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# FAIR AND EFFECTIVE COMPENSATION OF LOSS IN RESTRICTED USE AREAS SURROUNDING AIRPORTS IN POLAND

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**ABSTRACT:** The intervention on the real estate market through a restricted use area (RUA) surrounding an airport changes the situation of the parties to the conflict and determines the manner of resolving the dispute, which is caused by noise externalities. The state, as a third party to the contract, influences the level of transaction costs on the real estate market. The aim of the publication is to present and compare the concepts of compensating loss relating to residential real estate located within RUAs surrounding airports according to the market value and fair value, as well as to present the methodology and estimates of social costs related to this kind of intervention. The methodological perspective is an effectiveness (market) based justification of the intervention derived from R. Coase's views, which are subject to critical assessment. Legal and economic deliberations are presented on the basis of studies, conducted in 2016-2018 for 5 largest Polish airports (according to the number of passengers), regarding the assessment of loss compensation in RUAs in the case of residential, single-family houses. The results of empirical research and the case study concern one airport, namely Poznań – Ławica. Theoretical considerations focus on comparing and searching for a legal, economic, and social justification of utilizing two bases of valuation, namely: market value and fair value. The methodology of research has been arranged with the use of R.A. Posner's approach. The discussion is divided into two parts: an analysis of the regulating element (the legal system) and the changes of the real estate market conditions from the point of view of price and cost levels after the implementation of a RUA.

**KEY WORDS:** compensation value, public intervention, transaction costs, negative externalities, airport noise

## Introduction

The intervention on the real estate market through a restricted use area (RUA) surrounding an airport and established due to negative noise externalities changes the situation of the parties to the conflict and determines the manner, costs and time needed to resolve the property dispute. The activity of the State, which in the economic sense becomes the third party to contracts concluded on the real estate market, is justified by the expected, social result in the form of increased welfare caused by a decrease of social costs that accompany the transfer of real estate rights. The high, from a social point of view, costs of concluding contracts on a unique local market are substituted by assumingly lower costs of transferring entitlements, with the transfer following a normative model prescribed in legal regulations. In order to ensure the effectiveness of such targeted intervention into market relations, it is necessary to provide a rather complex set of formal tools and methods. In a hierarchical order, these include statutory legal provisions, local law, and appropriate regulations of real estate valuation methodology. The tools must be mutually consistent and suitable to achieve the purpose of valuation connected with a very particular intervention. Theoretical considerations in this paper focus on comparing and seeking a legal, economic and social justification for applying to the valuation of damage, two bases of valuation, namely: market value and fair value. The purpose of the publication is a critical analysis of the concept of compensating loss concerning residential real estate located within RUAs of Polish airports according to market value and fair value and to present the methodology of calculating as well as estimates of social costs connected with this type of intervention. Legal and economic deliberations are presented on the basis of studies conducted in 2016-2018 for 5 largest Polish airports (according to the number of passengers). On the basis of one of the Polish legal airports, an assessment of the compensation mechanism for damages regarding residential, single-family homes located within a RUA is made. The discussion focuses on finding a legally, economically and socially justifiable procedure and bases of valuing loss. The obtained results may be utilized in creating and amending legal regulations and the management of property entitlements by airports as well as by real estate valuers involved in valuations of real estate located in RUAs surrounding airports.

## An overview of the literature

Views concerning private property are decisive when considering the admissibility of intervention, its forms and the criteria applied to assess its

effectiveness in the context of a selected concept of justice and effectiveness. This publication focuses on a particular methodological problem connected with the effectiveness of a specified intervention on the real estate market in the form of a RUA (Act 2001, of 27 April 2001, Law on the Protection of the Environment, art. 129, art. 135 and 136 s. 3, in short: POE). According to the neo-Austrian school, this intervention classifies as triangular (Rothbard 2008, p. 277; more on other types of intervention see: Habdas, Konowalczyk, 2018, p. 7) and for that reason abundant, foreign literature presenting well documented since the 1960's results of empirical research (Kopsch, 2016), in which the influence of externalities on residential real estate in the vicinity of airports is measured (compare an overview with a focus on a tool-based examination of analyses: Batóg et al., 2019, pp. 2-5), has limited applicability. National literature, for obvious reasons, deals with contemporary market research from the XXIst century (compare an overview of this research: Trojanek, Huderek-Glapska, 2018). There are no published results of studies that would be directly dedicated and connected with the particular and isolated intervention in the form of a RUA surrounding an airport (Haldas, Konowalczyk, 2019, p. 10). Solutions adopted in foreign countries (Pilski, 2012; Goulbourne, 2002) demonstrate various approaches to compensating the effects of intervention, but imitating those solutions is not a viable option due to the differences in the legal systems of various countries and in the case of USA, even among different states (Migala, 2017; Bennett, 1982). In Polish literature, the issue of this particular kind of environmental compensation has not been discussed and this holds true also for a stronger intervention that occurs when a new airport is built (Kobryń, Bukanowicz, 2015, pp. 81-92).

The point of departure for discussing property (ownership) and its market context is the still relevant concept of justice as described by Aristotle (Arystoteles, 2017, 1132 b 21 et seq.). It is fundamental to ascertain whether compensation concerning RUAs should be based on distributive or remedial justice. In the situation under consideration there is no relation of the perpetrator (just punishment) and the victim (just compensation) which is characteristic of remedial justice. The intervention is a legal interference of a public authority (Haldas, Konowalczyk, 2018a, pp. 6, 10) in which the competence to specify details necessary to achieve proper compensation has been delegated to local governments at the highest tier (the voievodship – POE, 2001, art. 135 s. 2). Consequently, we are dealing with distributive justice, connected with payments, that is with principles of shaping prices on the market and not with a penalty for the perpetrator and compensation for the victim.

Currently, the ownership of real estate is conceptualized not only in a utility context (e.g. a house as a place to live). A key aspect of ownership is connected with capital in the context of the potential for market exchange

(e.g. sale or lease). In common law, ownership (property) is a bundle of rights (Gray, Gray, 2009, p. 91; The Appraisal, 2013, s. 11 et seq.), which in Roman based, private law systems is associated with various entitlements of the owner (Gniewek, 2016, pp. 61-63; Stelmachowski, 2007, pp. 232-239; Murphy, Roberts, Flessas, 2004, pp. 60-68). Both of these concepts concentrate on the owner's prerogatives, neglecting a vital element of property, namely its object (Arnold, 2002, pp. 290-291). This denotes that in the case of real estate, its environmental context and the relation between a human and the environment is overlooked (Arnold, 2002, pp. 302-303). Simultaneously, it is this relation that must be taken into account when deciding on the scope of interference by the legislator into the owner's entitlements (Arnold, 2002, pp. 319-320). Historically, literature regarding intervention includes: A.C. Pigou's concept of taxation presented in the *Economics of welfare* (Żylicz, 2004, p. 68), a similar concept concerning common property in the Lockean proviso (Lock, 1992, p. 193) and his libertarian concepts forbidding interference into property which is the effect of an individual's labour (Lock, 1992, chapter 1, p. 42), a concept according to which externalities do not deserve correction and must be borne by the society (Mill, 1965, chapter 2, p. 6), Rawls's concept of background justice (Rawls, 1994, pp. 32 et seq.). Only libertarians do not accept any social dimension of property and even in cases of force or fraud suggest only a minimal interference of the state (Nozick, 1999, p. 5, 186).

