

IDENTIFICATION AND CLASSIFICATION OF REAL ESTATE FEATURES FOR THE PURPOSE OF AN ALGORITHM-BASED VALUATION – CASE STUDY WITHIN SZCZECIN

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Abstract

Research background: The article discusses the issue of the identification and measurement of market characteristics of real estate for valuation purposes. This problem is the most difficult stage of the whole valuation process in terms of both a substantive, methodological and analytical basis.

Goal: The aim of the research is to outline and explore on the basis of literature studies as well as developed problems to be solved in the process of mass valuation together with the presentation of an exemplary solution.

Methodology: In the theoretical part a hypothetical-deductive method which consists of developing a certain hypothesis and deducing its consequences was applied. The empirical section uses the method of scientific discussion among scientists and practicing valuers and, for the presentation of the results; some graphical methods were used for a statistical analysis.

Results: As a result of the conducted research, criteria to be used in identifying and classifying market characteristics for the purposes of valuation were identified and a set of market characteristics of properties was developed along with a method of identifying their states for the purposes of mass valuation.

Novelty: The article proves that the problem of the identification and classification of market characteristics of real estate for valuation purposes is extremely important from the point of view of the valuation process and the results obtained as a result of it as well. In addition, for some features, it is proposed to develop special measures such as the plot shape attractiveness ratio. This meets the problem of the objective measurement of market features of real estate. In relation to other features, the legitimacy of the expert approach was pointed out.

Keywords: property valuation, market analysis

JEL classification: R30, C10

Background and outline of the research problem

Identifying and classifying the marketable features of real estate is an important stage in the process of each property valuation. One may risk the thesis that it is the most difficult stage in terms of substantive, methodological and analytical aspects.

Substantive difficulties result from the fact that there is no clear, good and well-established theory in this field. Generally, in the literature (Celmer, 1999; *Wycena nieruchomości*, 2000; Żróbek, Belej, 2000; Hozier, Kokot, Kuźmiński, 2002; Żróbek, 2002; Prystupa, 2003; Hozier, 2006; Parzych, 2007; Walkowiak, Zydrón, 2012; Zydrón, Walkowiak, 2013; Prystupa, 2014; Kokot, Bas, 2015, 2016) as well as in legal regulations (Act on real estate management, 1997; Regulation on real estate valuation and preparation of the valuation report, 2004) and professional standards (interpretative note: Application of the Comparative Approach in Property Valuation, 2008) marketable features are understood as those qualities of real estate which have a significant impact on transaction prices obtained on the market and on the value of the property under valuation. For example, according to the interpretative note Applying the Comparative Approach in Property Valuation: “marketable features on the basis of which the property is compared with similar properties are, inter alia, their location, physical, technical and legal characteristics which have a fundamental impact on price differentials”. As it is clearly visible, the definition is very broad, i.e. it can cover a large number of very different characteristics. The price that can be paid for a given property in a free market transaction is “born in the head” of the buyer. What exactly they take into account, which attributes of the property being the subject of the transaction are important for them and which are not, they know only themselves. Therefore, an important role of the valuer is to distinguish real marketable features from a number of other characteristics of real estate, sometimes referred to as the specific attributes of a property (Kokot, 2018). In such an approach, marketable features are those property attributes for which it is possible at least roughly to determine their impact on the expected price obtainable on the market. They are generally accepted attributes taken into account by buyers when calculating the purchase price of the property. In other words, buyers take into account the fact that one has to pay more for a property in a given part of their town than for a similar property located in another, “worse” district. Specific features, on the other hand, are those qualities of the property whose impact on its price is very difficult to determine, but which, in specific situations, determine the price, as they can present a subjective value to various buyers’. In the case of a flat, these may be factors such as: whether the unit is equipped with a shower or bath, the colour of the tiles, the style of the interior design, the equipment of the

