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TRANSFORMATION OF PUBLIC SPACE IN RURAL AREAS – IDENTIFICATION AND ASSESSMENT OF ITS MANAGEMENT IN SELECTED COMMUNES OF WIELKOPOLSKA PROVINCE

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ABSTRACT

The goal of the work is to identify public space types in rural areas of Wielkopolska Province and determine their specific nature by means of learning about the way and state of their management. The research material is based on the results of a survey conducted in 2014–2018 in the following five communes: Drawsko, Jarocin, Kaczory, Komorniki and Zaniemyśl. The assessment of the identified space types revealed considerable differences both between the communes and the types of examined common space. The overall state of public space management was evaluated as best in the commune of Komorniki and the lowest scores were given to the commune of Jarocin. What is worth noting is high repeatability of very good scores for places such as a school sports ground and a village community room. It was suggested that a school sports ground could be considered a distinct type of new rural public space. In rural areas more and more frequently one can observe facilities which are usually associated with those available only to city dwellers.

Key words: common space, rural area, type of space, Wielkopolska

INTRODUCTION

The range and pace of transformations taking place in Polish rural areas during the first two decades of the 21st century are comparable to the degree of changes which occurred in the first years of the period after 1989 (Przemiany struktury… 2006, Rola środków… 2010, Głębocki 2014, Kalbarczyk 2014). These transformations include not only the economic sphere, as an effect of e.g. the influx of additional funds from the EU or the development of farm multifunctionality, but also the social sphere (Głaz and Hasiński 2010, Kołodziejczak 2010, Wójcik 2010). The phenomenon which cannot be overestimated in the latter sphere is reversal of the direction of movement of people from villages to towns. New rural-urban inhabitants of rural areas are only beginning to be the object of academic studies (Matysiak 2019). However, without a doubt they bring both a new character and new (higher?) expectations regarding the quality of life in a rural community. In this context, availability and management of common space in rural areas gain a new meaning.

Importance of public space for building good neighbourly relations, and at the same time its influence on quality of life, has been emphasised

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in publications of many researchers (Zimnicka and Czernik 2007, Gehl 2010, Problemy kształtowania… 2010, Jagori 2011, Søholt 2017). The intensified pace of suburbanisation in Poland increased interest in the processes of rural area transformation in suburban areas (Zimnicka and Czernik 2007, Niedźwiecka-Filipiak and Borcz 2010, Mierzejewska 2011). Nevertheless, the issues of transformation regarding public space management in purely rural areas are raised slightly less often (Soszyński et al. 2016). For this reason conducting research on rural public space has been considered justified. In accordance with the definition from the Act on Spatial Planning and Development of 27 March 2003 (Dz.U. 2003 nr 80 poz. 717) a public space is "an area of a special importance for fulfilling the needs of inhabitants and improving the quality of their lives which contributes to establishing social interactions due to its location as well as its functional and spatial features". In the literature one could find numerous types of public space (Global public… 2016). Generally a public space is divided into: streets and pavements, open public spaces (squares, boulevards, watersides, esplanades, avenues), green spaces (gardens and parks), and non-identified, empty spaces. A more detailed typology was proposed by Wantuch-Malta (2016), who enumerates: new manifestations of architectural types, revitalised squares and streets, new roads and streets, green public spaces of a contemporary city, integrated transport hubs and new public spaces connected with municipal public transport systems, commercial and retail spaces, waterside public spaces, postindustrial spaces and former urban wasteland, residential development, and complex systems. The above-mentioned types refer primarily to urban spaces. An interesting division of village public spaces was presented by Górka (2012), who distinguished the following categories of new village common spaces: playgrounds, village greens, village parks, squares and streets, and special-use spaces.

As a research hypothesis, the work makes an assumption that in rural areas there are changes in the presence and number of certain public space types as well as the way and state of their management. The goal of the work is to identify public space types of selected communes in Wielkopolska Province and determine their specific nature by means of learning about the way and state of their management.

MATERIAL AND METHODS

The research material is based on the results of a survey conducted in 2014–2018 in the following five communes: Drawsko, Jarocin, Kaczory, Komorniki and Zaniemyśl (Fig. 1).

The study selected communes different in terms of area size, population size, and population density (Tab. 1), having a different location in relation to the administrative centre of the province (periphery – Poznań metropolitan area). Field research was conducted in each of the communes at least twice, once in the autumn–winter season and another time in the spring–summer season.

