
"ABSORPTION" OR "CARRYING CAPACITY" OF AREAS – ASSESSMENT METHODS ON THE EXAMPLE OF DETACHED HOUSING REAL ESTATE

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Abstract

The concept of market absorption and carrying capacity in economic terms are adequate to the real estate market, even though the legislator uses only the concept of the absorptive capacity of the area in the planning process. The aim of the study is to discuss the concept of carrying capacity and absorption of the real estate market in economic and planning terms as well as the application of conclusions from literature studies and determination of capacity and absorption on a specific selected local market.

In the empirical part, a model of demand for space for detached housing development (market absorption) was built as a function of price, income and expenses for complementary goods.

At the same time, as a complementary good for the purchase of land for the construction of a house, the purchase of a flat and purchase of a real estate built-up with a detached house were accepted. On the other hand, reference was made to absorption understood adequately to planning documents. It was discussed whether the concept, interpreted in two ways, leads to the absorption of the same area on the local market. The analysis uses data from the Register of Prices and Values of Starosty County Price and Value Register, planning documents as well as data resources on statistics, and public information and own research.

Key words: *real estate market, spatial planning, carrying capacity, absorption.*

JEL Classification: *R52, R58, R14.*

Citation: Foryś I., Kazak J., 2019, "Absorption" or "Carrying Capacity" of Areas – Assessment Methods on the Example of Detached Housing Real Estate, *Real Estate Management and Valuation*, vol. 27, no. 2, pp. 05-19.

DOI: 10.2478/remav-2019-0011

1. Introduction

The spatial planning system is based on the social and economic rationale of the use of space and the principles of sustainable development, taking into account the strategy adopted by the public (FORYŚ, PUTEK-SZELAĞ 2015). Taking into consideration the non-renewable resources of space, its task is to support the assumed development directions while maintaining coherence with the political, social and economic system of a given region. Dynamic economic development and intensified processes of industrialization and urbanization in many developing countries have led to uncontrolled spatial

processes (KIRAN et al. 2013) or socially unacceptable changes. These transformations do not always make it possible to manage space efficiently and in accordance with social standards (FORYS 2013). In the Polish legal system, the function of the spatial management at particular administrative levels is performed by specific institutions, which have the necessary spatial policy instruments at their disposal. The instruments available at the local level include a study of conditions and directions of spatial development, a local spatial development plan, or decisions on building and land development conditions that allow effective spatial management, in accordance with social standards (FORYS, NOWAK 2014, pp. 13-15). In order to improve the functioning of these instruments, the legislator decided to link planning processes with the analysis of the demand for investment areas and the absorption of available areas designated for given purposes.

Market capacity and absorption are two economic concepts used primarily in market research of buyers of goods and services, which also appear in the spatial planning process. If the property is treated as a specific commodity on the market (more specifically the right to real estate) as a subject of trading, then the concepts of capacity and absorption can also be adapted to real estate market analyses. In economic terms, market capacity means the amount (value) of specific products that can be sold at a given time, taking into account the cost of these goods and the needs and incomes of the population. Thus, market capacity is a function of the price and the needs and incomes of the population, i.e. their purchasing power. This is different with the demand function.

On the other hand, market absorption is a quantitative approach to the intensity of unrealized needs, i.e. the level of identified needs in relation to the size of effective supply or demand. Hence, market absorption fits between market capacity and effective supply.

The capacity testing means determining indicators defining the needs of the population on a given market (potential buyers), in particular they use the purchasing power index, which takes into account the potential of the market under analysis. On the other hand, market absorption research means the use of quantitative and qualitative methods, also taking into account factors affecting absorption, such as tastes, preferences and marketing elements.

2. Absorption and the carrying capacity of the real estate market

2.1. An economic approach to the problem

In addition to the absorption, market capacity is a broadly understood economic category. Both are subject to quantitative measurements. Capacity analysis requires the collection of data on the population living in a given market and the calculation of indicators defining the needs of this population. Real estate market analyses assume that the product (real estate) or service is targeted towards the local population. Otherwise, migration rates, their intensity and direction should be taken into account. For the analysis of the housing market, one can use the indicator of the usable area of a flat per person or household, but already in the case of the analysis of detached houses or land for development with detached houses, it would be more appropriate to determine the relation to the number of households. Partial studies use the probability of the purchase of goods (services) by a given group or a given commodity in relation to the basket of goods. When the capacity test comes down to estimating the market for a given product, a specific group of buyers or a market of a given producer, then it is referred to as a partial capacity. When it applies to all potential customers, then the test refers to the overall capacity.

Market absorption surveys mean determining the indicator of the degree of need satisfaction, taking into account the effective supply of units of a given good or service and the needs, calculated per buyer, i.e. a person or household. Analyses should also take into account factors determining the absorption capacity, such as: fashion, tastes, preferences and the impact of marketing tools.

Against this background, the economic capacity of the real estate market is the ability to divide the space in such a way as to ensure optimal conditions for the use of real estate. Absorption determines the possibility of socially and environmentally optimal use of real estate; it is the initial stage of calculating the size of the project, i.e. the market capacity. The absorption capacity of the real estate market depends on the resistance of the environment, i.e. individual ecosystems, to particular forms of property use (proportional). Absorption indicators are an expression of the environmental resistance to the way the space is used.

The capacity of the real estate market is a property of a given area, resulting from values and the natural environment, as well as the functions attributed to them, which is associated with a proper

manner of development and use. It can mean the maximum number of properties (e.g. geodetic parcels of undeveloped land), which can be separated from space, and which can simultaneously perform particular functions (development methods) without lowering the value of elements of the natural environment, as well as benefits for users of these properties. According to L. Kałowski, the capacity of the real estate market is the value of real estate that can be sold in a given place and time, at specific prices and other relatively constant determinants of demand, while market absorption is the state of the intensity of needs in relation to real estate, compared to the current state of their satisfaction, on a time unit scale and within an accepted area, i.e. a spatial and administrative unit (FORYS 2011). This approach to absorption is not in line with planning activities, in which needs cannot be assessed only ex post, but because of the long-term effects of planning decisions, also predicted in the long term.