Currently it is accepted that the protection of property is relative and the dominating justification for intervention is its effectiveness. This justification is derived from a rather loosely and extensively interpreted (Fox, 2004, p. 2 et seq.) Coase's theory (Coase, 2013). As a result, the criterion of justice is abandoned and the perspective of effectiveness according to social utilitarianism is adopted. Previously, such an approach was present in economics only in the context of Bentham's individual criteria of utilitarianism (Skousen, 2012, p. 172). An analysis conducted, according to Coase's views, from the perspective of an equivalent situation for both parties of the conflict (mutual loss) is in fact a bilateral, effectiveness based approach to externalities (social costs), which justify intervention. The latter is performed in a market context.

In valuation methodology, the dominating, neoclassical models of the perfect, free or effective market basically have two dimensions concerning price and quantity. These models focus on the functioning of the market in the context of equilibrium and the shorter or longer periods it takes to achieve it (Marshall, 1925, p. 258, 268-277). Therefore, they do not include numerous, unique aspects of the real estate market, such as: transaction costs, low liquidity and low informational effectiveness (D'Arcy, Keogh, 1998).

Simultaneously, it is argued in writings that prices of real estate are not exclusively determined by and on the market (Evans, 1995). Other contemporary theories of the market (e.g. Nash-Cournot's non-collusive firm equilibrium, Arrow's risk aversion, Black's, Scholes's, and Marton's options, Markowitz's portfolio theory, supplemented by Sharpe's, Lintner's and Mossin's CAPM model, Fama's and Miller's informational effectiveness) are inadequate to explain the effects of state intervention and in practice are not relevant when solving disputes within RUAs. This is because they do not deal with real estate as objects, but rather with the reflection of real estate on financial markets (e.g. mortgages and other derivative instruments) which function in a parallel and peculiar reality (de Soto 2002, p. 25).

When assessing state intervention, a traditional, equilibrium model of the competitive market in the neoclassical perspective, based on full or sufficient information with no transaction costs is employed. This model has only two dimensions, i.e. price and quantity and it determines the dominant understanding of market value, thus shaping the manner in which valuations are performed (Act 1997 of 21 August 1997 – on the management of real property, consolidated version: Journal of Statutes 2018 item 121 as amended, art. 151; International Valuation Standards 2011, pp. 20-22; European Valuation Standards, 2016, pp. 18 et seq.). As a consequence, it also defines the principles of valuations for the purpose of awarding compensation payments and designates fair value as the basis of valuation for specified parties of the transaction (European Valuation Standards, 2016, pp. 38-39; International Valuation Standards, 2011, pp. 22-24; more: Konowalczyk, 2018). The application of a legally regulated market value as a basis of valuing real estate that has been subjected to a triangular intervention (the result of which is a change in the market equilibrium) results in an abstract valuation. This may cause the results of the valuation to be removed from reality or at least to inadequately reflect the economic reality, which creates the problem of the legal footprint (Konowalczyk, 2017), that is a situation in which the law obstructs reflecting economic relations. Meanwhile, capital in the form of real estate is treated on the market as a resource (and not dead-capital) (de Soto, 2002, p. 25), so all economic measurements are done only in the context of the relation between the market (capital) and property. One may therefore conclude that intervention is a normal, contemporary dimension of real estate ownership and only in exceptional circumstances, introducing restrictions or obligations or providing entitlements, will necessitate a duty to compensate the produced loss/damage or demand a payment in a private law (e.g. in cases of establishing a RUA) or a public law setting (e.g. planning burdens, see Act 2003, art. 36, or payments connected with the

division, division and consolidation of land or installation of utilities with the use of public money, see Act, 1997, art. 143 et seq.).

## Research methods

Since Coase's theory requires loss to be mutual, then it must be assumed that intervention in the form of a RUA would be redundant only if transaction costs of market negotiations leading to the solution of disputes concerning airport noise externalities were low. In a system of statutory law, the intervention should be based on the premise that protection of interests is afforded to the party who will suffer the greater loss in a social dimension, according to the criteria of effectiveness, measured on the market. This sets out the general purpose of intervention, which is to increase welfare by lowering social costs. In the case of airports, identifying the scope and the form of intervention should take into account the public, or at least the quasi-public (Habdas, 2016), character of land and property designated as airports and utilized to fulfill public interests.

R.A. Posner's concept of analyzing the legal system (Posner, 2014) includes two types of activities, namely discovering and designing economic principles. On this basis he differentiates between positive analysis (economic rules on the basis of which the legal system functions) and normative analysis (economic rules on the basis of which the legal system should function). Consequently, the assessment of intervention in the form of RUA requires conducting a normative and a positive analysis, which in this publication have been considered in the following context:

- the regulated phenomenon, i.e. the functioning of the residential real estate market, which can change upon the introduction of restrictions on use, particular obligations or providing the owners with specified entitlements; the effect of the above may be a change in price or building costs; measuring the cause and effect relation of intervention is only possible after the establishment of a RUA,
- the regulating activity, i.e. the legal system, which pursuant to Williamson's model (Williamson, 1998, pp. 25-27) should be assessed on different levels (for more see: Habdas, Konowalczyk, 2018a, pp. 7-8):
  - the statute, which may restrict liability for damages or prescribe a particular form or procedure of intervention,
  - local law, which for real estate situated within a RUA may, in varying extent, restrict the use of land, place obligations on real estate owners or restrict other persons (e.g. local governments forbidding owners to utilize land for uses specified in local development plans),

- legal regulations on valuation of real estate applied by real estate appraisers which prescribe types of values, utilized in valuations for purposes connected with awarding compensation.

This paper focuses on intervention regarding single family houses, because number-wise they are the dominating type of real estate within RUAs surrounding airports and also account for the majority of filed compensation claims both in number and in value. It has been assumed that the main problem concerns claims for reimbursing money spent on acoustic improvements or paying for future, hypothetical costs of acoustic improvements and additional claims for compensating loss of value. The problem of loss connected with lost profits and forced acquisition of real estate is not considered in this paper, as in practice it is non-existent or negligible.

The tools of descriptive statistics utilized to present the results of research concern the size and the structure of claims and executed compensation payouts in the context of changes in real estate prices. Comparative research, applied when searching for a legally, economically and socially adequate basis of valuation, is based on deduction and a critical analysis of mainly foreign academic writings.

## Results of research – a legal, social and environmental assessment of intervention in the form of a RUA surrounding an airport

The intervention in the form of a RUA, limited to real estate, is first and foremost aimed at protecting human health, because it should ensure effective, acoustic renovation of residential and other sensitive buildings (kindergartens, schools, homes for the elderly, hospitals, etc.). Acoustic improvements are to fulfill increased technical criteria which allow for a proper, acoustic climate within buildings. In addition, the intervention is aimed at properly shaping the principles of future land development in the airport's vicinity. The legislator has connected compensating real estate owners with the introduction of restrictions in the use of land (POE, 2001, art. 129 s. 1 and 2) and this is the core of the intervention in the form of a RUA. Specified restrictions in land use as well as obligations placed on real estate owners (concerning the acoustic standard of buildings) are implemented at the level of local law and their extent determines the strength and the character of intervention, thus prescribing the manner and scope of compensable loss. The latter does not exist if no restrictions or obligations apply to a particular real estate owner. This intervention does not allow for compensating loss of value resulting from the fact that a given piece of real estate is located in the

vicinity of an airport. This follows from the fact that the location of a given piece of real estate is not influenced by whether a RUA is implemented or not.

Statutory intervention is designed to expand or facilitate compensation by:

- confirming that all introduced restrictions in land use warrant compensation if they have caused a loss of real estate value,
- introducing the homeowner's right to request the reimbursement of costs incurred to perform acoustic improvements to the building and accepting that such costs classify as loss (POE, 2001, art. 136 s. 3).