Site inspections determined a type of public space, its predominant users, functions, availability and the way and state of its management taking into consideration architectural elements, greenery and special-use facilities. The state of management was evaluated on a scale from 1 to 5 where 1 equalled a very bad state and 5 – very good. In addition, photographic

Table 1. Basic data on communes of Wielkopolska Province included in the research

Marked as in Fig. 1	Name of a commune/district	Area [km^2]	Population*	Density of population [inhabitants/km^2]	Number of village administrative units
1	Drawsko/czarnkowsko-trzcianecki	162.95	5 866	36	12
2	Jarocin/jarociński	200.23	45 853	229	23
3	Kaczory/pilski	150.05	7 952	53	12
4	Komorniki/poznański	66.55	29 415	442	8
5	Zaniemyśl/średzki	106.76	6 939	65	18

* as of 2018, BDL (2019)

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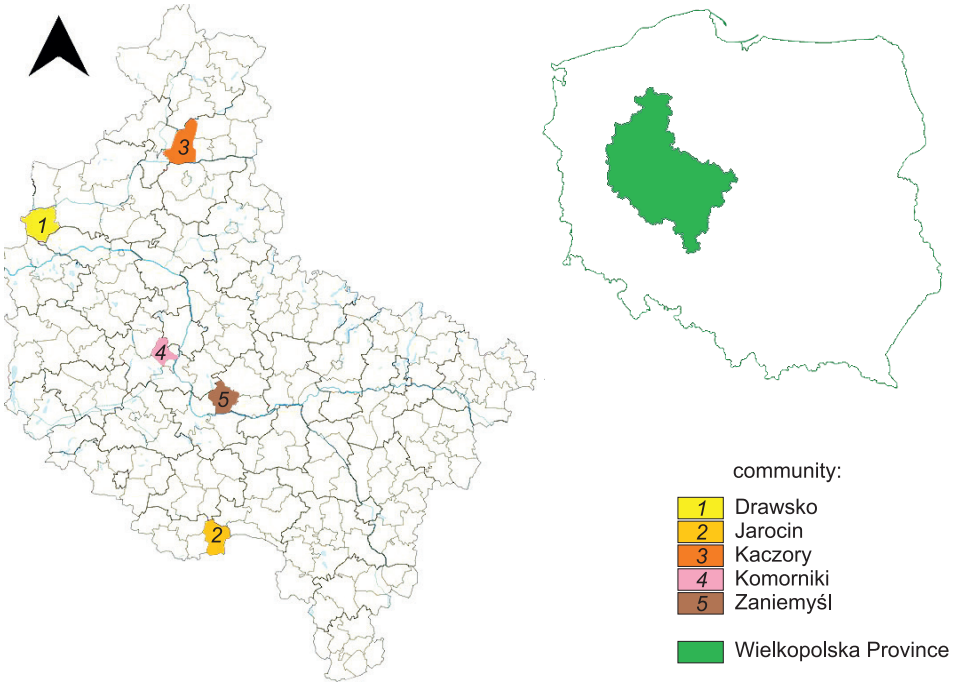

Fig. 1. Location of the examined communes in Wielkopolska Province

documentation was made for particular places. The field research was preceded by the review of literature mainly on the development of rural areas and public space. Subsequently, the gathered material in the form of photographs, questionnaires and tables used during the field survey was analysed. The division into basic types of rural public place was adopted after Górka (2012) who differentiated the following categories of new rural common areas: playgrounds, village greens, village parks, squares and streets, special-use spaces.

The obtained results were presented graphically and in the form of tables using the Microsoft Office 2016 graphics and word processing tools.

RESULTS

In the examined area of rural areas all types of common space distinguished by Górka (2012) were identified; however, not in each of the examined communes at the same time (Tab. 2).

The most diversified in this respect was the commune of Jarocin where places belonging to each of the five main types of space were identified; next came the communes of Kaczory and Zaniemyśl; the least diversified was the commune of Drawsko with places classed only as two out of the five considered types of space. Out of the specified types of common space the most frequently identified were playgrounds and special-use spaces, merging all the remaining types (Fig. 2). Due to high chances of classifying all places which did not strictly reflect the four specified types of space as the remaining type, a type grouping highly varied spaces, and at the same time the most numerous, was created. It was affected by the presence of spaces adjoining such frequent facilities as a bus stop. However, in this case one could consider suitability of classifying this place as the type: squares and streets. Interestingly, the next most frequent type of space was a school sports ground, closely followed by space in the vicinity of places of religious worship (shrine, church, statue) and a village community room. In addition to numerous school sports grounds, the presence of many sports recreation facilities was observed, e.g.: an outdoor gym, a sports hall, a marina on a lake; and leisure facilities such as a bonfire area, a lake beach, and a theme park (Fig. 3). The above

