

Research Article

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Evaluation of stigmatized properties

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Abstract: Stigmatized property is real estate burdened with an external negative effect. Individual cases are spread along a broad spectrum, along many dimensions that include the rational and the irrational, the acute and the chronic. Examples for the stigmatizing effect are a nearby airport, ground water contaminated by chemicals, presence of a high-voltage power line, and so on. Evaluation of these properties needs special methodology. Stigma can reduce the property's market value through a particular, multi-layered filter. The author systematically examines the professional literature's cases of evaluation of stigmatized properties. The research aims to organize and compare the cases in order to calculate the market value of stigmatized properties. Based on the analysis, six significant dimensions are identified. A focus group of 19 experts examined and individually evaluated the stigmatizing effects along these different dimensions. The author suggests that it is possible to estimate the stigma's effect and compare different cases to one another effectively. The results allow the international methodology of valuation to be processed.

Keywords: real estate valuation, stigmatized property, market value

1 Introduction

This research is about a specific problem in real estate appraisal. There are numerous instances of stigmatized property described in professional literature; however, most of these present their cases on an individual basis and do not make comparisons. Individual cases appear in different regions and cultural environments, in addition to falling under different jurisdictions in each country. This research aims to organize and compare the cases in order

to allow for quantification and value formation within this very specific field in property valuation in Central Europe, which has no such antecedents. The first step towards value calculation is analyzing the various incidents and comparing their "severity". Even though the methodology of evaluation is not yet developed, experts familiar with such cases should have no trouble coming to a consensual conclusion about individual cases.

After presenting the relevant professional literature, the author has developed a methodology, which, together with the input from the 19 well-equipped experts, on the one hand sorts the stigmatizing effects – from a Central European perspective – and on the other hand is suitable for quantifying and comparing the stigmas in specific cases. The results published here are significant for advancing the topic, as they also allow the international methodology of valuation to be processed.

2 Literature review

2.1 Stigmatized property – definitions in professional literature

This study wishes to treat the topic of "stigmatized property" in a uniform manner. This necessitates the clarification of the concept. The community's fear of incalculable risks is what is generally behind the property's stigma. Places, products, technological procedures and lifestyles can all be stigmatized. The community's opinion of the magnitude of the risk can differ from the results of scientific studies; in some cases, the community can estimate the risk to be significantly greater (Gregory et al. 1996). According to Gregory, stigma always shares five common characteristics:

- the stigma source is a threat associated with high risk;
- the stigma strongly violates the community's expectations of what is natural and good;
- the stigma affects certain members of the community more than others;
- the stigma's potential effect is uncertain;
- there is uncertainty regarding risk management.

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The stigma's appearance is often caused by a major, shocking incident that influences public opinion and draws attention to the peculiarities listed earlier (Slovic 2009). Gregory and Satterfield (2002) add that stigmatizing effects cannot be calculated trivially using cost-benefit analysis and that there are no accepted procedures in management for handling this effect. Roddewig (1996) describes the process of stigma in the real estate market as a series of five distinct cycles that mutually affect each other:

- The health risk cycle: a scientific or semi-scientific opinion is published about an effect that could be detrimental to health. An increasing number of people begin to investigate the effect and a debate ensues between differing opinions. The more accurate the data and the scientific approach, the more the fears concerning the stigma decrease.
- The remediation cycle: after risk assessment, various remediation technologies are developed and applied. These methods and their costs can be calculated increasingly well over time, and after a while, the community also becomes aware of these.
- The media cycle: in this cycle, the media first “bombards” the public with negative opinions; later, in the information phase, objective reports also begin to appear.
- The regulatory cycle: regulators at first voice puzzled opinions and promises, which is followed by systematic examinations and finally changes in regulation.
- The lending cycle: this cycle follows the previous four; during this cycle, banks, after a delay, first remain aloof and then – after understanding and evaluating the risks – continue to finance the affected properties.

Stigma (or blight) has many definitions in real estate appraisal literature. A few examples are presented in chronological order:

- Stigma is the difference between the value of a contaminated and a non-contaminated real estate property (Mundy 1992).
- Stigmatized property is psychologically affected by an event that occurred or was suspected to have occurred on the property, such event being one that has no physical impact of any kind (Morgan 1994) – this definition is identical to the definition currently used by the National Association of Realtors in the US.
- A stigma is a negative community opinion about a piece of property, which can neither be objectified nor be measured directly (Roddewig 1996).
- Stigma is (a) decrease(s) in value because of increased environmental risk (Hurd 2002).

- Stigma is an environmental effect that decreases the value or marketability of the property or that of nearby properties, or decreases interest in the property or in nearby properties (Greenberg and Hollander 2006).
- Stigma can apply to places, products or technologies, which, according to the general opinion, are unnecessarily risky or aesthetically displeasing (Slovic 2009).

What conclusions can be drawn from these definitions? The most important one is that there is no clear, standard definition. Each sub-field, researcher and school uses a definition that is suitable for their field of research. It is not clarified whether stigma is a calculable element of value or whether it is simply an indicator of a type of decrease in value. Some definitions do not exclude measurability, but others specifically point at the effect's unquantifiable nature as part of the definition. Furthermore, when using the word “stigma”, it is not clear whether we interpret environmental risk in the context of “environmental protection” or whether we take a broader meaning and also apply it to the social, human environment. This uncertainty makes it necessary to formulate a new definition that includes all real estate to which the word “stigmatized” can apply in the professional literature and discourse. According to the definition in this article, “stigmatized property is real estate burdened with an external negative effect. This external effect can reduce the property's market value through a particular, multi-layered filter”.

2.2 Stigmatized property – types of cases

The author collected the cases and the types of contamination that have resulted in or can result in stigma in the real estate market. Individual cases are spread along a broad spectrum, along many dimensions that include the rational and the irrational, the acute and the chronic. There are cases where more than one effect is in play, such as the first example dealing with the presence of a high-voltage power line, where those affected complained about aesthetics and wind noise along with radiation; a nearby airport is another example, where the main distraction is noise, but again there are also complaints about the aesthetics of seeing planes nearby, turbulence and fuel spillage. In other cases, there is a singular effect, e.g. ground water contaminated by chemicals. These cases and phenomena are not uniformly solid; some have been well documented in literature, whereas some have not been investigated and they include world-wide problems but also problems specific to experts in Central Europe.