In the case of real estate, the capacity may be expressed both in the number of sold real estate and the sum of financial resources allocated for their purchase. A popular index of market capacity is also the spatial purchasing power index. To determine the purchasing power index, functional relationships between the sale of goods or services are used, and the factors affecting this sale, such as population growth (potential buyers), increase in wages, etc.

2.2. Absorption of areas in planning documents

The legal basis for estimating spatial absorption are the following articles: 10 para. 5.2 and 10 para. 5.3 of the Act of March 27, 2003 on spatial planning and development (i.e., Journal of Laws of 2017, items 1073, 1566), which states that:

"Art.10.5. When balancing the areas designated for development, in turn: (...)

2) the absorption of areas with a fully developed compact functional and spatial structure within the boundaries of a settlement unit within the meaning of Article 2 (1) of the Act of 29 August 2003 on official names of towns and physiographic objects, understood as the possibility of locating new development in these areas, expressed in the usable area development, divided into the following functions, shall be estimated;

3) absorption of areas designated in local development plans, other than those referred to in point 2, is estimated at the area of the commune, understood as the possibility of locating new development in these areas, expressed in the usable area of development, divided into development functions".

These regulations came into force in November 2015 after the amendment of this legal act of 9 October 2015, which is a kind of novelty in planning studies. This change was developed together with the act on revitalization, which required the above-mentioned changes to the law. Amended regulations require that estimated absorption should be presented in the form of the usable area of buildings. Thus, it can be seen that regardless of the surface area designated for particular purposes, the factor of building intensity on the plot will also be an important factor. In the case of detached housing, this calculation will be easier; however, in the case of multi-family housing, it is important to subtract the sum of common areas from the result not used for residential purposes (e.g. terraces, storage rooms, basements, staircases, etc.).

The above standards relate to the development of the land balance for the needs of some of the conditions included in the studies of municipalities, a component of which is the estimation of spatial absorption. The regulations specify that the usable area of a new development should be determined separately, divided into areas with a compact functional and spatial structure and those outside this area. It should also be noted that executive acts, which would contain regulations on necessary data, methods or techniques used to compile the land balance, and, hence, the estimation of spatial absorption, have not yet been published to the above-mentioned legal norms.

As stated above, the legislator distinguishes the estimation of absorption divided into functions of development. The analysis of the areas' absorption capacity in the economic context should therefore be preceded by an analysis of the intensity of meeting the needs in the area's individual functions, and in effect, the division into functional units and in such quantity as to provide areas for all theoretical social functions. On the other hand, from the point of view of the optimal use of space, the concept of capacity would be closer, in which the functional division of areas would be optimal in terms of space management and would correspond to divisions which would result in the creation of properties that could be developed by potential buyers (users). In the real estate management process, it is necessary to determine the existing absorption of areas designated for various functions in local plans, i.e.,

determining the maximum number of plots that can be independently developed and built. In general, the determination of the current absorption of building plots for individual settlement units is understood as the determination of the maximum number of plots available for development, while in detailed terms, the number of plots already built-up as well as possible to develop, including plots that are currently built-up but, due to their area and parameters, create the possibility of being divided and thus separating another plot that can be built-up.

Authors of numerous works (FORYŚ, NOWAK 2014) as well as planners and urban planners point out that the value of the absorption of areas intended for housing development should always be treated as an indication, because the actual "load" of the area is primarily determined by its actual investment, not the prospect of re-divisions. This is particularly the case when the local population wants to have a plot of land larger than the minimum plot size indicated in the plan, especially in suburban areas. A large house or plot of land is, in many cases, synonymous with material status or the pursuit of ownership of a larger area. This also applies to the creation of specific reserves for extensions or other additional functions such as parking spaces. As a result, undeveloped areas are created, which constitute an investment reserve for property owners, especially where rapid growth in the value of real estate is possible. For analytical purposes, therefore, a balance is sought between the land constituting the reserve and the plots that are actually managed, which take into account the current state of development. On the other hand, in areas where unit prices of undeveloped land are high, the opposite trend can be observed – mainly the turnover of smaller plots of land, close to the legally required minimum dimensions of a building plot. The designated absorption of residential areas, taking into account the above observations, should reflect the functional and spatial structure of the planning unit, refer to the current land development, prospects for settlement development, services, transport system and engineering projects, as well as the extent of the impact of legally protected areas.

Another important parameter that characterizes land absorption in the applicable local spatial development plans are the characteristics of built-up plots in relation to undeveloped plots. In the case of residential buildings, the so-called investment absorption of the area, or what surface area (number of apartments) can be built on a given plot, in accordance with the local spatial development plan and in accordance with the surface area of flats (type of buildings) preferred on a given local market. The obtained values are adjusted by demographic absorption (e.g. taking into account population forecasts, housing density indicators).

2.3. Econometric approach to absorption and carrying capacity on the real estate market

The econometric analysis of demand deals with the study of quantitative regularities in the area of consumer demand. Consumption demand for a given good should be understood as the quantity that a certain group of consumers decides to acquire on the market over a given period of time. From the point of view of econometrics, demand should be considered due to the subject (consumer good), consumer group and in the adopted unit of time.