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Table 2. Types of public space in selected rural communes in Wielkopolska Province – identification

Types of public space	Rural commune				
	Drawsko	Jarocin	Kaczory	Komorniki	Zaniemyśl
Playground	*Y* (16)	*Y* (22)	Y (6)	*Y* (8)	*Y* (7)
Pasture ground	*N*	*Y* (1)	*N*	*N*	*N*
Village park	*N*	*Y* (5)	*Y* (2)	*Y* (1)	*Y* (2)
Village square (including market square)	*N*	*Y* (4)	*Y* (4)	*N*	*Y* (1)
– special spaces, including:					
– sports field	*Y* (4)	*Y* (4)	*Y* (15)	*Y* (17)	*Y* (2)
– sports hall	*N*	*N*	*Y* (1)	*N*	*Y* (1)
– outdoor gym	*Y* (3)	*Y* (2)	*N*	*Y* (1)	*Y* (1)
– rural club room	*Y* (1)	*Y* (9)	*Y* (13)	*Y* (2)	*Y* (3)
– railway station	Y (1)	*Y* (4)	*Y* (1)	*N*	*N*
– bus stop	*Y* (19)	*Y* (18)	*Y* (5)	*Y* (>20)	*Y* (11)
– area adjacent to religious sites (church, roadside shrine/figure)	*Y* (21)	*Y* (6)	*Y* (5)	*Y* (2)	*Y* (3)
– public library	*N*	*Y* (2)	*N*	*Y* (1)	*Y* (2)
– beach	*Y* (2)	*N*	*Y* (2)	*Y* (1)	*Y* (3)
– place for a bonfire	*Y* (14)	*Y* (2)	*Y* (2)	*N*	*N*
– theme park	*Y* (1)	*N*	*N*	*N*	N
– marina/harbor	*Y* (1)	*N*	*N*	*N*	*N*

Explanations: *Y* – confirmed occurrence of a given type of space; *N* – no identification of a given type of space (in brackets – the number of identified places of a given type in a given commune)

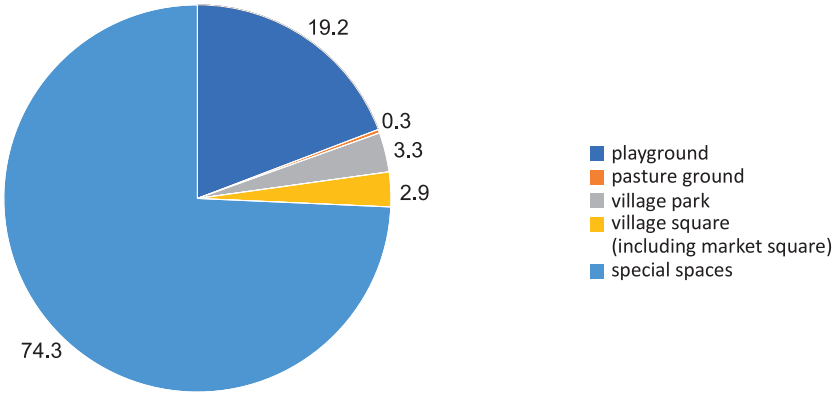

Fig. 2. Structure of public space types [%] in rural areas of selected communes in Wielkopolska Province

mentioned places usually occur individually and only in some of the communes, but their presence in rural areas cannot be omitted. Frequent and relatively numerous sports grounds justify the sense of separating them and treating as another type of common space present in rural areas.

The assessment of the state of the identified types of space showed considerable differences both between the communes and the types of examined common space. The state of common space evaluated in several villages in each of the communes differed in the range of awarded scores and therefore the results were not averaged for a commune, but all the most frequent scores were listed. Thanks to this, the actual state of management of these spaces was reflected better. In the overall evaluation of common space management, the commune of Komorniki ranked highest; it was given very good and good scores (Tab. 3).