2.2.1 High-voltage power lines and cell phone towers – radiation and visual effect

The general public became aware of the problem of stigmatized property when, in 2000, Steven Soderbergh released his film titled “Erin Brockovich”. The movie’s protagonist, based upon an actual person and portrayed by Julia Roberts, fights desperately for the residents of a housing estate who most likely became sick from a high-voltage power line above their houses. The movie’s antagonist is the huge electric company, but, ultimately, this modern David and her selfless friends overcome the Goliath. Besides the health risks, characters in the movie complain about their properties’ depreciation and loss of market value. A wealth of literature was written about the negative health effects of high-voltage power lines – most of them failed to demonstrate actual negative health effects – and another large volume of publications deals with the depreciation of affected property. After reviewing previous expert opinions about high-voltage power lines, McDonough (2003), in her article, reaches the conclusion that power lines reduce property value primarily because of their visibility and their presumed health risks. In each case cited by the article, the depreciative effect of high-voltage lines was between 0% and 10%, but all of the cases referenced by the author were US court rulings. Chalmers, in his 2009 article, explored all precedents in professional literature and examined a sample of 1,200 properties in New England to determine the effect of high-voltage power lines on property value (Chalmers and Voorvaart 2009). He used multiple regression, and using four models, he concluded that transmission line proximity or visibility does not significantly affect property value. However, the research database also showed that the existence of a transmission line did have an actual depreciative effect on affected properties.

Similar worries by the populace surround mobile phone transmission towers. Dorin and Simth (1999) investigated these in their article. The study examined newly constructed residential housing near 77 transmission towers in Richmond, VA, USA, partly through interviewing experts and partly by comparative analysis. The investigation concluded that there is no significant effect of tower proximity on property value. Similarly, another study conducted using hedonic regression on a sample of 1,000 properties in Hamburg demonstrated that only those properties that are in the immediate vicinity of a tower sell at a reduced price (within 100 m, by an average of 5.2%) (Brandt and Maennig 2012). The research-focussed analytic mindset was reflected in national standards, too. In Canada, for instance, the mandatory construction

site consultation sheet does not include the depreciative effect of transmission towers as a topic (Townsend 2004). Hajnal (2012), in his case study of mobile phone transmission towers, used a sample of 69 towers and concluded that the significant factors affecting the stigmatized property’s value formation are the time of the transaction, the area and quality of the building and, among the pollution factors, the visibility of the tower from the property in question.

Both with high-voltage power lines and mobile phone transmission towers, several negative effects, such as radiation (and shielding), visual disturbance and increased wind noise, apply together, and neither the complainants nor the researchers have separated the physical reasons for value depreciation so far.

2.2.2 Airport

One of the reasons for real estate value decreases, again a combined effect of several factors, is the proximity of airports. In 1994, a summary overview of previous related studies was made by the Federal Aviation Administration of the United States, and based on this survey, a recommendation for a new methodology was made. The purpose of the study was to enable decision-makers to assess, before building new airports, the expectable additional costs arising due to the value impairment affecting property owners due to increased noise levels. For this purpose, a mixed data collection and evaluation method was developed. The study highlights the fact that the value impairment of low-prestige properties is of a significantly lower percentage than that of high-prestige properties. It was raised as an open question that a possible later decrease in noise levels around airports does not necessarily entail increasing prices. No other (published) research has been conducted on this matter ever since. Later on, several (mostly American) experts have researched the value-impairing impacts of airports, always relying on the conclusions of their predecessors. Besides summarizing previous experience, Bell (2001) points out that property renters are less sensitive to increasing noise than property owners, and thus rental fees change to a lesser extent than the market value, which is related to the criteria of property owners.

Nelson (2004) studied 33 previous data aggregations in his article, using a meta-regression model. He found that, in the area of the US, a 0.6–1.5 dB increase in noise levels entails a value impairment of 1%. On the other hand, he pointed out that none of the previous studies could handle the elimination of value-enhancing impacts

of airports, e.g. improved accessibility. This factor is also dependent on distance, and, unlike negative effects, it definitely increases property values. In another paper, published 4 years later (Nelson 2008), he described the modelling procedures for this problem and the related study findings. He arranged potential methods into two clear-cut groups: hedonic pricing (HP) and stated preference (SP). Lazic and Golaszewski (2006) made an overview of significant analyses that had been made in the US since 1990 and summarized them for the purpose of synthesis. They found that both the methods applied by analysts led to the general conclusion that each 1 dB increase in noise load entails, on average, about 1% of property value impairment. Jud and Winkler (2006) applied a new approach compared to previous studies: they studied how the news of the announcement of building a new airport would affect housing prices. By applying the Spatial Auto Regression (SAR) model on a sample size of tens of thousands, they found that the announcement led to a 9.2% decrease within a 2.5-mile area of the airport and to a 5.7% decrease in a further 1.5-mile area, instead of the usual ~2% discount in the asking prices. However, despite the massively unequivocal standpoint of researchers (1 dB noise – 1% value impairment) and their multiple syntheses, results with the opposite outcome appear as well. In his thesis, Valdes (2008) used a method of spatial correlation and did not find any obvious value impairment in connection with the increase of noise levels at Oakland Airport. Valdes points out that, at certain locations and for certain types of properties, a change in the items that constitute value might even lead to an increase in value with regard to an airport. Boes and Nüesch (2011) share a similar opinion when they find that rental fees are not influenced solely by the actual magnitude of noise but also by other, often counteracting, variables that are related to a certain location. They also found that, in the area around Zurich Airport, a 1 dB increase in noise levels led to a 0.5% decrease in rental fees. Hajnal (2017) conducted a study of Budapest Airport and concluded that, based on the examination of a hedonic model, the extreme 25% value impairment that is commonly assumed is not justified by the sample. Even if such an impact exists at all in this environment, it is to a much lesser extent than commonly thought.