unit or building with devices important for a specific purchaser (a refuse disposal chute, a lift), location in the area which is attractive for a specific purchaser (e.g. close to the workplace, close to one's parents' home or close to a tram stop) (Kokot, Bas, 2015, 2016). Ultimately, on the market the prices are shaped by a combination of all the property marketable and specific features, often supplemented with other, hard to identify, motives governing individual buyers' decisions. Moreover, it is difficult to speak of the marketable features of a property in general, as the real estate market has a complex structure, manifested by its stratification and segmentation and its local character. Often, within a given market segment there are sub-segments which can take different shapes depending on the needs. For example, in the segment of flats we can talk about sub-segments of small, medium and large flats, located in modern, large-slab and older buildings, with or without the so called front-gardens, in low and high buildings, etc. As you can see, the sub-segments can permeate each other, because e.g. "small" flats can be found in both low and high buildings, etc. In addition, in different local markets, some property attributes may be considered as marketable features. For example, it may turn out that on the market of flats in a small town, the property location does not affect the price because no matter where the property is located, everything is within walking distance. In practice, all the above aspects pose a genuine difficulty in establishing particular marketable features for the purpose of property valuation and each time this task should be preceded by an appropriate analysis. Ultimately, the selected features will be a derivative of the property type (a segment and a properly defined sub-segment of the real estate market) and the conditions prevailing on the local market. The issue of determining the characteristics of real estate should not be treated in a universal way. Characteristic combinations for given segments of the real estate market found in the literature should be treated only as a collection of good advice or guidelines.

Methodological difficulties, in turn, result from the imperfection of methods used to identify marketable features. This problem is related to analytical difficulties understood as the applicability of these methods, which in turn largely results from the classical understanding of the shortcomings of the real estate market and the properties themselves as objects being traded in this market. Ideally, in order to correctly identify the marketable features of a property, it would be necessary to have complete sets of data on real estate prices obtained in individual transactions and all of the potentially significant attributes of these properties, some of which will later be identified as marketable features. Each of these features should be 'measured' according to objective criteria. Unfortunately, we will never have such data at our disposal. Firstly, because, by their very nature, any methods used to measure characteristics will never be objective, and secondly, because no institution will undertake the enormous amount of work

involved in obtaining such information. Having such sets of data, with the additional assumption that the behaviour of buyers is rational, would make it possible to indicate, using the statistical methods of a relationship analysis, those of all the features that have a significant impact on the transaction prices. As it has been mentioned above, it is not possible to specify the property's marketable features in this way. In practice, we can only obtain data about some of the qualities of the property that have been subjectively assessed by an assessor. The identification of property features on the basis of such sets of data carries the risk of failing to include in the adopted set of marketable features one or more features that are truly marketable. Moreover, due to the non-objective criterion for their assessment which to some extent is exacerbated by the natural imperfections of the real estate market, the measures of the power of the relationship between transaction prices and individual features are inadequate to the real impact of these features on prices. An alternative to the methods of the statistical specification of real estate marketable features can be methods that examine the potential property buyers' preferences. These methods focus on examining not the 'effect' but the 'causes' of the links between property features and prices. Statistical methods serve in this context to analyse market facts, and methods that examine buyer preferences serve in a way to predict them. The survey of potential buyers' preferences also carries a high risk of obtaining results that do not correspond to the actual impact of property features on their prices. First of all, due to the difficulty in providing a representative research sample, understood not only as a sufficiently large group of respondents that represents a relevant real estate market in terms of its size and type, but also, or perhaps above all, a reliable group, i.e. one whose members actually have the practical experience of choosing a property to buy. Otherwise, the respondents' answers will not reflect their market behaviour, but only their momentary views. Also, carrying out such surveys requires a lot of organizational effort, which the valuers cannot afford as part of their business activity. No institution conducts such research in a systemic way, and the existing publications of the results are incidental in nature. A separate problem of methodological and analytical character is how to measure the potential or already specified marketable features of a property. The marketable features of a property are most often qualitative features expressed on a scale of order. Such features are referred to as "quasi-quantitative". It is difficult to measure precisely e.g. the Location feature. There are attempts to express the attractiveness of a location as e.g. the function of distance from a city centre or another landmark. Unfortunately, such efforts usually do not produce satisfactory results, as local fashions for locations are not such a function. Various location fashions often form on the market, and the solution to the problem lies in the proper recognition of these fashions. As a consequence, experts attribute to the location feature such measures as bad,

average or attractive. Different marketable features are characterised by different susceptibility to measurement. An example of an easily measurable feature is property size which, as one of few that describe a property, is a typical quantitative feature. Usually it is relatively easy to assess, or rather measure such features as “access” (e.g. the length of the unpaved road section), “land development” (e.g. paved paths and driveways, fencing, vegetation), ‘technical condition’ (which can be identified with technical wear). In practice, the hardest to assess are the statuses of features such as location, neighbourhood, etc., where it is difficult to create unambiguous valuation criteria and where individual buyers’ emotions, characters, sensitivity and perceptions play a significant role in their assessment.