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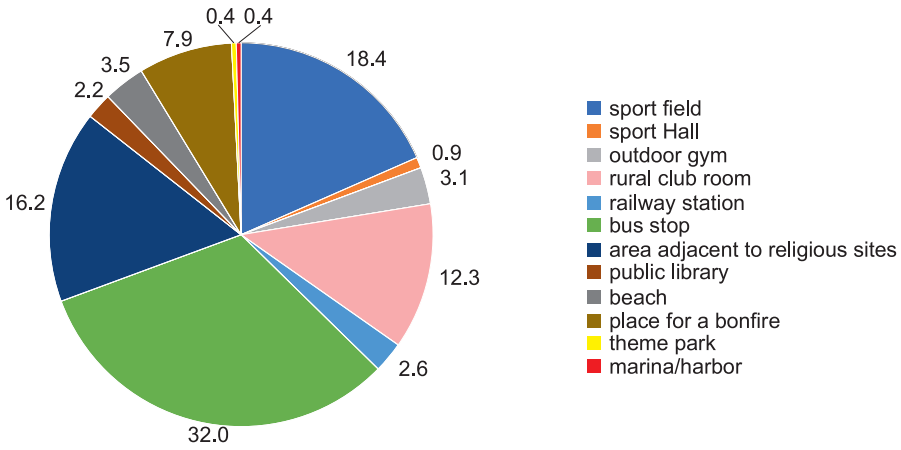

Fig. 3. Types of special public space [%] in rural areas of selected communes in Wielkopolska Province

Table 3. Assessment of public space management in rural areas by specific types in selected rural communes in Wielkopolska Province (on a 1–5 scale)

Types of public space	Rural commune				
	Drawsko	Jarocin	Kaczory	Komorniki	Zaniemyśl
Playground	2; 5	2; 5	3; 4	4	4
Pasture ground	–	–	–	–	–
Village park	–	4	3	5	3
Village square (including market square)	3	2; 5	3; 4	4	4
Sports field	2; 5	1; 4	2; 4; 5	5	4; 5
Other special spaces	1; 5	1; 3; 5	2; 5	4	2; 5

Explanations: 1 – very poor condition, 5 – very good condition

The lowest scores were given to common spaces in the commune of Jarocin; some of them (e.g. an outdoor gym) were even assessed as very bad. What was noticed was high repeatability of good and very good scores for places such as: a sports ground, a village community room or a playground.

DISCUSSION

The common space in rural areas identified in the work differs in many respects, e.g. functions served, availability, the state of its management and equipment; however, they are all aimed at fulfilling the need of direct contact between the members of a local community. Such understanding of public space is close to the definition of this notion by Lorens (2010). In definitions of public space applied by other authors a differentiating factor was also creating conditions for interaction and direct contact (Chmielewski 1996, 2001, Dymnicka 2013). According to Lorens (2010), physical availability of space may be temporarily limited by the way it is organised. Therefore, public space may include not only open space such as sports grounds or playgrounds but also facilities like a village community room or a village library.

The work, while identifying the occurrence of public space types, used a typology proposed by Górka (2012) which in a clear way enables classification of common space in rural areas. The conducted identification pointed to over-representation of facilities/spaces of one of the types (special-use space). Thus, introduction of another type of space was suggested, i.e. a sports ground. Recreation facilities were distinguished among types of public space

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by Soszyński et al. (2016), who, describing the types of public space, applied a functional division. On the other hand, Tomecka and Korzeniowska (2017) distinguished such categories of space as: squares separated from the spatial structure, areas adjacent to service facilities and public buildings, space next to recreation facilities, and space open to landscape and roads.

In the overall evaluation of common space management, the commune of Komorniki ranked highest, the lowest scores were given to common spaces in the commune of Jarocin. It is worth pointing out that the communes have extremely different locations in relation to the administrative centre of the province but a similarly high population density (Tab. 1).

The conducted assessment of the identified public space showed more and more frequent presence of very well managed places, highly rated by their users, places which have been recently created or renovated. The facilities which were most frequently renovated or arranged included playgrounds, school sports grounds and village community rooms. It may prove effectiveness of actions taken in the first decades of the 21st century by rural communities, including applying for funds for construction or renovation of such facilities (Głaz and Hasiński 2010, Wójcik 2010, Czapiewska 2011).

In rural areas one can increasingly observe facilities which are usually associated with those available only to city dwellers, such as a sports hall or an outdoor gym. Czapiewska (2011) noted that the changes occurring in rural areas assume a character of a large social movement, which in the long-term may lead to transformation of "the image of the Polish countryside". The observations made in this work may indirectly serve as another proof of large-scale transformations which have been taking place in rural areas since the 1990s. Multifunctional development of rural areas, initiated at that time, at first mainly through ecological agriculture and agritourism (Bobrowski 2006, Kalbarczyk and Kalbarczyk 2007), offered not only new possibilities to village dwellers (Matysiak 2019), but also, in some rural areas, attracted new urban-rural inhabitants, increasingly urban lifestyle and new expectations from common space.