The dependence of demand on the set of economic and non-economic factors influencing consumers' decisions regarding the purchase of consumer goods on the market is described by the demand function. The study uses data in the form of time series, which in effect allow for the analysis of macroeconomic trends in demand functions. However, since the examination of demand, treated as a willingness to acquire a given good at a specific time, place and price, is difficult to quantify, expenditure on given good and consumption are considered more frequently. The first of them, recognized in terms of value, is usually considered in the context of family budget surveys (most often representative surveys), the second one also in relation to market statistics.

Models of demand and supply on the market differ depending on the type of good they concern, and, more precisely, whether the market for a given good is perfect or not. The Wolda model (Hozer 1993, pp. 29-30) describing the relationship between demand (D_t), supply (S_t) and price (P_t) can be adopted in an excellent market:

$$P_t = f(D_{t-1} - S_t, P_{t-1}, U_{1t}), \quad (1)$$

$$D_t = g(P_t, U_{2t}), \quad (2)$$

$$P_t = h(P_{t-1}, U_{3t}), \quad (3)$$

where: t -time and U_{1t}, U_{2t}, U_{3t} - random elements.

In an imperfect market, only demand is a function of price and price increase:

$$D_t = g(P_t, \Delta P_t, U_t), \quad (4)$$

where P_t is fixed. Demand here means the spending on a given good, which, in consequence, is tantamount to real market capacity, in contrast to potential capacity expressing needs. Potential capacity is thus real capacity (demand, which measures expenditure) and market absorption, which determines the intensity of satisfying needs and can be measured as the elasticity of demand versus price and income.

In the macroeconomic demand-side functions, demand is the sum of expenditures for a given good (global demand calculated for durable goods) depending on the price of goods, consumer incomes (e.g. average household income or average wage or disposable household income) and the price of substitutable or complementary goods to the time variable t . In practice, prices of complementary goods or substitutes can be excluded from the model, but this cannot lead to the elimination of prices that directly affect consumer decisions of a given good. Therefore, real prices or real price indices are most often used as exogenous variables.

Demand functions for durable goods are most often linear or power functions, which are based on Stone's assumption that a specific feature of durable goods is a long period of their wear. Hence, the level of current purchases depends on both the current economic situation of households and also on goods already owned (resources). Thus, purchases of a given good are the sum of restitution purchases (replacing technically worn or morally durable goods) and investment purchases (increase in the state of resources of a given good). The level of restitution purchases can also be treated as the level of purchases in previous periods and the rate of consumption of resources in a given period. Investment purchases may depend on the price, the level of income, the increase in the number of households (population) and the prices of related goods. This approach requires the researcher to build models in layers, e.g. due to household income, or the age of a durable good and, more precisely, its remaining useful life.

The purchase of land for the construction of a house should be treated as a good for long-term use, which is in many acts of consumption and is used up in a longer period of time, and is also characterized by a relatively high price, forcing to anticipate income by taking loans or using savings.

In macroeconomic research, demand is most often used as a power function because, as shown by numerous studies, the relationship between demand and income is non-linear in nature, and the parameters of functions standing at income and prices are equal to the elasticity of demand, relative to these variables. In econometric models, in which the power function was used, most often the power exponent at the variable measuring the income level is positive, at the price of a given good - negative. The exponent with the price of a substitute good for the good for which the demand function is determined is positive and negative for the complementary good (PAWŁOWSKI 1980, pp. 426-435).

The macroeconomic demand function is an element of a multi-equation model, combining equations describing the interaction of demand, supply and price. As a result, it is possible to record a model in which demand is a power function of price and income, price is a linear function of demand and the costs of the production of goods, and supply - a linear function of demand. This approach requires the estimation of supply on the land market, depending on the optimal, legally and physically possible number of plots (areas) for detached housing in a given planning unit.

3. Absorption and carrying capacity of the undeveloped real estate market for detached housing on the example of the Bezrzeczce area of the Dobra commune

3.1. Dynamics of the analyzed variables on the local market

On a micro scale (local market), the analysis of real capacity and absorption capacity primarily comes down to the study of demand as a function of expenditure, income or expenditure on complementary goods. Therefore, in the first step of the study, the trend in population growth in the area designated for detailed analysis was assessed. For this purpose, data from the public statistics resource (Local Data Bank of the Central Statistical Office GUS), concerning the average annual number of inhabitants in the Dobra commune (the smallest statistical unit in LDB in this category (Fig. 1)), were used.

On the analyzed market, one can observe a dynamic linear increase in the number of inhabitants - more than fourfold in the perspective of 22 years. Annually, an average of 781 inhabitants enter the commune, which, with an average number of people in a household in Poland not exceeding 3, means

nearly 260 new households a year in the commune. Such a high indicator proves both the high popularity of the commune as a place to live, but also a constant tendency of suburbanization in the Szczecin agglomeration. Due to the observed regularity and increasing trend, it may be assumed that the demand for new locations for detached and multi-family housing will continue to increase.

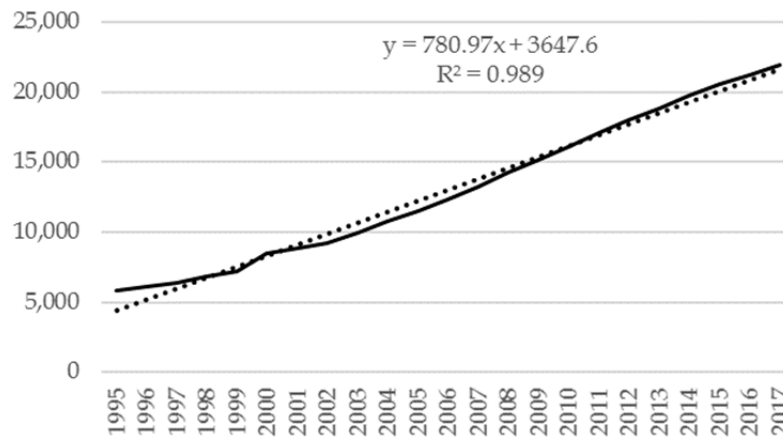


Fig. 1. Average change in the population in the Dobra commune between 1995 and 2017 (as of June 30 each year). Source: own study based on LDB GUS data