2.2.3 Noise

The greatest encumbrance caused by airports is noise, but the effects of noise on property value have been covered by international literature on its own, independent of airports. After a thorough review of previous publications

about road and railway noise, Bateman et al. (2001) write that authors have demonstrated between 0.08% and 2.22% of value impairment per decibel, with an average reduction of 0.55%. This is less than the average of 1% relating to airports. A 2010 study in Hamburg based on price offers demonstrated even less, an average of 0.23% depreciation per 1 dB increase in road noise (Brandt and Maennig 2010). A year later, the same authors also investigated the effects of railway transportation in Hamburg, and their final results showed that railway accessibility as a positive external factor dwarfed any negative environmental effects due to railway proximity (Brandt and Maennig 2011). It should be noted that this effect is by a different order of magnitude: the railway station's proximity increases property value by 4.6% (in Hamburg, in 2012). Furthermore, using a similar method, the effect of the new London Jubilee Line was estimated to increase property value by about 9.3% (Gibbons and Machin 2005). At this point, too, it is worth pointing out the internal shortcomings of the Hedonic method: no amount of care in model construction allows separating the negative from the positive effects on property value of the same cause (e.g. railway construction).

Andersson et al. (2010) published a case study comparing road and railway transportation noise effects in Sweden. They concluded that road noise has a larger negative effect on housing prices than the same amount of railway noise (Andersson et al. 2010). Again, the question arises regarding the reasons and whether the indicator used in the analysis is good enough. It is not only a question of using the right calculations and benchmarks for scientific analysis but also whether the measured numbers provide an accurate representation of the subjective perceptions of noise pollution. Baranzini et al. (2008) reached the conclusion that in these cases, his hedonic model returned similar results based on both subjective and objective values when noise pollution was medium or high.

2.2.4 Stench and air pollution

One of the most dangerous environmental hazards is air pollution, which has made the lives of entire metropolises more difficult. It is no coincidence that stigma due to air pollution is a major area of research in environmental literature. Depreciation of real estate has become the focal point in certain areas of environmental protection in some countries. Because of the air pollution factor, this situation has become a cornerstone of national regulation in the US. In counties where air pollution (or more precisely,

the total number of suspended particles) reaches a certain upper limit, any kind of emission has been under much stricter regulation since 1977 than in other places. According to Chan and Chin (2002), as a result of strict regulation, the combined value of flats in affected areas rose by \$45 billion, because according to their hedonic analysis, a $1 \mu\text{g}/\text{m}^3$ decrease in suspended particles yielded an average increase of 0.28% in property values. However, their method has been under attack from multiple flanks, including methodological ones since the 1970s (see e.g. Harrison and Rubinfeld 1978). In spite of that, researchers continue using the hedonic method when estimating the effect of air pollution on market values for a metropolis or a country (Carriazo-Osorio 1998). There have been many micro-studies in the field; an example is an investigation of how the stench from Californian auto body shops impairs value, according to which depreciation is at 3.4% (Saphores and Ismael 2005), or the stigmatizing effects of the smell from Brazilian wastewater treatment plants; accordingly, stench does cause a significant decrease in value (Batalhone et al. 2002).

A previous article (Moffatt et al. 2001) draws attention to the fact that while in Victorian England, a mill's smoking chimneys meant work availability and welfare, and thus the locals judged the site favourably, today, society's expectations of air quality turns the same (or, by today, a significantly lower) effect into a negative one. Moffatt et al.'s case study is one of the few that does not apply the HP method when analyzing stigmatized property but rather uses the SP model. The conclusion is also noteworthy. While outsiders view the industrial area designated in the case study as stigmatized and heavily polluted, the inhabitants themselves do not feel that way. This conclusion appears in other publications on air pollution as well; those living in the broader area deem air pollution to be greater, and those living in the immediate area deem it to be less than in reality (Bickerstaff and Walker 2001; Bickerstaff 2004).

2.2.5 View restriction

There is ample literature on the effects of a panoramic view, but the results are rather contradictory. Magill and Schwan (1989) were the first to conduct a systematic study of this question in 1989. They focussed primarily on the effect of landscape views on price during their 7 years of research. After investigating large areas, they classified possible panoramas by distance, span and perspective. The grand total of 66 variables applied to the dataset of 236 studies spread over 13 sample areas prove to be too

many and too complex to allow a hedonic method to yield evaluable and generalizable results. The authors – as landscape experts – finally concluded that their point of view and that of real estate agents differ, which is why they could not find correlations between prices and variables. Lange and Schaeffer (2001) used a practical approach when they used the prices of hotel rooms in Switzerland to infer that an exceptionally beautiful view generates extra income, both through general pricing and through increased utilization. The conclusion is that the specific increase in value provided by the panorama can be estimated by capitalizing the additional revenue. They also point out that different people prefer different views: in the hotels used as an example, the majority prefers to pay more for a mountain landscape, but guests arriving from Arabic countries prefer a view of a forest and trees.

The results of Benson et al. (1998) obtained using the hedonic model are interesting here. He concludes that housing prices depend on the view (who sees what and to what extent); e.g. a full ocean panorama adds 32% to the property's value, while a partial ocean view only adds 10%. Yu et al. (2007) created a hedonic model using modern visualization technology (3D geographic information system [GIS]), which estimated the seafront view's effect on prices to be 15%. The model estimated the view with its content and extent; it represented the view as a single consolidated factor in the regression equation and thus thwarted the many noise effects that made Lange's model ineffective. Chau et al. (2004) also investigated a consolidated factor in a Hong Kong example. When analyzing new developments, their results showed that having a balcony increased the price by 3.7%, whereby – in an undemonstrable way – the benefits of a view outweighed the remaining positive and negative factors of a balcony. Damigos and Anyfantis (2011) studied the effect of a panorama on value using the fuzzy Delphi method (and the views of ten experts) on real estate in Athens. In contrast to the earlier findings, they concluded that a pleasant view can be worth as much as 50% extra, while an unpleasant view reduces prices by 25%. We later also show that using the expert opinion method in the absence of data can end up significantly overestimating the degree of stigma.