Carrying out acoustic improvements of the building always increases the debt of the homeowner, however it would not classify as loss in cases where these improvements were done voluntarily, without an express obligation prescribed by law. In the case of RUAs, when requirements of acoustic building standards are introduced, but there is no obligation to acoustically upgrade buildings (in practice this concerns buildings already erected at the time the RUA is implemented), the intervention ensures that the costs of such upgrades are nevertheless classified as loss (POE, 2001, art. 136 s. 3).

An underappreciated aspect of the intervention is the fact that a precise area of restrictions and obligations is designated, which undeniably minimizes social costs. Before the intervention, these social costs hindered transactions, because they could only take place if measurements of noise levels were conducted by individual homeowners. This concerns both voluntary settlements as well as filing lawsuits. In the analyzed five airports, during the past dozen years, settlements concerning single family houses were concluded only incidentally (1-2 settlements in the case of two airports and no settlements in the case of the three remaining airports) and there was only one airport nuisance lawsuit brought in the entire country. The cost of such a measurement in the case of single family house typically is at the level of 10 000 PLN (for routine measurements). The approximate costs of these measurements/reports were calculated on the basis of current costs incurred by five analyzed airports and an assessment of a few dozen reports prepared by experts.

With an average of 500 single family houses within airports' RUAs, this amounts to social costs of 5 000 000 PLN, while the market cost of all specialized measurements/reports regarding all types of real estate required by an airport to implement a RUA does not exceed 1 000 000 PLN. Thus, the intervention with the use of a formal, "group" right to compensation is simply cheaper. Additionally, the advantage of such an intervention is its durability. Noise levels which determine the area of a RUA are calculated for a forecasted number of airport operations. Consequently, the intervention entails aspects of public activity, in which it is possible to create a plan for managing the



conflict situation. The adopted strategy is avoiding risk, taking into account not only the current state of the environment but also the future operations and the development of the airport while minimizing social costs and neighbour conflicts.

An important and socially effective aspect of the intervention would be reimbursing obligatory and non-obligatory (in practice buildings already erected at the time of implementing a RUA), but factually carried out acoustic improvements of buildings within a RUA. Advantages of such a solution (a properly implemented intervention), apart from improving homeowners' legal situation, are as follows (figure 1):

- limiting the formal extent of intervention, because in the RUA resolution it would not be necessary to specify detailed requirements for various types of buildings and administrative deadlines for performing improvements,
- making it possible to adjust the scope and type of improvements to differing needs of people in the context of the factual use of real estate,
- excluding or materially limiting unnecessary expenditures (vacant homes, homes used incidentally, utilized only in part, etc.),
- decreasing costs of determining reimbursement, because potential expert opinions/reports would only have to verify the type of installed improvements and their market cost,
- increasing informational effectiveness of the market by eliminating speculation that accompanies the alternative solution (future costs of improvements, as opposed to factual expenditures, are compensated) thus allowing the market to function based on free competition.

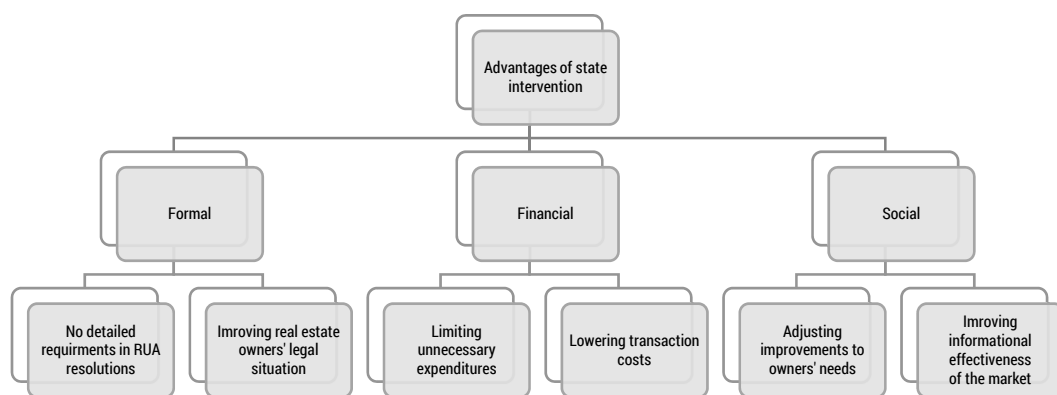


Figure 1. Advantages of an effective state intervention through a RUA

Source: author's own work.

In summary, the described advantages of intervention which provides the owners of real estate located within a RUA with a special right to request the reimbursement of money factually spent on necessary acoustic improvements, even if a particular owner is not obliged to carry them out, are derived from the fact that the intervention allows to fully imitate the market. This fulfills the criteria of Coase's effective intervention. No other solution will be more effective, because it will not decrease social costs.

The application of the intervention in a manner which allows to award compensation and conclude settlements with the airport regarding hypothetical (planned) costs of acoustic improvements that have not been carried out suffers from institutional flaws which lead to:

- compensation that does not take into account individual conditions (varying needs of persons and different manners of factually using the real estate in question),
- increasing the level of social costs – loss/damage is identified without the use of the differential method at a level of maximum, hypothetical acoustic improvements, thus encompasses unnecessary improvements, i.e. ones that no-one will utilize, or that will be utilized only incidentally; moreover, calculating the cost of these hypothetical improvements requires commissioning expensive expert reports,
- decreasing informational effectiveness of the market (speculative behaviour caused by no control over how awarded compensation for planned acoustic improvements is spent),
- not achieving the main purpose of the intervention, namely the protection of RUA inhabitants' health (no possibility to execute the performance of planned acoustic improvements for which monetary compensation was awarded).

It follows from the above that intervention in which compensation is paid for hypothetical (planned) costs of future acoustic improvements is flawed because it does not imitate the market.

From a methodological point of view, both compensation models (hypothetical costs or actual expenditures) bring about the increase of market value because the utility parameters of buildings are improved, including their energy efficiency (Kazak et al., 2018). Additional effects are also achieved, because the scope of acoustic improvements (outer layers of the building's elevation, windows and doors) lower the building's energy consumption and thus support sustainable development goals (Foryś et al., 2019).

The effects of intervention in the case of single family houses are different from situations when within a RUA, undeveloped land is subjected to restrictions, such as a ban on residential development, and is designated for open green space or agricultural use. Such an intervention unfavourably changes

the utility of undeveloped land and the equilibrium between two submarkets of land (by increasing the amount of “green” land and decreasing available residential land), even though it is beneficial from an environmental perspective (comp. the definitions and professional interpretation of the market for purposes of valuing according to the equilibrium model – International Valuation Standards, 2011, pp. 15-17). With respect to single family houses, for which the current use may be viewed as optimal, the intervention does not change utility or affect the market equilibrium, because it does not change the stock or supply of this type of real estate. As a result, there is no justification for measuring loss in the context of the balanced market model. The effects of such intervention may only be measured as a particular, external depreciation, which due to the intervention, has a guarantee of being fully compensated by the airport. This is environmental depreciation (comp. Standardy zawodowe, 2002, Standard III.4, point 4.3), which ignores the issue of intervention and shows environmental depreciation as a market variable.

From the homeowners’ point of view there is no negative change, because their formal, negotiating position is improved. Only when assuming that a market transaction is effected (e.g. a sale) the intervention may be viewed as a deterioration of the market feature of the building’s technical condition. Such an assumption may be justified methodologically only if the owner has not utilized (in full or in part) the claim for reimbursement of acoustic improvements. In such a situation the “market” loss may methodologically be only associated with differing prices due to a “deteriorated”, price-influencing feature and not with the loss of value connected with the location of real estate within a RUA.