The analyzed area has a positive correlation coefficient between the increase in the population in subsequent years and the total number of completed dwellings (0.46), even higher for apartments built for sale and rent (0.62), while much lower for detached housing (0.25). This means that the dynamics of population growth in the context of the housing market is rather related to multi-family housing, although it concerns the implementation of investments in suburban areas within the boundaries of a **village administrative unit** (Fig. 2). Thus, the clear boundary of the urban area is blurred in space, moving smoothly into urbanized areas within rural areas.

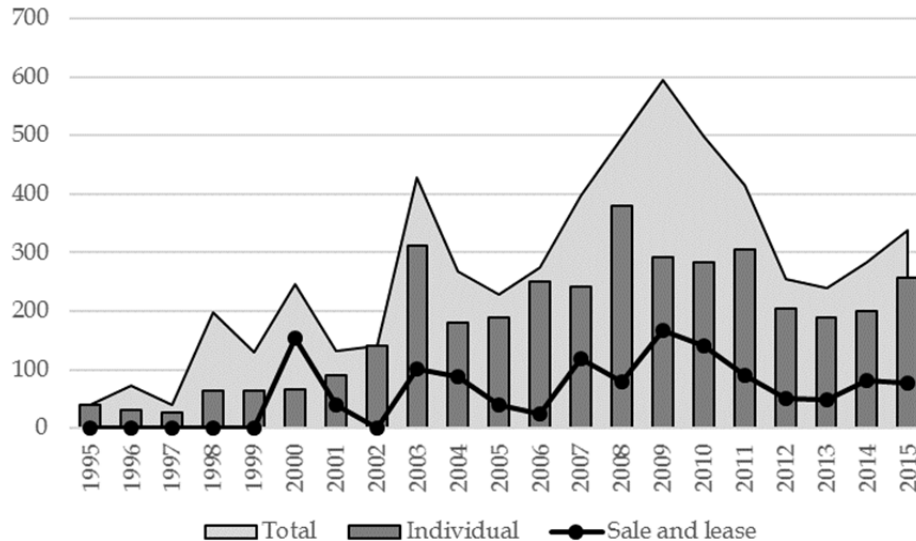


Fig. 2. Dynamics of flats completed in Dobra commune in 1995-2015. Source: own study based on LDB (GUS) data.

The largest increase in the number of apartments delivered for use took place in 2003 and 2009. The first increase was connected with the legalization of the construction started before the accession to the European Union and the threat of VAT growth, the second is an echo of the economic situation on the real estate market in Poland and the region in 2006-2008. It should be noted that, in the individual construction category, there are detached buildings erected by landowners on their own, while the construction for sale and rent category includes both flats in multi-family and detached buildings.

As regards the price of land in the Bezzecze research area in the Dobra commune, there has been a dynamic increase in unit prices in 2005-2008, a downward trend until 2012 and a slow increase in prices in subsequent years (Fig. 3).

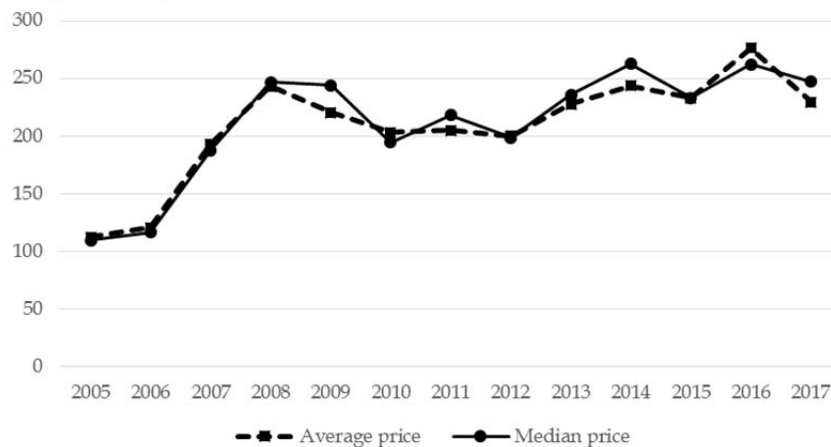


Fig. 3. Dynamics of the average price of undeveloped land in the area of Bezzecze in 2005-2017 (PLN/m²). *Source:* own study based on RCiW District office Police data.

The symmetric distribution of unit prices deserves attention, which is reflected in what is almost an overlapping of the average price and the median in 2005-2008 and a slight variation in subsequent years. In the last four years, land prices for detached housing have stabilized at the level of PLN 233-276/m², which means a nearly 2.5-fold increase compared to 2005.

In the audited period, there were, on average, 35 market transactions of purchase and sale of land properties for housing development, with the highest number (131) in 2006, the lowest number (8) in 2005 and (17) in 2010.

A substitute for households to buy land and build a house is the purchase of a flat or a house from a developer. Therefore, prices and the intensity of trading in ownership rights to residential units and detached houses were assumed to be another variable in the model. The unit assumed the price of 1 m² of usable floor area, regardless of the form of development (Fig. 4).