CONCLUSIONS

The conducted assessment of the presence and management state of the identified types of space showed considerable differences both between the communes and the types of examined common space. In the overall evaluation of public space management in selected rural communes of Wielkopolska Province the commune of Komorniki ranked highest. The lowest scores were given to public spaces in the commune of Jarocin. Most frequently, very good and good scores were awarded to such places as: a school sports ground, a village community room and an outdoor gym, which mainly results from the fact that in recent years those objects underwent renovation works or are newly-built facilities. The work pointed to frequent presence of sports grounds. Therefore, it was suggested that a sports ground could be considered a distinct type of new rural public space.

The observations made in this work may indirectly serve as another proof of large-scale transformations which have been taking place in rural areas since the 1990s. In rural areas one can increasingly observe facilities which are associated with those available only to city dwellers, such as a sports hall or an outdoor gym.

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GEOINFORMATION SUPPORT SYSTEM FOR REAL ESTATE MARKET

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ABSTRACT

Investing in real estate is one of the major investment areas in the world. While buying real estate people often consider – apart from standard analysis like size, standard, age, equipment – location and market prices. There is no doubt that the access to a large set of data describing and presenting property environment at present, market participants (targeted users = buyers and sellers) use the services of intermediaries or real estate appraisers, which generate extra costs, or they conduct the research using their own computers or mobile devices.
The main goal of idea is to create an automatically generated information system for real estate market members. The proposed solution can allow delivering filtered information to the user. It can be presented in conjunction with the location. The user can be able, while standing in or near the property. The proposed solution consists of: positioning based on the phone GNSS (Global Navigation Satellite Systems) receiver and radius specification. As a result, valuable information can be displayed in AR (Augmented Reality) technology or on a map where location and unit prices are visible.

Key words: real estate market dynamics, augmented reality, spatial analysis

INTRODUCTION

Geoinformation Support System (GSS) will determine a mobile device coordinates using GNSS systems (GPS, GLONASS, Galileo). It is possible to use the system to present the market (transaction prices) in augmented reality (AR) technology and generate statistics by the asking position/user. Currently, there are over 400 thousands of purchase/sell transactions made per year only in Poland. During the transaction, two sides- buyer and seller meet. They are potential users of the service (about 800 000 of people in total – there are at least two people per transaction) (Eurostat 2018, GUS 2018). Each of the sides is trying to reach to information on as many as possible recent transactions to make the right choice when it comes to the paid price. At present, the access to the real estate market analysis in chosen location can be assured by the experts (brokers or real estate appraisers). This service is both expensive and time consuming. GSS solution can allow collecting and filtering the information for the chosen location. Currently, there is no such service in Poland and in other european countries. Hence the assumption that potential buyers and sellers of real estate will be interested in such a system.

The second group of users are financial institutions, using the GSS system will be able to significantly automate the method of defining the risk when granting mortgages. The analysis, which is dedicated

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for specified location, will allow for market analysis together with the average real estate price estimation for chosen area. Within the financial institutions, the companies dealing with real estate investment will form a significant group of service receivers (Renigier-Biłozor et al. 2018, Kowalczyk et al. 2019). The proposed GSS system will allow tracking the market tendency based on distributed data sources from which valuable information together with location attribute about the market condition is generated. Currently, the reports describing only the global situation on the real estate market are available. The number of real estate transactions that were made last year consists over 2 mln of authenticated deeds. 412 000 of them concerned sell. The rest of them where other forms of legal status regulations. Both sellers and buyers are very interested in finding the optimum price by trying to get to know the prices that have been recently reported in the neighborhood of the sold property. The proposed business is about delivering, to over 800 thousands of people (over 412 thousands of transactions involves over 800 thousands of potential users each year – a buyer and a seller for each transaction), the selected and valuable information about the real estate sales (market conditions) in the chosen neighborhood each year. GSS is about delivering to nearly 800 000 people per year a selected information about the unit prices of real estate sold in the neighbourhood (understood as a location chosen by the application user). The Figure 1 shows the type of properties that were the largest group of sell transactions made in 2018. It follows that the largest group of transactions are contracts for the sale of premises and plots.

The user will run the application in a place selected for transaction. Based on the GNSS technology, the mobile device will determine user position. The user will select the type of desirable property and the radius from which the transaction prices should be displayed. As a result, the location report and a map showing transaction prices will be displayed. A visualisation of the transaction places in the neighbourhood (using AR technology) will be an extra option.