### Results of the research – the proposed differential approach to the model of valuing loss within a RUA – case study

Whenever valuing real estate for the purpose of compensating loss, the differential method must be applied, according to the following formula:

$$MV_s = MV_0 - MV_1, \quad (1)$$

where:

- $MV_s$  – market value of loss concerning real estate (the difference between values –  $\Delta MV_s$ ),
- $MV_0$  – value of real estate with no effects of intervention,
- $MV_1$  – value of real estate with a depreciated use standard (to the owner) or market standard (to a hypothetical buyer) due to providing an effective claim for acoustic improvements.

In order to present the results of research concerning the assessment, on the level of valuation methodology, of the intervention's effectiveness, a model which compares the costs of improvements (without functional depreciation) for four single family houses in different (*ceteris paribus*) technical conditions at the date of intervention has been applied. The rules for applying the cost approach in Poland (see: Act, 1997, art. 151-153; Ordinance, 2004, § 20-23) are different from the current methodology used in mature markets (Bowes, 2011). The effects of intervention do not influence the value of land, because no changes are introduced regarding its possible use and development. The model is simplified by assuming that one is dealing with the same type of buildings, situated on similar parcels of land, located in similar neighbourhoods, with the only difference being the technical state of the building.

The first case (object 1) reflects the simplest, but also a realistic, methodological situation:

- before establishing a RUA, the building is new and in the process of construction (brick-built, multi-storied, the structure already erected and the roof covered – i.e. open building shell), the owner's expenditures (planned costs) for all work on thermal insulation will amount to 90 000 PLN – the thermal and acoustic insulation concerning double layered outer walls (including the structure and the insulation parts), typical for single family house construction, may be correlated only when proper technology is applied – see table 3,
- after establishing a RUA the building requires additional improvements as described in the chart (differences in construction materials), the owner's expenditures (planned costs) for all work on acoustic and thermal insulation will amount to 115 000 PLN.

**Table 1.** Value of construction materials for acoustic renovation, object 1 [thousand PLN]

Scope of work	Differences in construction materials	MV <sub>0</sub> – standard cost	MV <sub>1</sub> – increased cost	ΔMVS – difference
Outer windows and doors	Cost of triple, instead of double glazed windows, cost of acoustic instead of standard doors	35	46	-11
Insulation of top floor ceiling	Additional layer of acoustic insulation	10	15	-5
Insulation of outer walls	Additional layer of acoustic insulation	45	54	-9
Sum		90	115	-25

Source: author's own work.

The procedure of calculating loss through a differential model for incurred expenditures (increased costs of building works) is presented in table 1.

The real loss for object 1 is 25 000 PLN (mathematically it is shown with a minus sign, which reflects a financial debt) and is claimed pursuant to art. 136 s. 3 POE. After carrying out improvements, the building fulfills technical requirements and its market feature connected with the acoustic climate (technical feature) is not deteriorated. Consequently there are no formal reasons which would warrant a measurement of real loss perceived as loss of value, since there is no cause and effect relation between any (potential) loss of value and the introduced intervention.

The second case (object 2) reflects the following methodological situation:

- before establishing a RUA, the building has been in use for over 30 years – structural elements in good condition, remaining elements requiring overhaul or replacement, including a 100% physical depreciation of all elements relevant to the acoustic climate, i.e. outer doors, wooden, double glazed windows, top floor ceiling insulation (suprema) and insulation of outer wall (5 cm Styrofoam),
- after establishing a RUA, the building, requires additional improvements as described in the chart (differences in construction materials), the owner's expenditures for all, increased work on acoustic and thermal insulation will amount to 115 000 PLN.

The procedure of calculating loss through a differential model is presented in table 2.

Table 2. Value of construction materials for acoustic renovation, object 2 [thousand PLN]

Scope of work	Differences in construction materials	MV <sub>0</sub> – standard cost	MV <sub>1</sub> – increased cost	ΔMVS – difference
Outer windows and doors	Cost of triple, instead of double glazed windows, cost of acoustic instead of standard doors	35	46	-11
Insulation of top floor ceiling	Additional layer of acoustic insulation	10	15	-5
Insulation of outer walls	Additional layer of acoustic insulation	45	54	-9
Sum		90	115	-25

Source: author's own work.

The real loss according to the differential model amounts to 25 000 PLN. It is analogous to loss for object 1 only if compensation for loss of value is identified with planned (but not actually incurred) costs of acoustic improvements (pursuant to art. 129 s. 2 POE). However pursuant to art. 136 s. 3 POE the owner may claim the full costs factually incurred (115 000 PLN). The latter possibility may be questioned in the context of distributive justice (the basis of valuation is the actually incurred cost – this is a particular fair value regarding two specified parties of the transaction), because although it promotes protection of health, its “side-effect” is a considerable market value enrichment of the real estate owner.

The third case (object 3) reflects the following methodological situation:

- before establishing a RUA, the building has been in use for over 30 years – structural elements in good condition, outer doors and windows replaced shortly before the introduction of a RUA, however not with ones that meet technical requirements for the RUA, no insulation of the building's elevation and the top floor ceiling (methodologically this situation is analogous to object 2, no insulation is equivalent to 100% depreciation.),
- after establishing a RUA, the building, requires additional improvements as described in the chart (differences in construction materials), outer doors and windows have a 100% external (environmental) depreciation (value of depreciation 35 000 PLN \*100% = 35 000 PLN), the owner's expenditures for all increased costs will amount to 115 000 PLN.

The procedure of calculating loss through a differential model is presented in table 3.

**Table 3.** Value of construction materials for acoustic renovation, object 3 [thousand PLN]

Scope of work	Differences in construction materials	MV <sub>0</sub> – standard cost	MV <sub>1</sub> – increased cost	ΔMVS – difference
Outer windows and doors	Cost of triple, instead of double glazed windows, cost of acoustic instead of standard doors	35 or with DE = 0	46	-46
Insulation of top floor ceiling	Additional layer of acoustic insulation	10	15	-5
Insulation of outer walls	Additional layer of acoustic insulation	45	54	9
Sum		55	115	-60

Source: author's own work.

The real loss claimed pursuant to art. 136 s. 3 POE is 60 000 PLN (this requires actually incurring the costs – standard doors and windows, a simpli-

fied assumption was adopted with a value of PLN) or may reflect the loss of market value claimed pursuant to art. 129 s. 2 POE. In the latter option, the maximum level of loss (in an active market with a high level of informational effectiveness) will not exceed 60 000 PLN, i.e. the amount required to improve the deteriorated market feature (technical state) regarding the building's acoustic climate. The remaining features are the same as in competing pieces of real estate offered in locations within and outside of the RUA.

The fourth case (object 4) reflects the following methodological situation:

- before establishing a RUA, the building has been in use for over 30 years with repairs/improvements carried out regularly, outer windows and doors have a standard physical depreciation of 40% (value of physical depreciation 35 000 PLN \*40% = 14 000 PLN), insulation of the building's elevation – 10 cm Styrofoam with high quality plaster (however these materials impair the acoustic insulation of walls), physical depreciation 60% (value of physical depreciation 45 000 PLN \*60% = 27 000 PLN), top floor ceiling with new, standard thermo-insulation – does not meet technical standards for the RUA,
- after establishing a RUA, the building, requires additional improvements as described in the chart (differences in construction materials), the owner's expenditures for this purpose amount to 60 000 PLN, replacement of the elevation's insulation with 100% of external (environmental) depreciation (value of external depreciation 45 000 PLN \*100% = 45 000 PLN.), the same 100% external depreciation applies to outer doors and windows (value of external depreciation 35 000 PLN \*100% = 35 000 PLN) – the scope of the paper does not allow for a full consideration of the issue of depreciation (see more: Żrobek, 2009). The concept of joint depreciation has been applied and in calculations, the highest level of the two analyzed types of depreciation was adopted.

The procedure of calculating loss through a differential model is presented in table 4.