2.2.6 Point source chemical pollution

Point source chemical pollution is another emblematic case in professional literature on stigmatized property. These are instances when, e.g. a tank truck full of dangerous goods spills on the road due to a collision, but the

Devecser disaster in Hungary (red chemical sludge spilled from a reservoir) also belongs in this category. Cases in literature are very much alike and, in fact, overlap with the topic of landfills. It is difficult to demonstrate by hedonic analysis whether it is a single accident or the long-term effect of waste dumping that results in stigma and impaired value. For a point source chemical pollution event, how the value-changing effect of contamination looks over time is important.

At the same time, it is important to note that property devaluation because of chemical pollution applies only to certain segments. An early research article demonstrates, through nine case studies, that in Silicon Valley, the prices of industrial development sites were unaffected by existing sources of pollution (Scholz 1989). Besides segments, there can be significant differences by value category as well: the value impairment of residential housing worth less is greater, according to a current study (Gamper-Rabindran and Timmins 2013). One of the most dangerous kinds of point source pollution is lead contamination, because lead is undetectable without instruments, and thus using the ground and the water does not make the inhabitants feel at risk. A micro-study (with the hedonic method) in Alabama demonstrated that, as one approaches the source of lead contamination, the value of residential property decreases by 2% for every kilometre (Affuso et al. 2010).

2.2.7 Biological contamination (mould and fungus)

As with the previous topic, biological stigma must also be discussed; however, such a study has not yet been published. The reason for this could be that biological contamination is often specific to the property itself and not an external, environmental hazard. Experts, however, view the fungus infection of a wooden wall or, for instance, mould as stigma. For example, a *Serpula lacrymans* infection (dry rot) is practically interminable; it can lay dormant for a long time and then attack with great force. In Moscow, the “waterfront houses” by the river, which communist potentates used to reside in, despite all their luxury, were constantly infested by cockroaches brought in by hungry and dirty construction workers. The lives of modern pilgrims are made difficult by the almost ineradicable presence of bed bugs. Prevention of biological contamination is possible with careful implementation and attentive operation, in addition to realizing that moisture generally provides an advantageous environment for these pathogenic agents, and therefore, treatment must begin by eliminating the source of damp. We could say

that stigma develops after a past infection that has been treated or which has withdrawn temporarily, since practical experience shows that a belated intervention is often unsuccessful and only provides temporarily relief from the problems of mould, insects or fungi.

2.2.8 Waste dumps

The stigmatizing effect of waste dumps is one that is taken most seriously in America, primarily because of the extremely high risk found among people in their vicinity developing cancer (Hamilton and Viscusi 1999). Starting from the 1970s, hundreds of toxic waste dumps have been included in the so-called “Superfund” programme; these areas have then been decontaminated and recycled, and the funding for these activities has been established. This intervention essentially created a new kind of market environment and a new market (Kholhase 1991). Hurd made several case studies of these areas. One of Hurd’s important results is that demonstrable value loss continuously reduces, at first significantly, over time (Hurd 2002). Deaton and Hoehn (2002) draw attention to a mistake in the hedonic method, when, next to the distance from the waste dump, they also introduce the distance from the industrial zone as a variable and realize that the two cancel each other out in the hedonic value, since industrial proximity already points at a bundle of environmental risks (noise, smell and traffic); thus, it is impossible to single out the effect of the waste dump. Environmental hazards have different effects on different segments of the real estate market. Ihlanfeldt and Taylor (2004) estimated the total loss of property value in every segment within a 1.5-mile radius of a contaminated site and found a 10% total decrease in value. It is interesting that some property owners were against including a dump site in the “Superfund” programme, because they were afraid that stigma would result in lower sale prices (Gregory et al. 1996). An Australian case study of the vicinity of a large waste dump found, however, that the negative effect on property value only extends to a radius of a few hundred metres (Neupane and Gustavson 2008).

The American “Superfund” solution to toxic waste dumps was successful in areas where, alongside government regulation, real estate investors were also active and where the media did not keep the topic on the agenda (Greenberg and Hollander 2006). Gayer and Viscusi (2002) examined the opposite of this effect with a hedonic model, when the media release good news about a waste dump’s decontamination. It is a methodological curiosity how the

standard flaw in the model is averted by only studying cases where the same piece of property was sold multiple times (at least twice). This still resulted in a dataset of 1,755 cases, in relation to news in the local media. The number of words in the article, whether the news was on the front cover and what information the article published about risks were all included in the regression. The results mostly showed that a positive article increased prices in the investigated waste dump areas by \$100–\$200 (independently of additional, more detailed variables). An important partial result is that a single positive article's publication raised the stigmatized property's value by 0.5%.

2.2.9 Property under construction

Ongoing investments appear at first to be included in the list without reason. At the same time, as a result of the real estate crisis that originated in 2008, there are unfinished and abandoned investments worldwide, from India through Turkey to Central Europe; overgrown sites, empty concrete skeletons and abandoned construction cranes serve as reminders of how the real estate bubble burst. These investments, under construction on paper but abandoned in practice, make up a large group of stigmatized property, because a wealth of specialities, as well as public prejudice, relate to these (Hajnal 2015). As opposed to the standard derivation of market value, the particularities of ongoing investments are the following:

- Each piece of real estate differs significantly from the remaining ones;
- These properties are not out on the market, but
- their technical content (completion, state) can only be determined by a thorough technical survey and analysis;
- They do not generate income; and
- There is no future vision that would allow for the planning of future revenue.

All these characteristics show a negative opinion attached to such properties, which generally results in depreciation. For the want of related studies, there is professional experience that unfinished constructions carry stigmas.