In the absence of a good theory and in the face of the methodological and analytical problems outlined above, market characteristics are in practice almost always qualified with the use of the expert method. Despite the fact that this method is often criticised, the good practices in this area are well established and use sets of certain market features typical for particular segments of the real estate market. Sets of typical or potentially marketable features can be found in the literature (cf. Prystupa, 2014; Żróbek, Belej, 2000; Hozer, 2006). Such a compilation of features should not be treated as a fixed set to be used for any valuation, but rather as advice, aid or guidelines for the final determination of the set of marketable features for the purpose of a particular valuation.

A separate question is: is it possible at all to develop a robust theory for the specification of marketable property features for valuation purposes? On the one hand, we have at our disposal properly developed statistical methods which can be used to verify properly formulated hypotheses. On the other hand, however, we encounter problems with the diverse nature of local real estate markets and the subjective perception of the property attributes by their purchasers.

1. Mass Property Valuation

All these problems take on particular importance in the so-called mass valuation (Jahanshiri, Buyong, Shariff, 2011). Whether the valuation is of a mass nature, over and above formal and legal considerations, is determined primarily by the number of properties being valued and the way in which all works related to the valuation are organised. Mass valuation is characterised by the following attributes (cf. Hozer et al., 2002; Kuryj, 2007; Telega, Bojar, Adamczewski, 2002):

- the subject of a valuation is a large number of properties of one type coming from one market (e.g. lands, dwellings, etc.),

- the valuation is carried out in a uniform approach resulting in consistent results,
- all properties subject to valuation are valued ‘at one time’; the structure and condition of properties as well as their prices are evaluated on the same (or very close to the same) dates.

In mass valuation procedures are arranged differently from the individual valuation and generally the process runs in two main stages:

- collecting of any necessary information and data concerning all the properties being valued and the relevant market,
- calculating the values of all properties subject to valuation using an appropriate calculation scheme.

On the other hand, the individual valuation collects information and data necessary to carry out the valuation of one property at a time, followed by calculating the value by means of a comparative table created for the sake of the paired comparison method, or by calculating the so-called correction coefficient as part of the method of average price adjustment. Having completed the valuation process, the valuer may proceed to the valuation of another property, but this valuation may relate to a completely different type of property, be carried out for a completely different purpose and in a different scope.

The mass valuation is regarded as being particularly useful in the following areas (Hozer, Kokot, Foryś, Zwolankowska, Kuźmiński, 1999):

- valuation of real estate for the purpose of updating annual fees for perpetual usufruct (Hozer et al., 1999),
- valuation of real estate for the purpose of estimating the economic consequences of adopting or changing local spatial development plans (Hozer et al., 1999),
- monitoring the value of real estate portfolios constituting collaterals for credit exposures held by banks in order to calculate LtV for the bank’s credit portfolio (Cho, Megbolugbe, 1996; Hozer et al., 1999; Korteweg, Sorensen, 2016; Tzioumis, 2017),
- general property tax (Hozer et al., 1999; Bradbury, Mayer, Case, 2001).

In certain situations, mass valuation may also refer to valuations run for other purposes, such as the sale of housing units from municipal resources, expropriations for infrastructure investments, etc.

A large number of properties valued and an adequate sequence of analytical activities entails the need to standardize the entire process, including the standardization of a set of marketable features of their variants (classes) and a relatively objective way of measuring them. Structuring the mass valuation process and standardization of marketable features makes

the valuation susceptible to algorithmization of the whole procedure. It should be noted that high requirements as to the estimation accuracy should be placed on both individual and mass valuation, knowing that they may be influenced by various factors, including those not directly related to the valuation method itself (Zhu, Pace, 2012). Credibility of valuation results should also be linked to a transparent estimation structure and an appropriate number of clearly defined and well-presented characteristics of the property (cf. Sawiłow, Akińczka, 2011).

2. Practical example

As it has already been mentioned, substantive as well as methodological and analytical difficulties in qualifying marketable features are of critical importance in mass valuation, as it requires their unequivocal standardization, i.e. establishing a permanent catalogue of marketable features for the whole group of valued properties; specifying variants of these features (states) and criteria for qualifying the properties according to these variants (states).