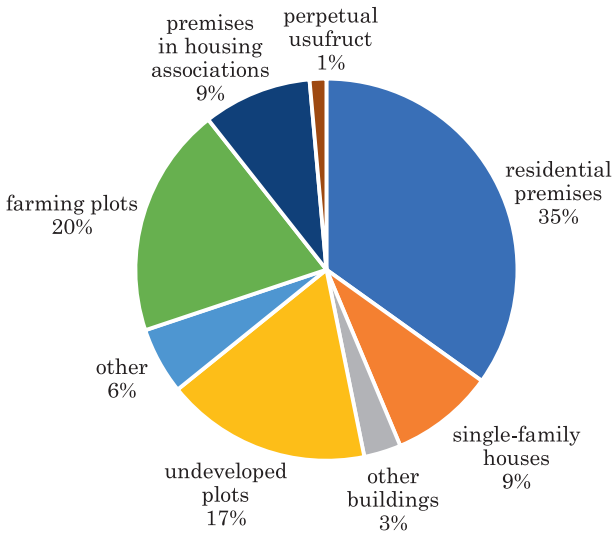

Fig. 1. The structure of real estate authenticated deeds in 2018 (GUS – Central Statistical Office)

Current knowledge confirms that users often ask counsellors for a summary of real estate market data from a given area in clear readings, including the number of buy/sell offers, the number of bids in time (the answer to whether the number of offers increases or decreases), and minimum, maximum and average prices.

The created service will have a very important feature of adapting to users' needs (Baier et al. 2015, Scholz and Smith 2016). The created database will allow for proper data filtering and sorting in order to create valuable information that is compatible with the expectations of different user groups.

Analyzing the market of mobile applications related to the real estate market in Poland, it can be concluded that augmented reality solutions are missing. Many solutions using AR in the international market are patent pending (Rese et al. 2017, Rauschnabel et al. 2019). Examples of such solutions are:

- real estate property project analysis using augmented reality user devices (Dintenfass 2018),
- augmented reality for maintenance management, asset management, or real estate management (Alonzo 2014),
- systems and apparatuses for providing an augmented reality real estate property interface (Zhang et al. 2018),

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– real-time analysis involving real estate listings (Calman et al. 2014),
– augmented reality property system for displaying moment file of user created content tagged to location including augmented estate owner content (Suiter et al. 2019),
– augmented reality real estate mls and virtual tours (Merati 2019),
– augmented Reality Based Mobile App for Home Buyers (Banerjee et al. 2015).

By following the offers of mobile applications a group of applications related mainly to apartments can also be found. Both with their equipment and display. The most important include:
– realtor.com (https://www.realtor.com)
– Commercial Real Estate AR (https://play.google.com/store/apps/details?id=com.cre.ar&hl=en_AU)
– Realar Places (https://www.realar.com/)
– IKEA Place (https://play.google.com/store/apps/details?id=com.inter_ikea.place&hl=pl)
– Drooms (https://drooms.com).

The aim of this paper is to present the possibilities of using augmented reality in the real estate market. The article presents the author's own vision of the system. In the further part of the work, technical and functional characteristics of the system were described, as well as the assumptions of augmented reality operation.

SYSTEM DESCRIPTION

At the moment, there is no viable solution (working in real time) on the market that would enable to properly make an investment decision. Currently available systems are just real estate valuations based on offers posted only on one portal. The restriction of these systems is to limit themselves to only one offer portal without obtaining data about actually executed transactions.

The innovation of the proposed solution is based on using mobile phone coordinates and defined range for market analysis. Based on the established data from the server powered by bid prices from the area (information obtained using search engine) and transaction prices from RCiWN (real estate price and value record) client will receive desirable information. Client will receive feedback as a report displayed with the use of expanded reality. There are market solutions that focus on individual elements like displaying real estate information using expanded reality, but they are based on data obtained from brokers. Such database is poor because of the specifics of the real estate brokerage market. In Poland, there are very few exclusive contracts between real estate agents and sellers. This results in no information about the real estate location in the sale offer. The proposed solution will use, except from big data, the information about completed transactions to generate final report. This will make it easy to evaluate the attractiveness of the offer. At the moment, there is no such solution on the market. Such analyzes are ordered individually, last for a very long time and require from investors to engage large capital. In contrast to the above, our solution will be attractive for everyone. Beginning with large investment funds, and ending with individual buyers looking for the apartment or a single plot.