The real loss claimed pursuant to art. 136 s. 3 POE is, without adjusting for physical depreciation, 110 000 PLN. This reflects the typical, market cost of increased, actually incurred or hypothetical costs of acoustic improvements. If physical depreciation is accounted for, the loss will be 64 000 PLN. If a claim for loss regarding acoustic improvements is not pursued, the loss may reflect a loss of value which may be claimed under art. 129 s. 2 POE. In the latter option, loss will not exceed 115 000 PLN and its market level will be equal to 64 000 PLN. The latter is a sum required by the market to improve the deteriorated market feature (technical state) regarding the building's acoustic climate. The remaining features are the same as in competing pieces of real estate offered in locations within and outside of the RUA.

**Table 4.** Values of tangible expenditure on acoustic revitalization, object 4 [thousand PLN]

Scope of work	Differences in construction materials	MV <sub>0</sub> – standard cost	MV <sub>1</sub> – increased cost	ΔMVS – without physical depreciation ZF	Value of ZF	Value of external depreciation DE	ΔMVS – the difference taking into account DF	ΔMVS – the difference taking into account DF and DE
Outer windows and doors	As for object 3	35 or with DE = 0	46	-46	14	35	-32	-46
Insulation of top floor ceiling	As for objects 1 and 3	10	15	-5	0	5	-5	-5
Insulation of outer walls	As for object 3	45 lub z ZZ=0	54	-54	27	45	-27	-54
Sum		90	115	-110	41	85	-64	-110

Source: author's own work.

Legal provisions (Ordinance, 2004, § 35) require that single family houses be valued on the basis of market principles, which requires taking into account physical depreciation and a typical, market expenditure that is factually spent by buyers on additional acoustic improvements. This expenditure may be objectively and directly identified on the basis of prices of real estate (the difference between them) only if there is an active sales market of houses with previously carried out acoustic improvements. If no such market exists then the indirect method remains, pursuant to which a loss of value is calculated if acoustic improvements have not in fact been carried out. The method is based on the market cost of acoustic improvements, which is calculated taking into account physical deprivation – a requirement stipulated in the law (Ordinance, 2004, § 35).

### A simulation of social costs based on the example of the Poznań – Ławica airport

The RUA for Poznań-Ławica airport came into force on 28 Feb. 2012 (Resolution, 2012), encompassing an area of 10,16 km<sup>2</sup> surrounding the airport. The area is divided into two zones: the inner zone (in the vicinity of the runway, indicated in figure 2 in blue colour, where new residential development is allowed under the condition that proper acoustic technologies are employed in rooms requiring acoustic insulation) and the outer zone (indicated in figure 2 in red colour, where there are no restrictions on residential development and there is no obligation to ensure additional acoustic insula-



tion of buildings). A part of this area overlaps with the RUA established for the military airport “Poznań Krzesiny” (Ordinance, 2007). The inner zone comprises approximately 1,1 thousand single family houses and the outer zone comprises around 1,5 thousand of such hoses and about 800 multi-apartment buildings. The whole restricted use area is inhabited by approximately 12 000 people.

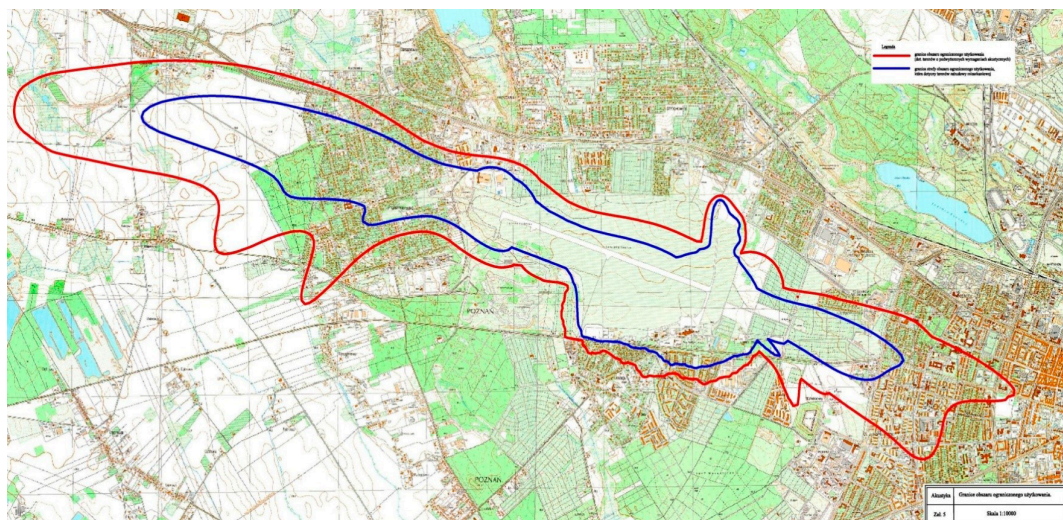


Figure 2. The location of RUA zones for Poznań – Ławica Airport

Source: PLL Ławica Poznań.

Out of RUA inhabitants, 1230 claims were filed (750 regarding the inner zone and 480 regarding the outer zone) for which no settlement was reached and the cases were submitted to court. RUA real estate owners had two years to notify their claims, after which time, the claims became time barred. It is important to note that the airport does not enter into settlements regarding loss of real estate value, but only regarding costs of acoustic improvements which fulfill current acoustic standards for airport RUAs. The airport, following a consistent line of judgements, does not account for physical depreciation (which would lead to lower payouts) and the fact that claims for loss of value and acoustic improvements overlap. This is because a different approach, in the light of court practice, would exclude the owners' willingness to conclude a settlement.

The sum of filed claims is approximately 125 million PLN, which denotes an average of 101,6 thousand PLN per house. With an estimated, average market price of a house equal to 600 thousand PLN, the owners have subjec-

tively valued their loss at about 15% of the property's market value. The results of analyzing the local market regarding average transaction prices obtained for similar single family houses located within and outside the RUA are presented in the table below. The RUA for Poznań – Ławica airport comprises parts of geodesic zones: (1) Poznań: Górczyn, Junikowo, Kotowo, Ławica, Łazarz and Plewiska from the Grunwald district; (2) Dębiec from the Wilda district of the city of Poznań; (3) Golęcin, Jeżyce, Krzyżownicy, Ławica II, Psarskie, Strzeszyn, Wielkie, Kiekrz from the Jeżyce district of the city of Poznań; (4) Przeźmierowo of the Tarnowo Podgórne commune. In the analyzed period and market there were 1371 transactions of single family houses, where 182 transactions took place within the Poznań – Ławica Airport RUA and 636 transactions took place within the Krzesiny military airport RUA (out of which 51 transactions were located within both, overlapping RUAs). 44% of all transactions took place outside RUA boundaries. This denotes that within the specified geodesic zones, in the market segment of single family houses, there are about 130 – 200 transactions, with the exception of 2009, when there were only 50 transactions.