This task is one of the first to be performed within the framework of mass valuation, after identification of the set of properties for valuation and collecting data on transaction prices.

The practical example below shows the procedure of qualifying property features as well as their variants and eligibility criteria.

The valuation covers 1630 land properties located in Zone 3 “Nad Odrą” of the city of Szczecin. The location of the area in Szczecin is shown in Figure 1. The purpose of the valuation is to revalue annual fees for perpetual usufruct. Pursuant to § 28 sections 1 and 2 of the Regulation of the Council of Ministers of 21 September 2014 on the valuation of real estate and preparation of an appraisal report for this purpose, the value of real estate as an object of ownership rights is determined using a comparative approach and the sale prices of undeveloped real estate as an object of ownership rights. After the analysis of the set of properties to be valued, taking into account their spatial arrangement, and following the discussions between property valuers and real estate market analysts, the set of properties was divided into four groups according to their intended use:

- green and arable lands,
- industrial lands, terminals, warehouses, storehouses, storage yards,
- residential properties, recreational areas, parking lots, areas of public use,
- commercial areas (trade, services, offices).

The structure of the area under valuation due to the classification specified above is presented in Figure 2. Nearly 75% of the areas are plots intended for residential purposes.

The second group consists of plots classified as industrial lands, terminals, warehouses, storehouses, and storage yards. Less than 3% is covered by commercial plots. The smallest group of only 4 plots includes areas classified as green lands.



Figure 1. Zone 3 in the city of Szczecin

Source: own elaboration based on data from the Central Centre for Geodetic and Cartographic Documentation.

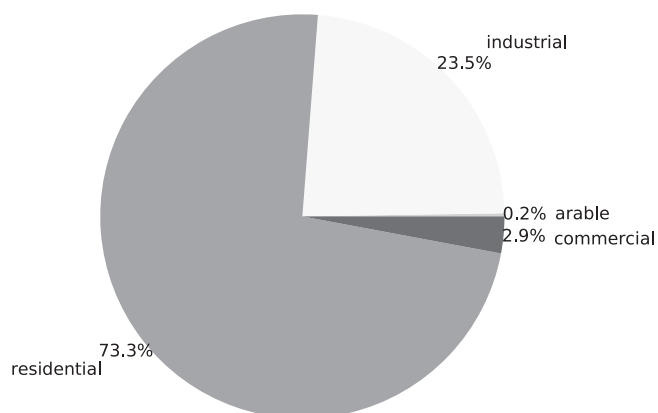


Figure 2. Structure of the intended uses of properties under valuation

Source: own study.

Also, after a discussion with experts and analysts and taking into account local market conditions as well as technical and organizational capacity to obtain data on the qualities of real estate, the following attributes were classified as marketable features:

1. Size, in the following variants: large, medium, small.
2. Utility Access, in variants: none, incomplete, full.
3. Surroundings, in the following variants: onerous, undesirable, average, desirable.
4. Accessibility, in the following variants: poor, average, good.
5. Physical Characteristics, in the following variants: undesirable, average, desirable.
6. Location expressed by market value coefficients (MVC).

For all four types of uses, the features and variants are the same. However, the eligibility criteria for the feature options are different. It is understandable that an agricultural property of a certain size can be perceived as “small”, while a single-family property of the same size can be considered as “large” from the market point of view. Similarly, e.g. the vicinity of an industrial function is regarded as burdensome for residential properties, but it will not be seen as when the property is intended for industrial purposes as well. Features such as Size, Utilities, Surroundings and Accessibility have been classified by means of the expert method through the exchange of opinions of a group of property valuers and real estate analysts. The shape indicator described in a separate study (Dmytrów, Gnat, Kokot, 2018) was used to determine a plot’s shape. The proposed plot shape measurement index is based on the ratio of plot perimeter and its area, which is related to the analogous ratio obtained for a plot of land whose shape has been considered optimal. The advantage of this method is the possible modification of the reference plot depending on the characteristics of the analyzed real estate market. The localization feature was also specified in a special way. Due to the fact that the valuation was carried out using the Szczecin Algorithm of Real Estate Mass Appraisal (SAREMA), whose characteristic features are the so-called market value coefficients (MVC) calculated on the basis of the ratio of the market values of properties defined individually by valuers and the hypothetical value of these properties, these particular coefficients were used in the study (Hozer et al., 1999; Hozer, Zwolankowska, Kokot, Kuźmiński, 2000; Hozer, Kokot, 2002). As already mentioned, other ways of determining the Location feature are also used in practice. These include, in particular, expressing location as a distance from the centre or centres of local cities, as a relation of average property transaction prices in different parts of the city, or on the basis of interviews with real estate agents. Following such principles, as a result of discussions among experts and after analysing the distributions of the various options of property features, the criteria for the

classification of marketable features by type of real estate intended use presented in Table 1 have been determined.