Current knowledge confirms that users often ask counsellors for a summary of real estate market data from a given area in clear readings, including the number of buy/sell offers, the number of bids in time (the answer to whether the number of offers increases or decreases), and minimum, maximum and average prices (Oksman et al 2012).

After running the application on a mobile device in a place where one wants to buy a property, the user will have to determine its type and radius from which the transaction prices should be displayed on the screen along with a map. An additional option would be to visualize places (using AR technology) where transactions took place, which makes the service more attractive and allows for easy identification of the property in the neighborhood where a transaction took place.

The service will also have an automatic browsing system (robot) for the existing data sets about the buy/sell offers. It will allow generating statistics of the properties offered in the area of interest. The future price trends for the location will be displayed based on the artificial intelligence algorithms.

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While conducting projects using geoinformation for companies involved in infrastructure construction we have noticed unused potential of existing data sets stored in unreadable formats for a wide audience. It was an idea to process the data and create valuable information dedicated for a wider audience. The main assumptions for idea are (Jang 2012, Lang 2012, Yovcheva 2015):

- providing information to a wide audience in the areas most relevant for investment decision making,
- users decides what area to analyze the market,
- creating artificial intelligence algorithms to predict trends based on distributed data sources on real estate purchase/sell,
- using the latest visualization techniques – Augmented Reality.

The system will be a combination of technical solutions:

- determining user position (geolocation) based on the mobile device equipped with GNSS (Global Navigation Satellite System) module,
- geolocation of filtered transaction data for the need of conducting analysis in the chosen area (radius/distance from the user),
- creating augmented reality markers illustrating transaction place (sold real estate).

TECHNICAL CONCEPT

The architecture of the proposed solutions is shown in Figure 2.

The system will consist of three areas related to each other: data sources, server and client. Data presentation with the use of augmented/expanded reality demands the use of equipment that fulfils specific technical requirements. They result directly from the architecture of such solution that will consist of: client-location module, client-interaction module, client-presentation module, Database Browsing Server, Database Processing Server, Data Storing Server.

Client-location module – module responsible for real world analysis. The sensors built in devices (measuring sensors, camera, GNSS receiver) will be used at this stage. The process of location determination is multistage. The first stage determines the position using one or many sensors. Next, the information with fixed coordinates will be transferred to the system.

Client-interaction module – subsystem responsible for communication (application interaction) process with the user.

Client-presentation module – subsystem responsible for data display. In case of presenting data in AR

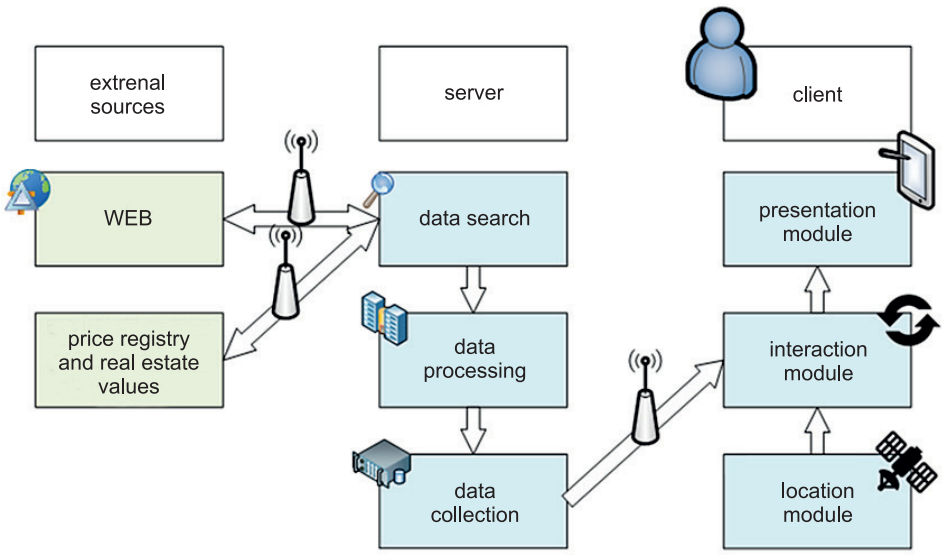

Fig. 2. Description of the proposed system architecture

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technology it is crucial to connect the camera signal from the device with visualized data.

Database Browsing Server – module that includes two search processes based on different algorithms: web search process with real estate sales and database search module with transaction price register.

Database Processing Server – module responsible for processing data which were obtained for database form that is essential for fast polling by the client module. Within this module, a geolocalization is conducted.

Data Storing Server – database consisting of peripheral devices which are used by the clients for polling. Robots which, based on the query containing client location data, will prepare statistics for the user will be created within this module (Judge 2018, Werner 2019).