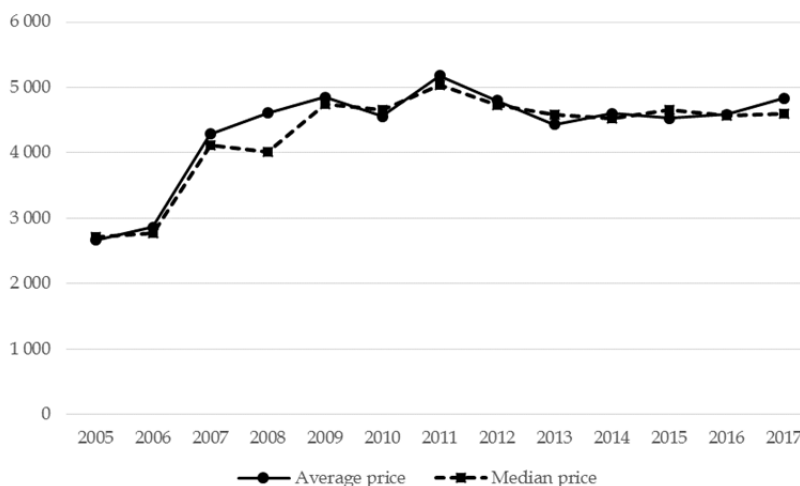


Fig. 4. Dynamics of the average price of residential premises within Bezzecze in 2005-2017 (PLN/m²). *Source:* own study based on RCiW District office Police data.

Prices of flats increased dynamically in 2005-2009 and confirm the boom in the real estate market during that period. In subsequent years, there were no clear drops, and prices, on average, were in the range of PLN 4,500-4,800 PLN/m². The maximum price was reached in 2011, when the average was PLN 5,178/m². The largest discrepancy in average prices took place in 2008, in the remaining years the average was close to the median value, which indicates a symmetrical distribution of the analyzed prices.

The activity of entities on both generic markets indicated a change in priorities in 2008. In 2005-2008, land-use transactions dominated, in 2009-2017, transactions with flats were twice as high as transactions of non-built-up land (Figure 5). On the one hand, this was the result of the activity of developers in response to the growing demand during the economic boom on the market, on the other hand - the effect of suburbanization and sprawling of Szczecin into the neighboring communes.

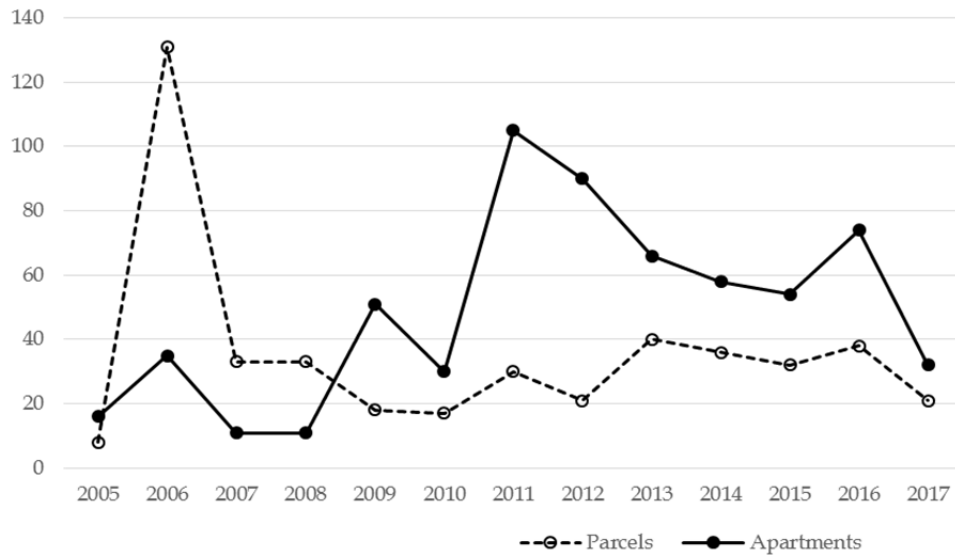


Fig. 5. Dynamics of the number of purchase and sale agreements concluded within Bezzecze in 2005-2017 (PLN/m²). Source: own study based on RCiW District office Police data.

A substitute for the purchase of land and building a house on one’s own is also the acquisition of ownership rights to real estate developed with a detached house. Therefore, the transactions of purchases of such real estate on the local market were analyzed.

As in the case of the other analyzed properties, unit prices of houses increased in the first years of the analysis, but, for houses, this trend continued until 2010, and after two years of decline, there was again a rise in prices, though less dynamic (Fig. 6).

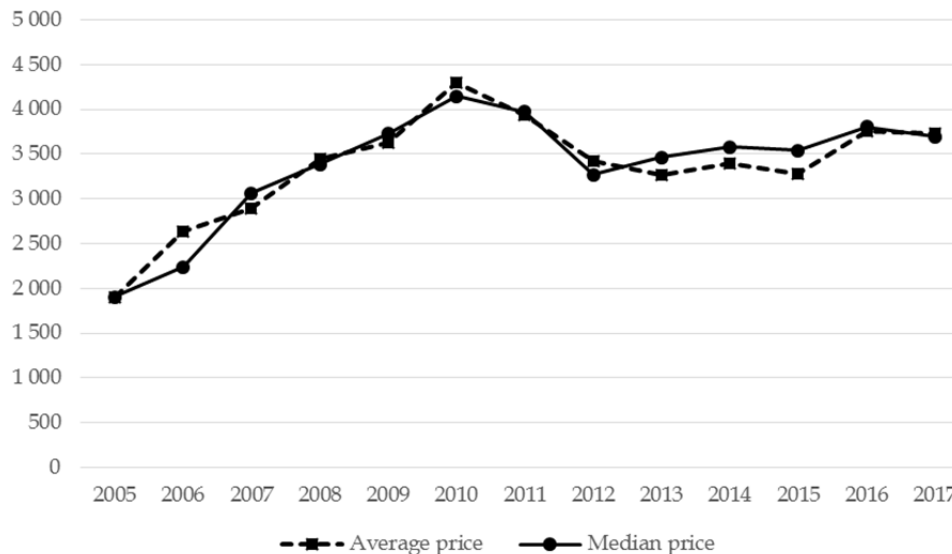


Fig. 6. Dynamics of the average price of usable space of residential houses within Bezzecze in 2005-2017 (PLN/m²). Source: own study based on RCiW District office Police data

Table 1 shows the basic descriptive statistics concerning the usable area of houses, flats and the area of land sold in 2005-2017 in Bezzecze.