Table 1. Criteria for qualifying marketable features by property's intended use

Feature	Category	Qualifying criteria for green and arable lands	Qualifying criteria for industrial lands, terminals, warehouses, storehouses, storage yards	Qualifying criteria for residential properties, recreational areas, parking lots, areas of public use	Qualifying criteria for commercial properties
1	2	3	4	5	6
Size (m ²)	large	>6,000	>6,000	>1,200	>1,200
	medium	2,000 – 6,000	2,000 – 6,000	500 – 1,200	500 – 1,200
	small	<2,000	<2,000	<500	<500
Utility Access	none	no access to sewage system, power grid, water and gas supply systems	no access to sewage system, power grid, water and gas supply systems	no access to sewage system, power grid, water and gas supply systems, systemic heating	no access to sewage system, power grid, water and gas supply systems
	incomplete	access to at least one utility supply network	access to at least one utility supply network	access to at least one utility supply network	access to at least one utility supply network
	full	access to sewage system, power grid, water and gas supply systems	access to sewage system, power grid, water and gas supply systems	access to sewage system, power grid, water and gas supply systems, systemic heating	access to sewage system, power grid, water and gas supply systems
Surroundings	onerous			industrial areas, terminals, warehouses, storehouses, storage yards	industrial areas, terminals, warehouses, storehouses, storage yards
	undesirable	industrial areas, terminals, warehouses, storehouses, storage yards	residential, recreational, parking lots, public use, commercial	Commercial units in close vicinity	green lands, arable lands
	acceptable	residential, recreational, parking lots, public use, commercial	green lands, arable lands	residential, recreational, parking lots, public use, commercial units in a farther vicinity	residential, recreational, parking lots, public use
	desirable	green lands, arable lands	industrial areas, terminals, warehouses, storehouses, storage yards	green lands, arable lands	commercial

1	2	3	4	5	6
Accessibility	poor	unpaved road longer than 500 m	unpaved road	unpaved road or the nearest public transport stop within the range of beyond 1,000 m	unpaved road
	acceptable	unpaved road longer than 100 m, or paved road of bad quality (paving, cobblestones, potholes)	paved road of bad quality (slabs, cobblestones, potholes)	paved road of bad quality (slabs, cobblestones, potholes) or the nearest public transport stop within the range of beyond 500 m	paved road of bad quality (paving, cobblestones, potholes)
	good	paved road of good quality	paved road of good quality	paved road of good quality and the nearest public transport stop within the range of 500 m	paved road of good quality
Physical Characteristics	undesirable	acceptable or undesirable shape of plot and uneven terrain	acceptable or undesirable shape of plot and uneven terrain	acceptable or undesirable shape of plot and uneven terrain	acceptable or undesirable shape of plot and uneven terrain
	acceptable	desirable or acceptable shape of plot but uneven terrain, or undesirable shape of plot but terrain even	desirable or acceptable shape of plot but uneven terrain, or undesirable shape of plot but terrain even	desirable or acceptable shape of plot but uneven terrain, or undesirable shape of plot but terrain even	desirable or acceptable shape of plot but uneven terrain, or undesirable shape of plot but terrain even
	desirable	desirable or acceptable shape of plot and terrain even	desirable or acceptable shape of plot and terrain even	desirable or acceptable shape of plot and terrain even	desirable or acceptable shape of plot and terrain even
Location	expressed by market value coefficients				

Source: own study.

Figures 3 to 7 show the distribution of variants of particular marketable features. The distributions take into account the Intended Use features as adopted in the study, to which digital codes from 1 to 4 were assigned. As far as the Size feature is concerned small plots are predominant in the industrial property group. A similar situation can be observed in the group of residential properties. In the group of commercial plots large plots dominate. Marginally less small plots were recorded in this group.

As far as the technical infrastructure of the area is concerned, as shown in Figure 4, plots with full utility access dominate. This situation is the same for Intended Uses from 2 to 4.