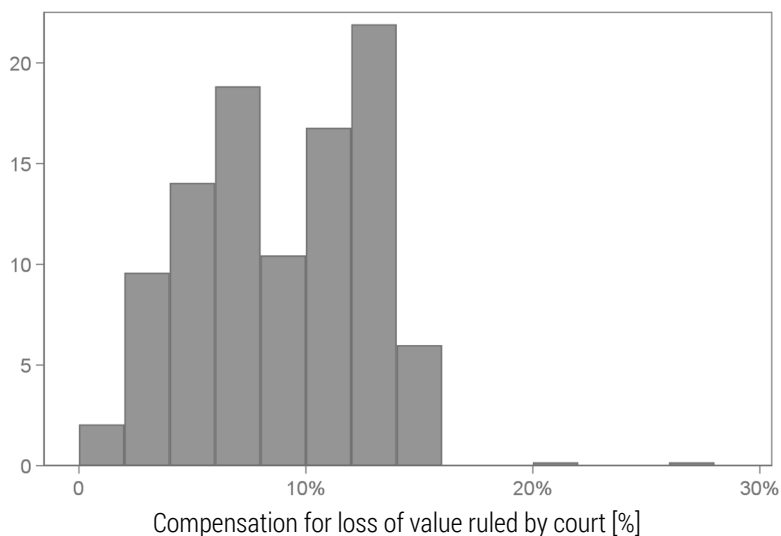
**Table 5.** Average transaction prices of single family houses within and outside the RUA [in thousands PLN]

Location	2008	2011	2014	2017	2008-2017
Poznań – Grunwald	725.80	621.18	571.45	461.00	623.30
Poznań – Jeżyce	715.25	664.68	625.24	551.50	627.91
Poznań – Wilda	623.09	503.49	43208	467.50	488.31
gm. Tarnowo Podgórne	543.75	590.10	602.86	370.00	575.38

Source: author's own work.

The overall value of compensation payments currently (as of 28.02.2018) paid by the airport on the basis of court judgments is already 45,5 million PLN and regarded 584 filed claims. It should be noted that 83,5% adjudicated and executed compensation payments regarded the loss of value, seen as a result of introducing a RUA and only 16,43 % of compensation payments regarded planned (hypothetical) acoustic improvements (0,07% are claims for other types of loss). Consequently, only 7,48 million PLN has been dedicated to the protection of human health and the improvement of living conditions in accordance with the aims of environmental legislation and there are no tools to ensure that awarded money is spent for that purpose. Figure 3 presents the distribution of paid compensation awarded by the court (the OX axis – as % of the amount demanded by the owner, the OY axis the percentage

of cases adjudicated by the court). On average, the courts awarded compensation at 9% of the sum requested by the owner for loss of value.



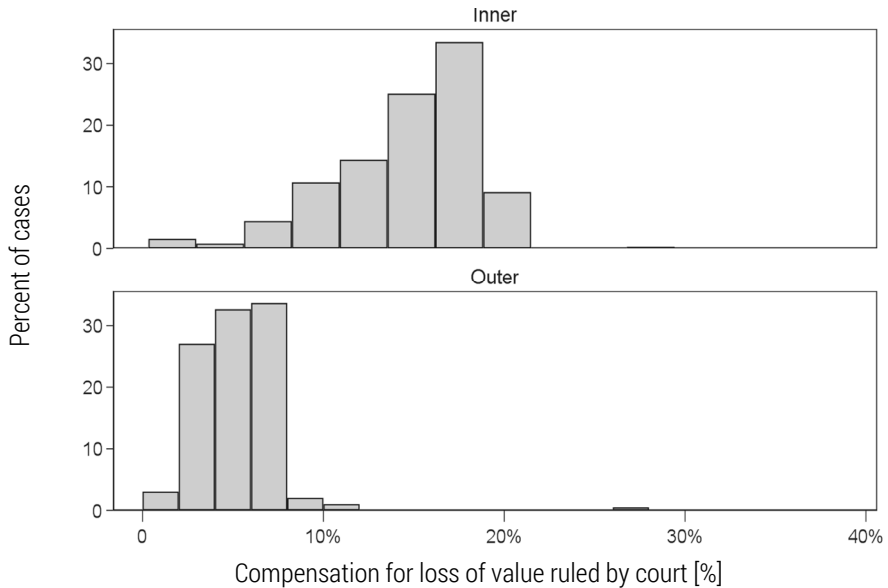
**Figure 3.** The distribution of executed compensation payments awarded by the court for loss of value, shown as a percentage of the demanded sum

Source: author's own work.

Similarly, the allocation of awarded compensation payments for loss of value between the inner (382 cases) and the outer (196 cases) zones allows to notice that on average, the awarded compensation in the inner zone was 10,9% of the demanded sum, while in the outer zone that percentage was 5,2% (figure 4).

A typical compensation case concerning a single family house located within a RUA (model property) may, for the purpose of constructing a model, be described in the following manner:

- market value is approximately 600 thousand PLN, with the cost of property replacement amounting to approximately 850 thousand (market price of land approx. 150 000 PLN and the buildings on land including other improvements approx. 700 000 PLN), with an average level of building depreciation ( $D_S$ ) of about 34% (according to the calculation:  $D_S = \{1 - [700\ 000\ \text{PLN} : (600\ 000\ \text{PLN} - 150\ 000\ \text{PLN})]\} * 100$ ),
- the typical awarded loss of value compensation for the inner zone is 11%, that is 66 000 PLN, and 5% for the outer zone, that is 30 000 PLN,



**Figure 4.** The distribution of executed compensation payments awarded by the court for loss of value, shown as a percentage of the demanded sum and with allocation between the inner and outer zones

Source: author's own work.

- the typical awarded costs of acoustic renovation (without taking into account the overlapping of claims and depreciation of outer windows, doors, ventilation, and top floor ceilings and roofs -without the building's elevation) is approximately 40 000 PLN,
- typical, superfluous costs of experts for the inner zone (reports on loss of value and costs of acoustic improvements) – 6 000 PLN, for the outer zone (report on loss of value) – 3 000 PLN,
- number of claims filed in court: 1230 out of which 750 concern the inner zone and 480 concern the outer zone.

The increased level of social costs for the model property located within the inner zone consists of:

- the full, typically awarded compensation for loss of value – 66 000 PLN,
- a part of the typically awarded costs of acoustic improvements, neglecting to account for the present technical state and depreciation (with depreciation of 34%), the assumed level is 40%, that is 16 000 PLN,
- the difference between typical, increased costs of expert opinions and the costs of such opinions in out of court settlements (6 000 PLN – 1,500 PLN) – 4,5 000 PLN,

- the difference between the typical, increased costs of legal representation and legal costs for out of court settlements (3 000 PLN – 500 PLN) – 2 500 PLN.

The increased social costs for the model property located in the RUA's inner zone are 89 000 PLN, which taking into account 750 filed claims amounts to 66 750 000 PLN.

The increased level of social costs for the model property located within the outer zone consists of:

- the full, typically awarded compensation for loss of value – 30 000 PLN,
- the typical, increased costs of expert opinions – 3 000 PLN,
- the difference between the typical, increased costs of legal representation and legal costs for out of court settlements (2 000 PLN – 500 PLN) – 1 500 PLN.

The increased social costs for the model property located in the RUA's outer zone are 34 500 PLN, which taking into account 480 filed claims amounts to 23 280 000 PLN.

Increased social costs in both RUA zones are equal to 90 030 000 PLN.

## Conclusions

Achieving an effective, triangular intervention on the market of single family houses located in an airport's RUA requires utilizing a complex set of formal and methodological tools, which are very sensitive to mistakes regarding their proper application in market practice. This denotes that improper practice will obstruct achieving the purpose of the intervention, namely the protection of human health and of the capital (real estate) owned by the inhabitants of a RUA. The effectiveness of intervention is measured by the reduction of social costs.

The legal provisions in force should be assessed as correctly designed and as allowing to award compensation which is fair from an individual (real estate owner's) perspective, but is also effective in a market context and thus ensures that the intervention is effective, because social costs are lowered. Achieving this result requires a strict application and interpretation of art. 129 s. 2 and art. 136 s. 3 POE, which guarantees compensating the individual loss of a particular real estate owner. The indicated legal provisions also designate conditions for a fair differentiation of the amount of compensation, depending on the state of the owned property, which determines the extent of necessary acoustic improvements. It will, however lead to enrichment upon sale, because compensation paid for improvements is not adjusted for depreciation. The criterion of justice does not need to be further explained,

however when considering limiting the amount of speculative behavior it is worth considering, in the case of the subsequent sale of real estate, the introduction of provisions on the return of a part of compensation that was not adjusted for depreciation (a solution analogous to provisions on local development plans – Act, 2003, art. 36).