2.2.10 Sexual attitude of neighbours

This topic became current in the US because of the Adam Walsh Act of 2006, requiring sex offenders (armed attackers, pornographers and rapists) to be registered. In Yeh's

study (Yeh 2015), a GIS-based hedonic model demonstrated that, in Nebraska, (registered) sex offenders living within a 0.1-mile radius decrease property value by 4% on average. According to her study, news about such attacks do not provide a demonstrable stigma relating to the attacks' neighbourhoods, but sex offenders in the mandatory and publicly available register do have an effect on the real estate market. This study reinforced earlier similar studies that were not GIS-based, e.g. Linden and Rockoff 2006. Besides a 4% reduction, they also demonstrated that the property value loss from being the direct neighbour of a sex offender is 12%.

2.2.11 Haunting

To end the list of stigmatizing effects, here is a rather exotic stigma, which is, however, taken very seriously in certain societies and cultures. The cases of "haunted houses" serve well to underline the mechanics of how the community judges the stigma: houses where a murder or suicide has taken place, where a human immunodeficiency virus (HIV)-infected person used to live, where it is "well known" that ghosts haunt or, simply, if a place has a negative public opinion for some reason. "Haunted" houses could also increase the value due to them becoming a tourist attraction, e.g. Lizzy Borden House or Winchester Mystery House. As Chapman and Ludlum (2014) write, real estate agents' responsibilities became regulated differently in each member state after a single case, wherein the seller believed the house was haunted, received great publicity. The reactions of people in different neighbourhoods can also be different, depending on whether the owner manages to properly communicate and dissipate (or sustain) the myth. Hofmann takes as an example of a Texan town where mass shootings had taken place in two restaurants during the same night, and while one's owner communicated the events well to their patrons and could profit from the incident, the other restaurant was stigmatized, avoided and had to be closed and torn down (Hofmann 1999). It is telling that in this case, residents could not even stand the sight of the stigmatized restaurant and installed window covers to their own houses to block the view!

It is interesting that in Japan, a property built above a former well also belongs to this category of stigma. The rents for such property are at least 20% lower than those of similar but unaffected real estate, and there are certain people who flatly refuse to use such a property. It can be seen that society's common value judgement changes the

property's price, while – at least according to our set of values – nothing restricts its intended usage. In Central Europe, one can perhaps mention cemeteries as a stigmatizing effect that has negative connotations. Among all the effects that a cemetery has on neighbouring property (the place of the cemetery within the city structure, how vacant it is, its vegetation, silence and negative feelings associated with cemeteries), it would be difficult to filter out which is the important one for the market.

3 Discussion

Table 1 contains the reasons for the stigmatizing effect, the physical effects on the stigmatized property, the effects on the people who use the property and the risks that these people presuppose, based on the effects in question. The causes that trigger stigma are presented in Table 2.

Tab. 2: Causes that trigger stigma.

Case	Construction activity	Accident	Regulation	Endowment
Transmission tower	Yes	No	No	No
High-voltage power line	Yes	No	No	No
Airport	Yes	No	No	No
Noise	Yes	No	No	No
Air pollution	Yes	Yes	No	No
View restriction	Yes	No	Yes	No
Chemical pollution	Yes	Yes	No	No
Biological hazards	Yes	Yes	No	Yes
Waste dump	Yes	No	No	No
Abandoned, under construction	Yes	No	Yes	No
Bad neighbourhood	No	No	Yes	No
Haunting	No	No	No	Yes

Tab. 1: Reasons for the stigmatizing effects.

Case	What happens?	How it affects the physical state of the property	Negative effects of the event on people who use the stigmatized property	Risks, worries
Transmission tower	The service provider constructs a transmission tower	Nothing	Radiation, noise pollution, shielding, restricted view	Health risks
High-voltage power line	The service provider installs a power line	Nothing	Radiation, noise pollution, shielding	Health risks
Airport	The investor constructs/ expands an airport	Generally nothing, turbulence in extreme cases	Noise pollution, air pollution, frightening view	Accidents, hearing impairment, health risks
Noise	The investor builds a development/infrastructure with a lot of noise	Nothing	Noise pollution	Hearing impairment
Air pollution	Air pollution sources are activated or increase their emission due to human activity	Dirt settling on the building in extreme cases	Air pollution, smog	Health risks
View restriction	The investor constructs a building in front of an existing one or acquires building permits	Loss of exposure to the sun	Lack of a panorama	Feelings of loss
Chemical pollution	Contaminants are released due to human activity	Generally nothing, may affect stability in extreme cases	Dangerous materials in the air, groundwater and the ground	Health risks
Biological hazards	A pathogen spreads or is not successfully dealt with	May affect building structure in extreme cases	Appearance of pathogens	Health risks
Waste dump	A waste dump is opened	Generally nothing, may affect stability in extreme cases	Dangerous materials in the air, groundwater and the ground	Health risks
Abandoned, under construction	The investor halted an ongoing construction	Accident risk, premature obsolescence	No effect	Costs of finishing the construction, unclear legal relationships
Bad neighbourhood	A registered criminal moves to the neighbourhood	Nothing	Risk of attack	Attack
Haunting	Someone senses a ghost	Nothing	Fear	(Irrational) fear

Tab. 3: Stigmatizing property cases.

Case	The effect can be tied to a stigmatizing property	Always	Usually
Transmission tower	Yes	Yes	–
High-voltage power line	Yes	Yes	–
Airport	Yes	Yes	–
Noise	Yes	–	Yes
Air pollution	Yes	–	Yes
View restriction	Yes	Yes	–
Chemical pollution	Yes	–	Yes
Biological hazards	Yes	–	Yes
Waste dump	Yes	Yes	–
Abandoned, under construction	–	–	–
Bad neighbourhood	Yes	Yes	–
Haunting	Yes	Yes	–

The source of the effect can often be tied to a property or group of real estate; these are stigmatizing properties (Table 3).

The effect appears on the property in question (the stigmatized property) as well as on the property responsible for the effect (the stigmatizing property).