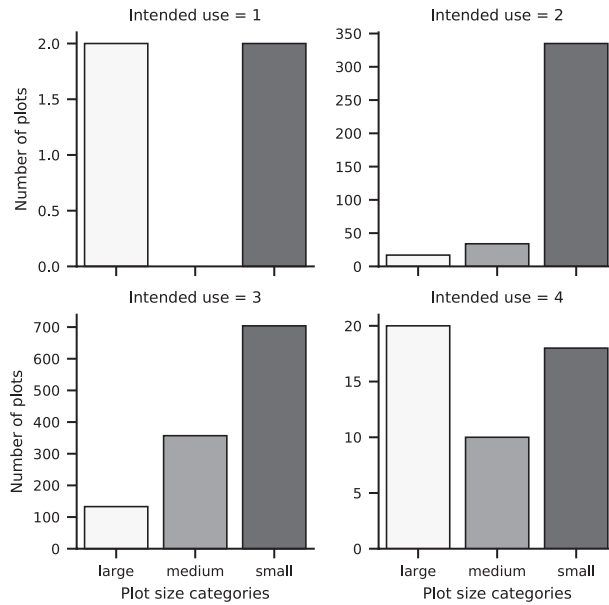


Figure 3. Structure of valued land properties by Size and Intended Use

Source: own study.

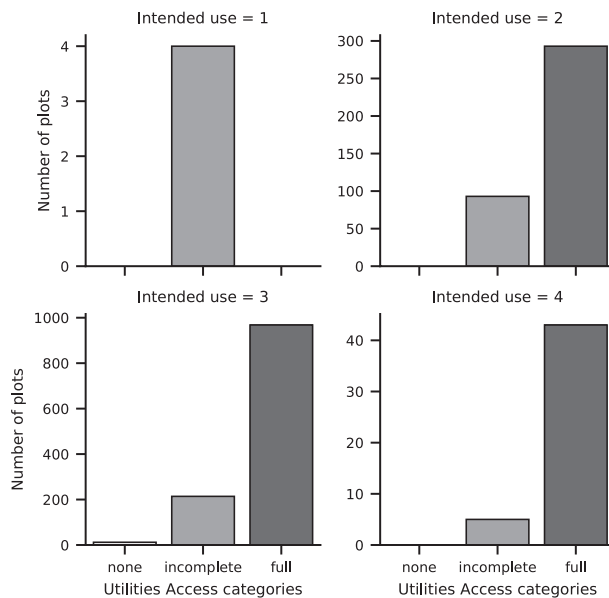


Figure 4. Structure of valued land properties by Utility Access and Intended Use

Source: own study.

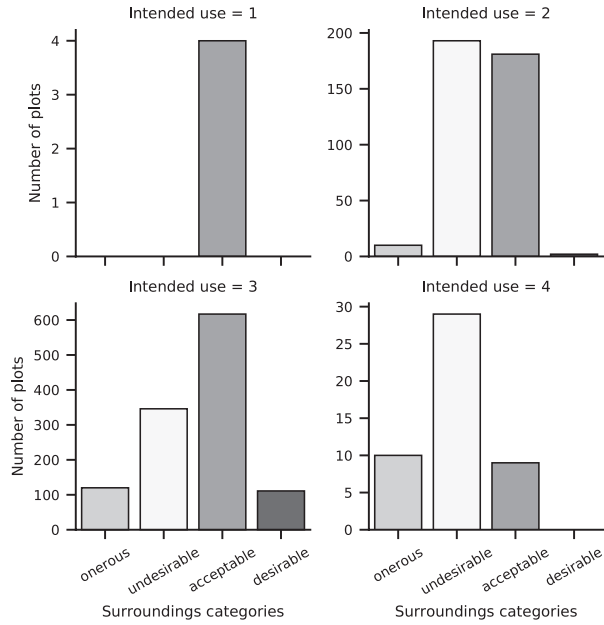


Figure 5. Structure of valued land properties by Surroundings and Intended Use

Source: own study.