For just one of the airports considered in this paper (Poznań Ławica), 45,5 million PLN have already been paid in compensation (584 claims) and out of this sum only 7,48 million PLN were dedicated to the protection of health and the improvement of living conditions, however there are no mechanisms to ensure that money awarded for costs of hypothetical acoustic renovations will ever be spent for that purpose.

The provision of art. 136 s. 3 POE corresponds with local law (the resolution on establishing the RUA), which does not burden real estate owners with duties they do not consider as necessary. Local law, following the premise that law is not retroactive, does not require owners of houses already erected at the time a RUA is established to perform any acoustic improvements. However upon the introduction of a RUA, should they choose to do so (an option from the point of view of economics), they are provided with a claim to have all money factually spent on acoustic renovation of buildings reimbursed by the airport. Such a solution is based on the fair value of loss, which reflects the relation between two specified parties (in particular the situation of the homeowner as the weaker party is taken into account) and ensures the reimbursement of money actually spent on acoustic renovation, without subtracting for the depreciation of the building. This solution is market effective, because improvements are carried out voluntarily and only to the extent that fulfills the owner's individual needs. In addition, free market competition is respected, because the condition of imitating the market is met.

The lack of social effects of the intervention analyzed in this paper is caused by a faulty interpretation of the law by the courts, who should have relied on a strict and literal interpretation of the provisions in force. In the case of the Poznań-Ławica Airport the courts' opinion was supported by the opinions of a narrow group of expert witnesses, who indiscriminately accepted court requests for expert opinions. Unfortunately, the courts' requests were improperly drafted with regard to what the expert was to ascertain and the experts neglected to follow good practice rules known from similar purposes of valuation (e.g. for planning gains, see: Act, 2003, art. 36) and to apply professional norms (Guidebook, 2013, p. 15) that deal with the problem of valuing overlapping claims.

The main problem is identifying money actually spent on improvements with the hypothetical cost of potential improvements. This causes a further mistake allowing for double compensation of one loss. Money is awarded for

potential acoustic improvements (which is wrong also because the calculation does not include depreciation) and for loss of value, when the intervention does not restrict or change the use of land. The real estate in question is the same before and after the intervention, the latter only “implementing” environmental depreciation (by introducing acoustic standards for new buildings). The intervention does not introduce a new market variable and does not change the market equilibrium (the supply does not change). Therefore it may be associated only with the deterioration of a market feature (the technical state). A successful claim compensating acoustic improvements either “fixes” this market feature (from the market perspective of hypothetical buyers) or improves it for the current owner (in terms of use) and therefore there is no justification for attempts to calculate the loss of value of the property.

The social effect of a faulty interpretation of the law is visible in the overburdening of airports with compensation payments and negatively influencing their financial condition by forcing them to create financial reserves for potential (but unjustified) compensation payments for loss of real estate value. This may cause insolvency and always negatively impacts the financial standing of enterprises providing indispensable, public utility services. The potential, increased social costs for a model property in the RUA of Poznań – Ławica airport (taking into account the current number of claims – 1230) have been calculated at over 90 000 000 PLN, out of which 66 700 000 PLN concern buildings in the inner zone, and 23 300 000 PLN in the outer zone.

The financial dimension of the improper application of the law proves that the mistake is systemic. It is suitable to quote Bastiat who said “the intellect is (...) a useless encumbrance” (Bastiat, 2015, p. 33) since the analysis of the problem and the arising doubts have been limited to a very formalistic approach of considering the effects of awarded compensation only in the context of each individual case. The missing element is a broader, market perspective on the purpose and conditions of the intervention. What was neglected are the effects experienced by airports of this formalistic understanding of the intervention. A formal analysis is always indispensable, however in the case at hand, it proved insufficient to comprehend the factual effects of the intervention. A systemic mistake is caused by an institutional loophole consisting of the lack of agreed and common for both law and economics methodological bases of analyzing new economic phenomena. Hayek identifies the roots of the above as the separation of disciplines, which in particular concerns two oldest branches of science, namely economics and law (Hayek, 1978, p. 4). Abandoning this division is a step towards integration necessary for the protection of the environment in the context of sciences such as economics, chemistry and technical studies (Famielec, Famiec, 2016,

pp. 24-38). It seems that only then will it be possible to perform complex economic analyses, which will allow to understand the activities of humans (Kostka, 2015, pp. 10-25), in this case on the real estate market. The latter must be viewed as a part of the environment.

Situations in which compensation exceeds justified social costs are analogous, when considering the reduction of social welfare, to arguments put forward by Bastiat in his essay on the baker's window broken by a hooligan (Bastiat, 2015a, p. 17). The position of the glass repairman who makes money on the baker's misfortune is assumed by households (which consume excessive compensation payments) and by lawyers, whose role in provoking the households is difficult to underestimate. In this context, the present publication is an attempt to solve the problem by applying a common methodology for law and for economics, which shifts deliberations in the direction of the economic analysis of the law.

### Acknowledgements

Magdalena Habdás's research is funded by the National Science Centre, Poland within grant 2018/31/B/HS5/00231, application no. 430518.

### The contribution of the authors

Iwona Foryś – 33,33%

Magdalena Habdás – 33,33%

Jan Konowalczyk – 33,33%

### Literature

- Arnold C.A. (2002), *The reconstitution of property: Property as a web of interests*, "Harvard Environmental Law Review" Vol. 26 No. 2, p. 281-364
- Arystoteles (2017), *Etyka Nikomachejska/Nicomachean Ethics*, PWN, Warszawa
- Bastiat F. (2015), *Co Widać I Czego Nie Widać/ Economic Sophisms and "What is Seen and What is Not Seen"*, przeł. A. Łatka, Prohibita, Warszawa
- Bastiat F. (2015a), *Prawo/The Law*, tłum. P. Tobiła-Pertkiewicz, Prohibita, Warszawa
- Batog J. et al. (2019), *Investigating the Impact of Airport Noise and Land Use Restrictions on House Prices: Evidence from Selected Regional Airports in Poland*, "Sustainability" No. 11(2), p. 412, doi: 10.3390/su11020412.
- Bennett R.L. (1982), *Airport Noise Litigation: Case Law Review*, "Journal of Air Law and Commerce" Vol. 47, p. 449-494
- Bowes E.N. (2011), *In defense of the Cost Approach*, Appraisal Institute, Chicago
- Coase R. (2013), *Firma, rynek i prawo/The Firm, the Market and the Law*, przeł. J. Stawiński, Wolters Kluwer, Warszawa