Based on the tables, one can identify the following common elements:

- All of the cases are negative or carry a negative judgement;
 - Most of the cases are the results of human activity (investment, accident and regulations), and there are only a few that can be considered natural;
 - These human activities are frequently related to construction or investment;
 - The root of the effect can usually be tied to a property or group of real estate (stigmatizing property).
 - There is generally no direct physical effect on the surrounding (stigmatized) property in the cases listed herein, except for extreme cases;
 - However, people who use the property are generally subject to some unpleasant effect;
 - This effect is difficult to objectify and difficult to measure; and
 - Users associate further serious (or perceived to be serious) risks in addition to the effect.

Another common point is that these cases have opened popular and expert discussion that has not yet reached equilibrium.

A few typical dimensions independent of the effect itself can be pointed out from the separate cases. These dimensions are the following:

- **“Space”**: The effect can be of point-source or extensive type, or it may occur along a line.
- **“Time”**: The effect can be a single event or multiple events, or it may occur continuously.
- **“Intensity”**: The disturbance can be of a minor or major type.
- **“Complexity”**: The case can be the result of a single effect or be the sum of multiple effects.
- **“Can it be solved”**: Is it possible to terminate the effect with additional investment or activity; can intervention fully or partially terminate the effect(s)?
- **“Measurability”**: Can the case be described scientifically; is there a measurement method and how accurate is it?

4 Contingency Survey

Between 3 and 5 October 2016, an expert workshop was held at the Department of Construction Technology and Management of the Budapest University of Technology and Economics, wherefrom the 19 senior real estate experts could obtain detailed information on these cases and dimensions. The workshop was a part of the Grant Thornton Knowledge Management programme, and it was titled “Stigmatized Property Evaluation Masterclass”. The workshop also served as a means of collecting expert opinion (so-called Contingency Survey), whereby professionals who are familiar with the subject from experience could voice their opinions on the matter, and complete the following table (Table 4) consensually. This is basically an application of the SP method with a special focus group of experts. The experts graded the cases presented in the previous section along the six dimensions, on a scale of 1–10 (where a smaller number means a smaller, and a larger number indicates a greater, degree of encumbrance). The goal of this grading is to give a relative picture of the severity of each stigma. The usual run-of-the-mill appearance of each case was considered in the course of grading.

Representation of the dimensions along a radar chart yields the characteristics of each case – the greater the covered area, the more “severe” is the case (assuming average properties). Laying the radar charts across each other, it is possible to see the differences between the specific cases of stigmatized property. The characteristics of the cases discussed earlier are presented in Figure 1.

Tab. 4: Stigma grades by dimensions.

Effect, case	Space	Time	Intensity	Complexity	Can it be solved	Measurability
Transmission tower	3	9	3	6	8	7
High-voltage power line	5	10	5	7	5	7
Airport	10	9	8	8	5	3
Noise	6	7	7	3	5	2
Air pollution	8	6	5	3	4	3
View restriction	1	10	5	2	7	5
Chemical pollution	3	7	8	7	5	4
Biological hazards	1	6	8	4	4	4
Waste dump	3	10	7	8	5	3
Under construction	1	4	3	8	2	8
Bad neighbourhood	5	10	5	7	5	7
Haunting	10	9	8	8	5	3

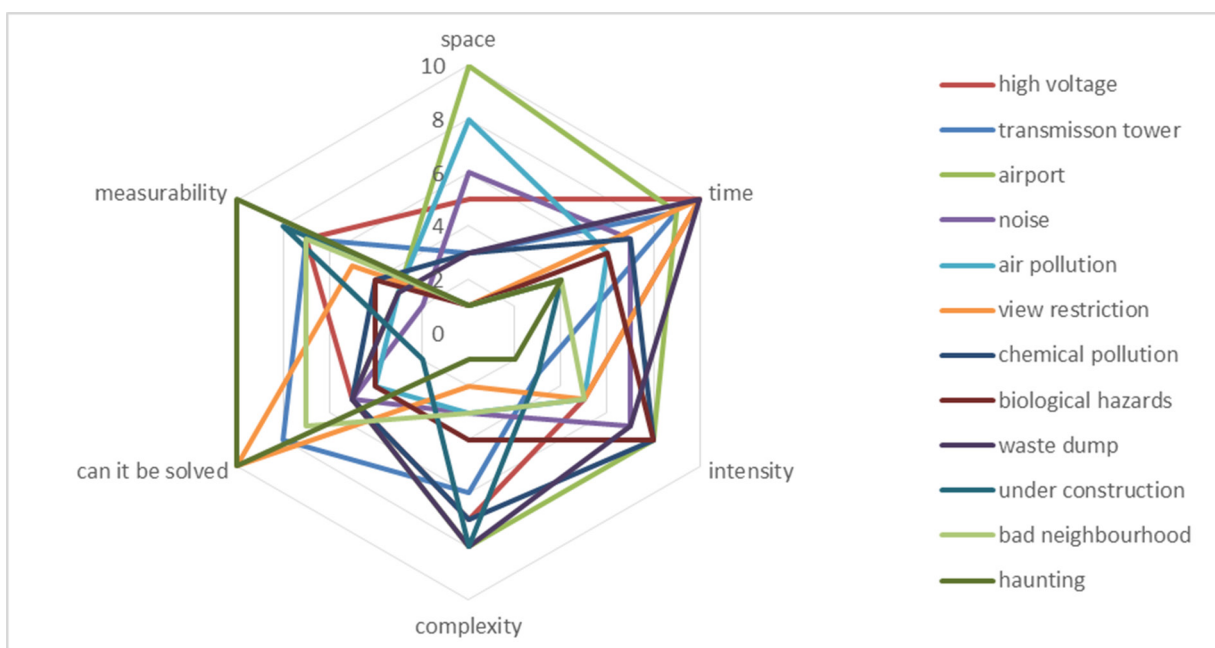


Fig. 1: Characteristics of the cases – compound radar chart.

5 Conclusion and summary

Suitable methods are available in the international professional literature to determine the value of stigmatized property. Some cases, datasets and client expectations have already predetermined certain methods (Horváth and Hajnal 2014). The herein-described method of comparison of different cases helps to compare the severity of different stigmas to one another. The effect of the stigma on market value can then be determined accurately using a suitable method.