In the analyzed years, there were houses with an average usable area of 160 m², flats of 71,3 m² and plots of land with an area of 1546,1 m². The largest diversity was characterized by the area of

building plots, which, from the smallest intended for the enlargement of adjacent plots (17 m²), reached even 46,256 m² in the case of very large properties, most often used for divisions. The smallest diversification was observed in the usable areas of houses. Here, the majority of houses with an area of 96 m² prevailed; in the case of flats, premises with an area of 68.7 m² and plots with an area of 800 m² were sold most often. In the analyzed period, there were a total of 712 776.3 m² of land property for housing development in the turnover.

Table 1

Descriptive statistics on the area of real estate by type of properties sold in the Bezrzecze area from 2005 to 2017

	Houses	Flats	Building plots
Average	160.0	71.3	1 546.1
Standard error	7.3	1.0	141.0
Median	140.0	69.5	995.0
Procedure	96.0	68.7	800.0
Kurtosis	166.5	2.4	122.3
Skewness	11.6	1.0	9.9
Minimum	91.1	25.4	17.0
Maximum	2 007.8	225.3	46 256.0
Amount	46 728.1	45 059.7	712 746.3
Meter	292	662	461

Source: own study based on RCiW District office Police data.

The purchasing power of the population determines the demand for a given good on the market. At the micro scale of the local market, there is no broad access to data regarding the savings of real estate buyers or their creditworthiness. Obtaining this information from a notarial deed also does not provide reliable information as to the purpose of the fund obtained from the loan (whether for the purchase of land, housing or for construction or renovation). Therefore the analyses used the average gross salary per person in the Police district and, for comparison, - also in the city of Szczecin (Fig. 7).

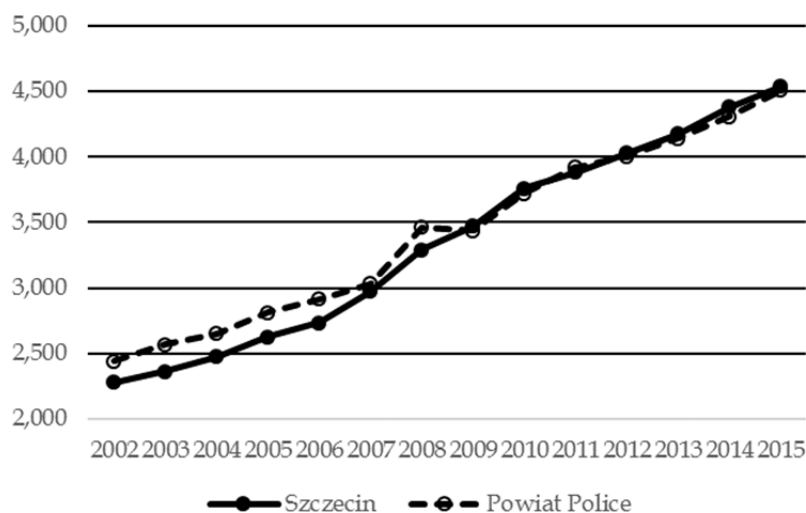


Fig. 7. Dynamics of average monthly salary in Szczecin and the Police district in 2002-2015 (PLN).

Source: own study based on LDB (GUS) data

In the analyzed years the average gross salary increased more than twice in both cases, while the salary in the Police district was higher than in Szczecin until 2009, evening out in the following years. The reasons are to be found both in the location of chemical plants in Police in the area of the county,

as well as the relocation of companies and affluent individuals to the area of communes around Szczecin, especially to the Dobra commune, which is confirmed by the growing income from PIT and CIT taxes in this commune.

Both the proximity of the municipality of Dobra in relation to Szczecin as well as the intensive development of municipal infrastructure and pro-investment attitude of local authorities mean that areas for development in the commune (including in particular Bezrzecze) are popular among residents of the Szczecin agglomeration and do not lose their value.

3.2. Results of the study – economic approach

The above mentioned literature and attempts to model variables that were identified as significant for the assessment of a given phenomenon based on the phenomena occurring on the Polish real estate market decided on the advantage of the power model of demand.

For further analysis of demand, the power dependence between explanatory variables and explanatory variables was assumed:

$$y^t = \alpha_0 \cdot x_{1t}^{\alpha_1} \cdot x_{2t}^{\alpha_2} \cdot \dots \cdot x_{kt}^{\alpha_k} \cdot e^{U_t} \quad (5)$$

where:

- α_0 - absolute term
- α_1, α_2 - model parameters (point elasticities),
- K - number of explanatory variables,
- u_t - random ingredient,

Which, in order to estimate the MNK model, was brought to the linear form. After linearization the model takes the form:

$$\ln Y_t = \ln \alpha_0 + \alpha_1 \ln X_{1t} + \alpha_2 \ln X_{2t} + \dots + \alpha_k \ln X_{kt} + \gamma t + U_t \quad (6)$$

An attempt to estimate the parameters of the model with an explained variable expenditure on the purchase of undeveloped land intended for detached houses did not give significant estimates of the parameters for the explanatory variables. Thus, in the next step, the power form of the function was used to estimate the demand for space, where the explained variable (Y) was the area of land for detached housing development in the area of Bezrzecze (m^2).

