.

On an aggregate level, if property values can be shown to be appreciating even where there is knowledge of some risk, or where some blight is readily apparent, then it is very difficult to argue property values have been diminished by that effect.

One solution is to collect aggregate data from local multiple listing sources or assessors offices and trend it over time. The average price of homes sold can be a fairly consistent indicator, if there is a sufficient number of at least 100 or so.

The consensus in the academic literature is that adverse impacts to property values from undesirable land uses are confined to a two-mile radius from a given source of concern. View sheds for 10-story windmill farms have been studied at a five-mile radius. Transmission line studies use similar distances. Virtually all of the studies involving any kind of quantitative analysis focus on urban residential properties.

Farmland, because of its expanse and relatively low unit values (compared to urban land) has seldom been found to be affected by structures or emissions, so long as no material damage can be shown. Transmission line studies suggest a small negative affect in rural areas, but these negative affects can be attributed to second home use rather agricultural utility.<sup>22</sup>

One example of a demonstrable negative affect created by air-borne emissions was the plume of nuclear fall-out created by the Chernobyl event (1986) in Russia which degraded and contaminated pasture land for many surrounding miles. Ash fall from the Mt. St. Helens eruption (1980) in the Pacific Northwest materially affected cropland where it accumulated.

However, studies have suggested that the mere perception of risk may create stigma or adversely affect property value in areas with urban populations. Mountain views, access and frontage on a stream or lake command premiums for rural or recreational residential use. Whereas residential property is sensitive to nuance, reputation and other intangibles, farmland is bought and sold based on its productivity and utility. Even demonstrable contamination or poisoning would not necessarily diminish property value if a satisfactory cleanup could be undertaken.<sup>23</sup>

Farmland loses value if it loses its water rights or if its soils turn fallow because nutrients have been exhausted. In some arid areas, farmland loses value when too much irrigation begins to cause salts to leach to the surface poisoning the crops. Low valued farmland or rangeland is typically bought and sold as large tracts where residential use is incidental to the farming activity. The presence of transmission towers, windmills, power lines, or any other structure or use does not adversely affect value because the parcels are too large with too low a unit value to be sensitive to that type of influence.

### **SOME GUIDEPOSTS FOR EXPERTS**

Real estate consultants, be they appraisers, brokers or even academics, will be asked to provide guidance to policy makers if not evidence in contested land use reviews. Each case must be carefully examined regarding property value impacts of LULUs. However, reference to macro-economic indicators and urban case studies can help focus the debate.

First, property values seem resilient, particularly when there is sustained population growth. Second, the value of large parcels in agricultural use (multiple acreage) seem far more likely to be affected by production and transaction factors (like availability of water and the costs of mortgage financing) than indirect impacts from LULUs. Finally, property values in rural areas will be most affected by local employment and the presence of recreational opportunities.

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