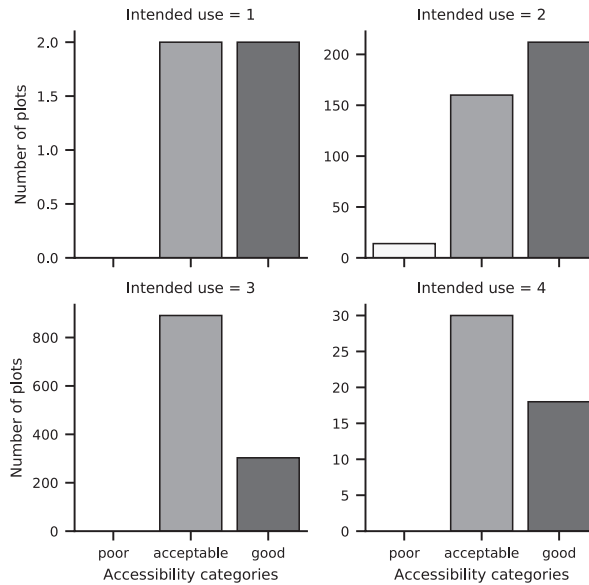


Figure 6. Structure of valued land properties by Accessibility and Intended Use

Source: own study.

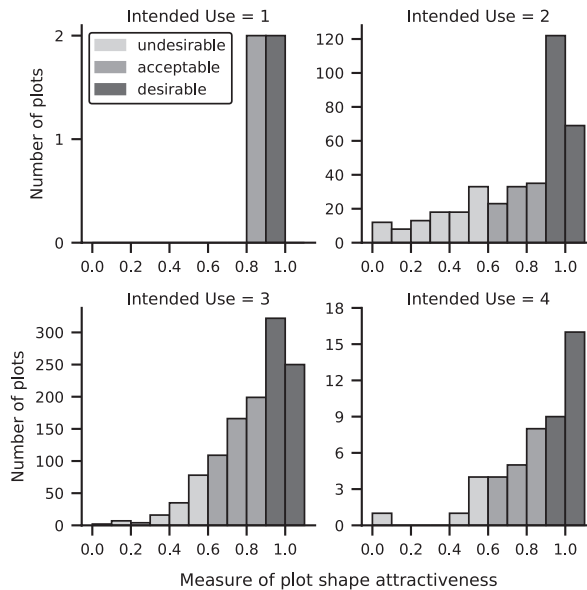


Figure 7. Distributions of Physical Characteristic measurement for individual Intended Uses including variants of the characteristic

Source: own study.

In the case of green and residential areas, the surroundings of the majority of plots are described as average. For plots of land designated as industrial or commercial, the dominant numbers of plots are located in onerous surroundings.

As regards to industrial plots, good transport accessibility prevails. On the other hand, in the case of residential and commercial plots this market feature is on an average level.

When analysing the distributions of the plot shape measures, one can see that they are characterized by left-sided asymmetry. This is an expected situation. Taking into consideration the fact that land use management should be performed in a rational manner, the prevailing share of plots of a favourable shape over these having unfavourable shape should not come as a surprise. Such a situation also takes place in the analysed database of plots of land. As we can see, the distributions of individual features take different shapes, which is due to the actual diversity of the property. However, it does not seem reasonable to manipulate the features and their states in such a way as to obtain appropriate distributions, but only possibly to eliminate such states of features which did not occur in the case of any real estate. The process of defining and classifying valuation objects in terms of the variants of specified marketable features is an important stage in the process of real estate mass valuation. Its precise and reliable

implementation will influence the quality of results obtained in further stages of research and works leading to the accurate determination of property value.

Conclusions

The process of property valuation requires resolving many detailed issues concerning the valuation procedure as such as well as the adopted criteria. One of them is the proper identification and classification of marketable features of a given property. The features should meet the following criteria:

- they can be isolated from the multitude of factors that may influence transaction prices,
- the criteria for classifying real estate according to specific features can be objectified,
- the impact of the identified features on the level of the transaction prices obtained on the market can be assessed,
- the impact of the identified features on price level is noticeable,
- they are measurable (expressed on at least an ordinal scale).

In the mass valuation, which is usually algorithmic, adequate procedures for the identification of market characteristics and the determination and measurement of their stocks take on particular importance. For some features it is helpful to develop special measures such as the plot shape index or the market value index, which is a specific measure of the attractiveness of the property location. Others require an expert approach, i.e. a discussion among property valuers and real estate analysts. The solutions adopted in the valuation procedure should be based on the principle of criteria objectivity, so as to minimise the risk of a situation when the same property is assessed differently by several members of the valuation team. In addition, different features may be taken into account on different local markets and they may be expressed and measured in a different way.

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