- D'Arcy E., Keogh G. (1999), *The property market and urban competitiveness: A review*, "Urban Studies" No. 36(6), p. 917-928, <https://doi.org/10.1080/0042098993277>
- European Valuation Standards (2016), TEGoVA, Printed in Belgium by Gillis nv/sa
- Famielec J., Famiec S. (2016), *Integration of economic, technical and chemical sciences for sustainable development*, "Ekonomia i Środowisko" No. 3(58), p. 24-38
- Foryś I., Putek-Szeląg E., Ziembicka B. (2019), *An attempt to determine the impact of energy intensity on the market value of residential premises on the example of selected multi-family buildings*, "Real Estate Management and Valuation", type-script after review, in print
- Fox G. (2004), *The Real Coase Theorems*, Department of Agricultural Economics and Business, University of Guelph
- Gniewek E. (2016), *Prawo rzeczowe*, Warszawa
- Goulbourne S. (2002), *Airport Noise and the Right to Family Life: A Legitimate Application of Article 8 of the European Convention?*, "Liverpool Law Review" Vol. 24, p. 227-236
- Gray K., Gray S.F. (2009), *Elements of Land Law*, Oxford University Press, Oxford
- Habdas M. (2016), *Quasi-public property: public spaces in private hands*, in: B. Heiderhoff, I. Queirolo (eds.), *European and International Cross-border Private and Economic Relationships, and Individual Rights*, Scritti di diritto Privato Europeo ed internazionale, Aracne – Arccia
- Habdas M., Konowalczyk J. (2018), *Cele i warunki skutecznej interwencji Państwa w obszarach ograniczonego użytkowania portów lotniczych*, "Świat Nieruchomości" No. 105(3), p. 5-16, doi: 10.14659/WOREJ.2018.105.001
- Habdas M., Konowalczyk J. (2018a), *Dyferencja w szacowaniu nieruchomości do celów odszkodowań w obszarach ograniczonego użytkowania portów lotniczych*, "Rzeczoznawca Majątkowy" No. 4(100), X-XII, p. 15-26
- Hayek F. Von (1998), *Law, Legislation And Liberty A New Statement Of The Liberal Principles Of Justice And Political Economy*, Routledge&Kegan, London, First editio 1978, reprinted 1993, 1998, <http://www.libertarianismo.org/livros/lllfh.pdf> [06-03-2016]
- International Valuation Standards* (2011), IVSC typeset and printed Page Bros, Norwich
- Kazak J. et al. (2018), *Indicator-based analysis of socially sensitive and territorially sustainable development in relation to household energy consumption*, "Energy Rural Development" Vol. 17, p. 1653-1661, doi:10.22616/ERDev2018.17.N045
- Kobryń A., Bakunowicz K. (2015), *Wielokryterialny model decyzyjny w wyborze lokalizacji lotniska pasażerskiego w województwie podlaskim*, "Ekonomia i Środowisko" No. 1(52), p. 81-99
- Konowalczyk J. (2017a), *The Problem of Reflecting the Market in The Legal Principles of Real Estate Valuation in Poland. How to Eliminate the "Legal Footprint"?*, "Real Estate Management and Valuation" Vol. 25 No. 2, p. 44-57, doi: 10.1515/remav-2017-0012
- Konowalczyk J. (2018), *Fair Value in the Valuation of Damage to Property Caused by Indirect Nuisance Created by Companies*, "Real Estate Management and Valuation" Vol. 26(3), p. 60-70, doi: 10.2478/remav-2018-0025
- Kopsch F. (2016), *The cost of aircraft noise – Does it differ from road noise? A meta-analysis*. "Journal Air Transport Management" Vol. 57, p. 138-142, doi:10.1016/j.jairtraman.2016.05.011

- Kostka M.S. (2015), *Pierwotne zadanie ekonomii: rozumieć człowieka*, "Ekonomia i Środowisko" No. 1(52), p. 10-25
- Locke J. (1992), *Dwa Traktaty o rządzie/Two Treatises of Government*, przeł. Z. Rau, Wydawnictwo Naukowe PWN, Warszawa
- Marshall A. (1925), *Zasady ekonomii/Principles of economics*, przeł. Z. Znamierowski, Wydawnictwo M. Arcta, Warszawa
- Migala S.J. (2017), *UAS: Understanding the Airspace of States*, "Journal of Air Law and Commerce" Vol. 82(3), p. 3-81, <https://scholar.smu.edu/jalc/vol82/iss1/2>
- Mill J.S. (1965), *Zasady ekonomii politycznej/ Principles of political economy*, przeł. E. Taylor, PWN, Warszawa
- Mizgajski A. et al. (2014), *Development of the ecosystem services approach in Poland*, "Ekonomia i Środowisko" No. 4(51), p. 10-19
- Murphy T., Roberts S., Flessas T. (2004), *Understanding property law*, Londyn
- Nozick R. (1999), *Anarchia, państwo, utopia/ Anarchy, State and Utopia*, przeł. P. Maciejko, M. Szczubiałka, Wyd. Aletheia, Warszawa
- Pilsk W.E. (2012), *Airport Noise Litigation in the 21<sup>st</sup> Century: A Survey of Current Issues*, "Issues in Aviation Law and Policy" Vol. 11:3, p. 371-394, <https://doi.org/10.1080/13698570601181631>
- Posner R.A. (2014), *Economic Analysis of the Law. Ninth Edition*, Wolters Kluwer Law&Business, New York
- Rawls J. (1994), *Teoria sprawiedliwości/ Theory of justice*, przeł. M. Panufnik, J. Pasek, A. Romaniuk, PWN, Warszawa
- Ordinance (2004), of 21 Sept. 2004 r. on the valuation of real estate and the valuation report, Council of Ministers, Dz.U. nr 207 poz. 2109 ze zm.
- Ordinance (2007), No 40/07 of Wielkopolsko Voievode of 31 Dec. 2007 r. amending the ordinance on the establishment of a restricted use area for the military airport Poznań – Krzesiny in Poznań
- Skousen M. (2012), *Narodziny współczesnej ekonomii. Żywoty i idee wielkich myślicieli/ The Making of Modern Economics: The Lives and Ideas of the Great Thinkers*, przeł. J. Strzelecki, Fijorr Publishing, Warszawa
- Soto de H. (2002), *Tajemnice kapitału/The Mystery of Capital*, przeł. Sz. Czarnik, Fijorr Publishing, Warszawa
- Standardy zawodowe rzeczoznawców majątkowych (2002), Wyd. 8+, PFSRM, Warszawa
- Stelmachowski A. (2007), *System Prawa Prywatnego. Tom 3*, in: T. Dybowski (ed.), *Prawo rzeczowe*, Warszawa
- The Appraisal of Real Estate 14th Edition* (2013), Appraisal Institute, Chicago
- Trojanek R., Huderek-Glapska S. (2018), *Measuring the Noise Cost of Aviation. The Association between the Limited Use Area around Warsaw Chopin Airport and Property Values*, "Journal of Air Transport Management" No. 67, p. 103-114, doi: 10.1016/j.jairtraman.2017.12.002
- Resolution (2012), No. XVIII/302/12 Wielkopolski Voivodship Parliament of 30 Jan. 2012 on the implementation of a restricted use area for the Poznań-Ławica airport in Poznań
- Act 1964, of 23 April 1964 – the Civil Code (consolidated version: Journal of Statutes 2018, item 1025, as amended)
- Act 1997 of 21 August 1997 – on the management of real property (consolidated version: Journal of Statutes 2018 item 121 as amended)

- Act 2001 (POE), of 27 April 2001, Law on the Protection of the Environment (consolidated version: Journal of Statutes, item 799 as amended)*
- Act 2003 of 27 March 2003 on spatial planning and management (consolidated version: Journal of Statutes, item 1945, as amended)*
- Williamson O.E. (1998), *Transaction Cost Economics: How It Works; Where It is Headed*, "The Economist" No. 146(1), p. 25-27
- Zeszyt metodyczny nr 1. Wartość nieruchomości na obszarach oddziaływania hałasu lotniczego (2013)*, PFSRM Komisja Standardów, Warszawa
- Zulin K. (2010), *Valuation of ecosystem services*, "Ekonomia i Środowisko" No. 2(38), p. 38-45
- Żróbek R. (2009), *Teoretyczne i metodyczne aspekty określania wartości zużycia łącznego nieruchomości*, "Studia i Materiały Towarzystwa Naukowego Nieruchomości" No. 1, p. 81-92
- Żylicz T. (2004), *Ekonomia środowiska i zasobów naturalnych*, PWE, Warszawa