The method described is very suitable not only for comparing different effects but also for comparison of specific cases. The stigma on properties with different attributes within a single type of effect can thus be measured

against each other. Further tests in international environments should verify the applicability of this comparison method in other countries.

References

- Affuso, E., de Parisot, C., Ho, C., & Hite, D. (2010). The impact of hazardous waste on property values: The effect of lead pollution. *Urbani izziv*, 21(2), p. 2010. doi: 10.5379/urbani-izziv-en-2010-21-02-005.
- Andersson, H., Jonsson, L., & Ögren, M. (2010). Property prices and exposure to multiple noise sources: Hedonic regression with road and railway noise. *Environmental and Resource Economics*, 45(1), pp. 73-89.

- Baranzini, A., Schaerer, C., Ramirez, J. V., & Thalmann, P. (2008). 'Feel it or measure it. Perceived vs. measured noise in hedonic models'. In: *EAERE 16th Annual Conference*, June, 25-28, 2008, Gothenburg, Sweden.
- Batalhone, S., Nogueira, J., & Mueller, B. (2002). *Economics of Air Pollution: Hedonic Price Model and Smell Consequences of Sewage Treatment Plants in Urban Areas*, Department of Economics Working Paper 234, University of Brasilia.
- Bateman, I., Day, B., Lake, I., & Lovett, A. (2001). *The Effect of Road Traffic on Residential Property Values: A Literature Review and Hedonic Pricing Study. Report to the Scottish Executive Development Department*. School of Environmental Sciences, University of East Anglia, Norwich.
- Bell, R. (2001). The impact of airport noise on residential real estate. *The Appraisal Journal*, 69(3), pp. 312-321.
- Benson, E. D., Hansen, J. L., Schwartz, A. L., & Smersh, G. T. (1998). Pricing residential amenities: The value of a view. *Journal of Real Estate Finance and Economics*, 16(1), pp. 55-73.
- Bickerstaff, K. (2004). Risk perception research: Socio-cultural perspectives on the public experience of air pollution. *Environment International*, 30, pp. 827-840.
- Bickerstaff, K., & Walker, G. (2001). Public understandings of air pollution: The 'localisation' of environmental risk. *Global Environmental Change*, 11(2001), pp. 133-145.
- Boes, S., & Nüesch, S. (2011). Quasi-experimental evidence on the effect of aircraft noise on apartment rents. *Journal of Urban Economics*, 69(2011), pp. 196-204. doi: 10.1016/j.jue.2010.09.007.
- Brandt, S., & Maennig, W. (2010). Road noise exposure and residential property prices: Evidence from Hamburg. *Transportation Research Part D: Transport & Environment*, 16(1), pp. 23-30.
- Brandt, S., & Maennig, W. (2011). The impact of rail access on condominium prices in Hamburg. *Transportation*, 39(5), pp. 997-1017. doi: 10.1007/s11116-011-9379-0.
- Brandt, S., & Maennig, W. (2012). Perceived externalities of cell phone base stations: The case of property prices in Hamburg, Germany. *Environment & Planning A*, 44(2), pp. 396-410. doi: 10.1068/a44292.
- Carriazo-Osorio, F. (1998). Impacts of air pollution on property values: An economic valuation for Bogotá. Master thesis, Colombia.
- Chalmers, J. A., & Voorvaart, F. A. (2009). High-voltage transmission lines: Proximity, visibility and encumbrance effect. *The Appraisal Journal*, 2009(Summer), pp. 227-245.
- Chan, K. W., & Chin, T. L. (2002). A Critical Review of Literature on the Hedonic Price Model and Its Application to the Housing Market in Penang. In: *The Seventh Asian Real Estate Society Conference, Seoul*, p. 12.
- Chapman, D., & Ludlum, M. (2014). Teaching stigmatized property: You don't have a ghost of a chance. *Journal of Business Cases and Applications*, 11. <http://www.aabri.com/manuscripts/131758.pdf>.
- Chau, K. W., Wong, S. K., & Yiu, C. Y. (2004). The value of the provision of a balcony in apartments in Hong Kong. *Property Management*, 22(3), pp. 250-264.
- Damigos, D., & Anyfantis, F. (2011). The value of view through the eyes of real estate experts: A fuzzy Delphi approach. *Landscape and Urban Planning*, 101(2011), pp. 171-178. doi: 10.1016/j.landurbplan.2011.02.009.
- Deaton, B. J., & Hoehn, P. J. (2002). The effect of hazardous waste sites on property values in zones of high industrial activity: A hedonic approach. In: *AAEA 2002 Annual Meetings, Long Beach*.
- Dorin, A. G., & Simth, J. W. (1999). The impact of communication towers on residential property values. *Right of Way*, 1999, pp. 11-17.
- Federal Aviation Administration. (1994). *The Effect of Airport Noise on Housing Values: A Summary Report*. Washington, DC.
- Gamper-Rabindran, S., & Timmins, C. (2013). Does cleanup of hazardous waste sites raise housing values? Evidence of spatially localized benefits. *Journal of Environmental Economics and Management*, 65(3), pp. 345-360. doi: doi:10.1016/j.jeem.2012.12.001.
- Gayer, T. W., & Viscusi, K. (2002). Housing price responses to newspaper publicity of hazardous waste sites. *Resource and Energy Economics*, 24(2002), pp. 33-51.
- Gibbons, S., & Machin, S. (2005). Valuing rail access using transport innovations. *Journal of Urban Economics*, 57(1), pp. 148-169.
- Greenberg, M., & Hollander, J. (2006). Neighborhood stigma twenty year later: Revisiting superfund sites in Suburban New Jersey. *The Appraisal Journal*, 2006(Spring), pp. 161-173.
- Gregory, R., & Satterfield, T. (2002) Beyond perception: The experience of risk and stigma in community contexts. *Risk Analysis*, 22(2), pp. 347-358.
- Gregory, R., Slavic, P., & Flynn, J. (1996). Risk perceptions, stigma, and health policy. *Health & Place*, 2(4), pp. 213-220.
- Hajnal, I. (2012). Estimation of value modification factor with hedonic modeling: A case study. In: *Creative Construction Conference 2012*, June 30 – July 3, 2012, Budapest, Hungary.
- Hajnal, I. (2015). Appraisal of work-in-progress buildings. *Procedia Engineering*, 123, pp. 224-232.
- Hajnal, I. (2017). An investigation of property value impairment caused by noise, in the case of the Budapest Ferenc Liszt International Airport, Using a Hedonic Model. *Periodica Polytechnica Social and Management Sciences*, 25(1), pp. 49-55. doi:10.3311/PPso.8850.
- Hamilton, J.T., & Viscusi, W.K. (1999). *Calculating Risks? The Spatial and Political Dimensions of Hazardous Waste Policy*. MIT Press, Cambridge, MA.
- Harrison, D., & Rubinfeld, D.L. (1978). Notes – The air pollution and property value debate: Some empirical evidence. *The Review of Economics and Statistics*, 60(1), pp. 635-638.
- Hofmann, J. V. (1999). When bad things happen to good properties, Tierra Grande. *The Real Estate Center Journal*, 1278, 1999.
- Horváth, K., & Hajnal, I. (2014). Value impairment of contaminated real estate. *Periodica Polytechnica Social and Management Sciences*, 22(2), pp. 141-148. doi: 10.3311/PPso.7389.
- Hurd, B. H. (2002). Valuing superfund site cleanup: Evidence of recovering stigmatized property values. *The Appraisal Journal*, 2002(October), pp. 426-437.
- Ihlanfeldt, K. R., & Taylor, L. O. (2004). Externality effects of small-scale hazardous waste sites: Evidence from urban commercial property markets. *Journal of Environmental Economics and Management*, 47(2004), pp. 117-139. doi: 10.1016/S0095-0696(03)00070-6.
- Jud, G. D., & Winkler, D. T. (2006). The announcement effect of an airport expansion on housing prices. *Journal of Real Estate Finance and Economics*, 33, pp. 91-103. doi: 10.1007/s11146-006-8943-4.