The best estimation of the model parameters was obtained for variables:

X1 – unit price of land for single-family housing development (PLN / m^2),

X2 – average gross monthly salary in the Police district,

and the estimates of structural parameters and stochastic structure are presented in Table 2.

Table 2

Parameters of estimating the function of demand for space for housing development

within Bezrzecze				
	Coefficients	Standard error	t Stat	P-value
Intersection	17.2351	4.0089	4.2992	0.0016
Variable X1	-2.3899	0.4773	-5.0068	0.0005
Variable X2	0.7571	0.6903	1.0967	0.2985
R ²	0.822631			
Standard error	0.26913			

Source: own study.

Bringing the model back to the power form allows for the interpretation of the obtained results.

$$\hat{Y}_t = 30\,557 \cdot X_{1t}^{-2.3899} \cdot X_{2t}^{0.7571} \quad (7)$$

The estimated model was characterized by a very good match between the theoretical data and the actual values. An important parameter at the level of $\alpha = 0.05$ turned out to be the parameter at

variable X1 and the **absolute term**. For the parameter at variable X2, in order to consider it statistically significant, it would be necessary to assume a materiality level of about 0.3.

The estimated parameters should be interpreted as point elasticities, i.e. an increase in the unit price of land by 1%, will result in a ceteris paribus decrease in demand for an undeveloped area by 2.3899%. On the other hand, an increase in the average monthly gross salary by 1% will increase the demand for an undeveloped area by 0.7571%. The positive value of the estimated parameter results from the fact that the model does not include the sum of household savings and the global value of mortgage loans taken out for housing investments.

Based on the obtained model, an attempt was made to build demand forecasts for the next year 2018. Econometric prediction methods require knowledge of explanatory variables in the forecast period. For this purpose, on the basis of observed development trends, the explanatory variables were extrapolated on the basis of the trend models. Based on the estimation of the trend function parameters of both explanatory variables, forecast values of these variables were determined in order to determine the demand for space in 2018 (Table 3, Table 4).

Table 3

Parameters for estimating the function of regression of the unit price of land for detached housing development in the area of Bezzecze (PLN/m²)

	<i>Coefficients</i>	<i>Standard error</i>	<i>t Stat</i>	<i>P-value</i>
Intersection	144,762	18,484	7,83175	8E-06
Variable X 1	9,07863	2,32876	3,89847	0,00248
R ²	0,58012			
Standard error	31,4167			

Source: own study.

Table 4

Parameters for estimating the regression function of the average gross monthly salary in the Police district (PLN)

	<i>Coefficients</i>	<i>Standard error</i>	<i>t Stat</i>	<i>P-value</i>
Intersection	2616.518	42.3064	61.84685	2.44468E-15
VariableX 1	174.6977	5.330106	32.77565	2.54401E-12
R ²	0.989864			
Standard error	71.90706			

Source: own study.

As a result, forecasted demand in 2018 can be determined at the level of 29,642.8 m² of land for detached housing development in the geodetic area of Bezzecze, the commune of Dobra. This means that, after 14 years, a total of 787,874 m² of land for housing development can be absorbed in the area of the surveyed area.

3.3. Results of the study – spatial planning approach

In terms of estimating spatial absorption from the planning point of view, spatial analyses in the ArcGIS environment were performed (version 10.3.1). The first step was vectorization of planning documents to build a coherent spatial database. Afterwards, data processing was based on spatial subtraction in order to identify areas designed for single family housing, but still not developed in such a way. The result of the calculation of areas intended for detached housing was multiplied by the average indicator of building intensity, resulting from the review of the existing local zoning plans and completed construction projects in Bezzecze.

According to the provisions of the Study of conditions and directions for spatial development of the Dobra commune, the majority of the areas in Bezzecze are intended for detached housing (Figure 8). The study also allows multi-family housing, but its participation must be in the range of

10% to 20%, and in addition, the consent for such development must each time be issued by the competent local administration. Particular attention should be paid to the fact that in the local spatial policy (Study of conditions and directions of spatial development) itself, the authors predict the possibility of a significant increase in the number of inhabitants in the area marked as "A". Area "A", however, goes beyond the town of Bezrzecze, and therefore the population figures from the Local spatial policy cannot be accepted to verify the calculations below.