- Kholhase, J. (1991). The impact of toxic waste sites on housing values'. *Journal of Urban Economics*, 30, pp. 1-26.
- Lange, E., & Schaeffer, P. V. (2001). A comment on the market value of a room with a view. *Landscape and Urban Planning*, 55(2), pp. 113-120. doi: 10.1016/S0169-2046(01)00148-7.
- Lazic, A., & Golaszewski, R. (2006). A Technical Note on Aircraft Noise and its Cost to Society. GRA, Incorporated, Corporate White Paper.
- Linden, L., & Rockoff, J. (2006). There goes the neighborhood? Estimates of the impact of crime risk on property values from Megan's laws; national bureau of economic research, Working Paper 12253.
- Magill, A. W., & Schwan, C. F. (1989). *Searching for the Value of a View*. Research Paper PSW-RP-193. Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, Berkeley, CA, 9 p.
- McDonough, C. C. (2003). The impact of wireless towers on residential property values. *Assessment Journal*, 2003(Summer), pp. 25-30.
- Moffatt, S., Bush, J., & Dunn, C. (2001). Even the birds round here cough': Stigma, air pollution and health in Teesside. *Health and Place*, 7(1), pp. 47-56. doi: 10.1016/S1353-8292(00)00037-X.
- Morgan, R. M. (1994). The expansion of the duty to disclosure in real estate transactions: It's not just for sellers anymore. *Florida Bar Journal*, (February 31), 68(2), pp. 28-35.
- Mundy, B. (1992). The impact of hazardous materials on property value, revisited. *The Appraisal Journal*, 60(4), pp. 463-471.
- Nelson, J. P. (2004). Meta-analysis of airport noise and hedonic property values: Problems and prospects. *Journal of Transport Economics and Policy*, 38(1), pp. 1-28.
- Nelson, J. P. (2008). Hedonic property value studies of transportation noise: Aircraft and road traffic. In: Baranzini, A., Ramirez, J., & Schaerer, C. (eds.). *Hedonic Methods in Housing Markets, Pricing Environmental Amenities and Segregation*. ISBN: 978-0-387-76814-4, Springer, 2008.
- Neupane, A., & Gustavson, K. (2008). Urban property values and contaminated sites: A hedonic analysis of Sydney, Nova Scotia. *Journal of Environmental Management*, 88(2008), pp. 1212-1220. doi: 10.1016/j.jenvman.2007.06.006.
- Roddewig, R. (1996). Stigma, environmental risk and property values: 10 critical inquiries. *Appraisal Journal*, (Oct), LXTV (4), pp. 375-387.
- Saphores, J., & Ismael, A. (2005). Smelly local polluters and residential property values: A hedonic analysis of four orange county (California) cities. *Estudios Económicos*, 20(2), pp. 197-218.
- Scholz, D. (1989). Hazardous waste contamination: Implications for commercial/industrial land transactions in Silicon Valley. *Berkeley Planning Journal*, 4(1), pp. 96-113.
- Slovic, P. (2009). *Talking About Recycled Water—and Stigmatizing It*. *Decision Research Report No.15-01*. Decision Research March, Eugene, OR, p. 2009.
- Townsend, D. A. (2004). Report on the national antenna tower policy review. *Industry Canada*, 2004 December 6, pp. 132-139.
- Valdes, C. (2008). Comparing methodologies that correlate property values and airport noise. Master's thesis, Saint Jose University.
- Yeh, S. (2015). Revealing the rapist next door: Property impacts of a sex offender registry. *International Review of Law and Economics*, 44(2015), pp. 42-60. doi: 10.1016/j.irl.2015.08.001.
- Yu, S.-M., Han, S.-S., & Chai, C.-H. (2007). Modeling the value of view in high-rise apartments: A 3D GIS approach. *Environment and Planning B: Planning and Design*, 34, pp. 139-153. doi: 10.1068/b32116.