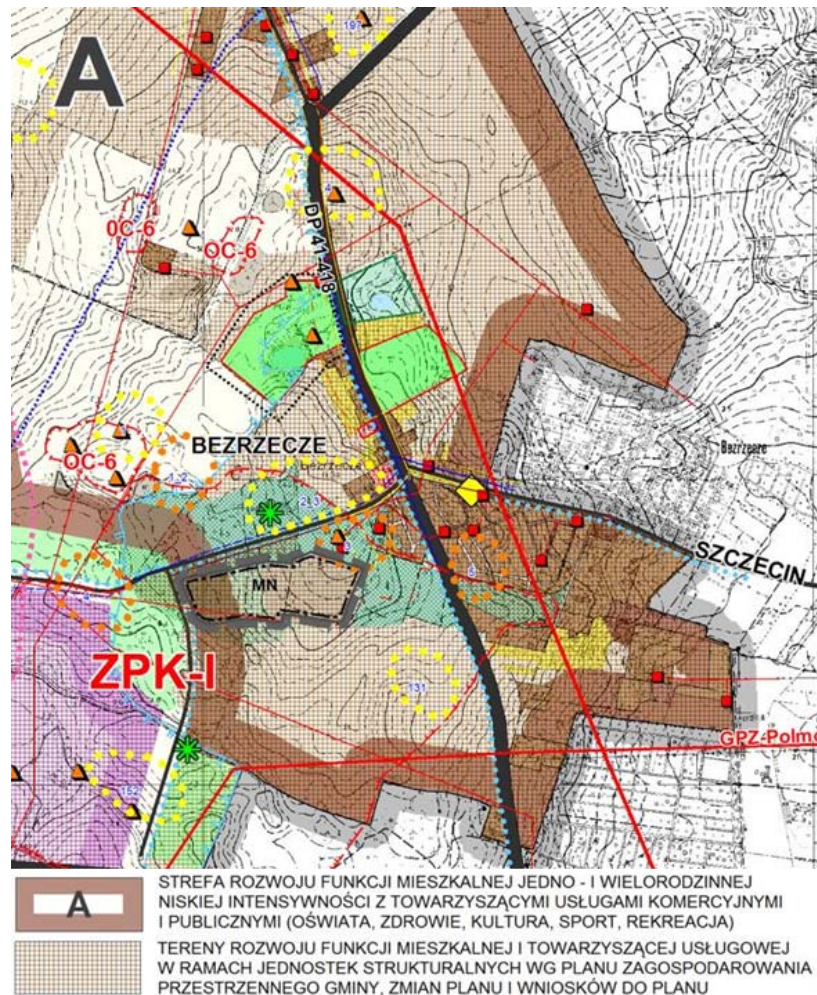


Fig. 8. Fragment of the Study in the field of spatial development directions of Bezrzecze. *Source:* Study of conditions and directions of spatial development of the Dobra commune.

For the Bezrzecze area, spatial subtraction has been made between areas designated for local housing purposes and areas already invested developed in this way. As a result of spatial subtraction, the obtained score was 52.2967 ha.

According to the Local spatial policy, there are two medium-sized building plots in the area of Bezrzecze. As a rule, the average size of a building plot in the "A" area is 1000 m², however in the southern part of Bezrzecze, it is assumed that this value should amount to 900 m² on average. For further calculations, the average size of a building plot for residential development at the level of 950 m² was assumed.

The area intended for housing development was divided by the average size of the building plot, which resulted in 550 building plots. Based on the data of the RCiW District office Police, the average usable floor area of a detached residential building was determined at the level of 160 m². Multiplication of the number of potential building plots by the average usable floor area of a residential building made it possible to determine the absorption of residential areas within Bezrzecze at the level of 88,000 m².

In order to verify the result of spatial absorbency obtained in the above calculations, it was decided to check whether steps are being taken in Bezrzecze to transform the current use of land for housing

construction purposes. For this purpose, the geoportal of the Dobra commune was used. Cadastral data (Kwartnik-Pruc 2013) indicate that real estate divisions are carried out in the area of Bezzrzece, which prove the intentions of property owners related to the implementation of housing (Figure 9). The division of real estate involves the need to incur financial costs. Considering the expenditures that had to be incurred in order to separate construction plots for detached housing, it can be stated that the supply in this respect is high. Referring to earlier absorption calculations in economic terms, it may be suspected that areas intended for detached housing within Bezzrzece may be "absorbed" by the market in less than four years.



Fig. 9. Real estate boundaries in Bezzrzece (A - Gónna street area, B - Wilanowska street area).

Source: Spatial Information System of the Dobra commune (<http://dobraszczecinska.e-mapa.net>).

4. Conclusions

Real estate market phenomena are not detached from the socio-economic environment of the entire market, hence the reference of these phenomena only to planning documents is insufficient (FORYŚ, PUTEK-SZELĄG 2015). The problem should also be analyzed in the economic aspect (GORZYM-WILKOWSKI 2006).

In the analyzed period of thirteen years, a total of 54,827 m² of land for residential development was traded. The planning forecast assumes the capacity of the area at 88,000 m² of land for detached housing development. Adding to this the economic absorption forecast in 2018 at the level of 29,642.8 m², this may mean a reserve of land for less than four years. Of course, the estimates should take into account the forecast error related to the so-called re-sale and the problem of function transformations.

The analyses of the concepts used in the literature presented in the work make it possible to challenge the legitimacy of using the term "absorption", which was used by the legislator. The result of the estimates in terms of planning seems to relate to capacity. Lack of reference to the ability to assimilate or process over time should be analyzed by spatial planning practitioners. Speaking of absorption, it would be worthwhile to refer, in the future, to the absorption of human investment by the natural environment, while maintaining the capacity of the environment to regenerate its resources (ŚWIĄDER 2018).

The issue of whether the surface area expressed in the surface unit should be taken into account for the calculation of spatial absorption, in terms of planning is still a matter of consideration. As indicated by STUŁA and KAZAK (2018), the calculations should also take into account the geometric features of the objects, determining the physical possibility of separating the building plot. However, regardless of the adopted principles of estimating spatial absorption, the intention of the legislator, aimed at limiting the excessive allocation of land for construction investment purposes, should be positively assessed. This mechanism may have a positive impact on halting the process of the excessive spreading of buildings (ŻRÓBEK-RÓŻAŃSKA et al. 2017, SOLECKA et al. 2017, KAZAK et al. 2014) by illustrating to decision makers the possible effects of planned investments in space (HEŁDAK, PŁUCIENNIK 2017). Calculation of similar spatial indicators positively affects the process of resource management on a local scale (SZEWRĄŃSKI et al. 2017), and currently available geoinformation tools enable the use of these indicators to build interactive decision support systems for spatial planning (KAZAK et al. 2017, KAZAK 2018).

Complementing the conducted analyses may be the future research of further, especially neighboring areas for which local spatial development plans assume single-family housing development and their interaction in the context of demand for such type of real estate, and a wider cause and effect analysis including other factors from the real estate market environment influencing the studied absorptiveness and capacity of the local market.

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