SOURCE OF DATA ON TRANSACTIONS

A database is an integrated set of data from a certain field. The spatial database is a base extended additionally with a spatial factor, therefore, in addition to the descriptive attributes of objects, it also includes records regarding their geometry (Bydłosz et al. 2009). Such a database is the Real Property Price Registry, hereinafter referred to as "RCiWN" or the "register". It contains information on transaction prices of real property specified in the notarial deeds and the value of real estate included in appraisal reports, from which the statements are forwarded to the units that run the property cadastre. It is an integral part of the register of land and buildings, although it is a separate resource from it.

Taking into account the legal status of the register, it should be classified as:
- part of the spatial data base of the country's spatial information infrastructure
- part of the state geodetic and cartographic resource
- public information
- an element of the spatial information infrastructure (Siewicz 2012).

RCiWN is an administrative register constituting one of the sources of data in public statistics. The sources were divided into two groups according to the nature of their creation. These are data created for the needs of the public sector and the private sector. The Property Price and Value Register is included in the first category (Beręsewicz and Szymkowiak 2015).

The creation, functioning and sharing of the registry database is regulated by the Act of May 17, 1989. Geodetic and cartographic law (Journal of Laws of 2017, item 1566), hereinafter referred to as "PGiK". According to art. 4 par. 1a, RCiWN is a part of the spatial data infrastructure database maintained in the IT system, therefore it is also subject to the Act of March 4, 2010 on spatial information infrastructure (Journal of Laws of 2017, item 1566).

In accordance with §74.1 of the Minister of Regional Development and Construction from 29 March 2001 on the land and building (Journal of Laws of 2001., no. 38, item. 454), hereinafter

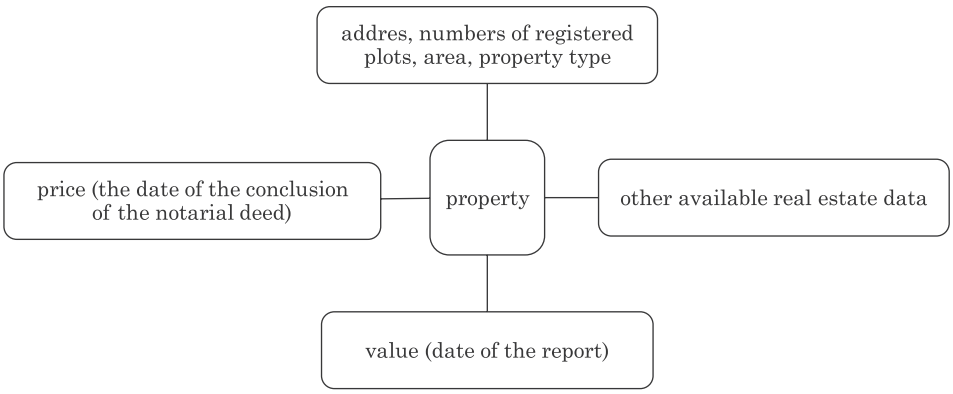

Fig. 3. The scope of data collected in the RCiWN

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referred to as „EGiB", the staroste is required to establish and maintain a register of prices and property values.

The detailed scope of information covered by the register and the scope of information covered by the register of prices and property values are specified in the EGiB Regulation issued pursuant to Art. 26 par. 2 PGiK. Figure 3 shows a graph of data connections contained in the RCiWN.

AR ENVIRONMENT

The potential area of operation of AR-based systems can be the basis for their classification. According to this criterion two basic solutions can be distinguished (de Macedo et al. 2014, Farshid et al. 2018):
– internal systems used in enclosed spaces (eg buildings)
– external systems used in the natural environment (in the open space).

Internal solutions have been developing dynamically so far. This was mainly due to the larger market for such solutions (laboratories, simulators, education, entertainment, medicine). In this solution, the location of the device and the displayed image is easier. It is caused by a limited area of the given solution's operation (eg limited number of changes in the device's location, known number of real world objects). Precise playback of AR objects is possible, among others, by supporting the Head-Up Display (HUD) type display by various sensors: wi-fi, gyroscope, accelerometers, etc.

The key element for the external solution used in the open space is the accuracy of location stability and credibility of the designated position. In this type of solution, the more accurate the location of the user / device, the better the placement of AR objects on the display. This is related to the right of transmission of Gaussian mean errors. The ability to display different types of information (from plain text to interactive 3D models) makes it possible to show objects invisible to the human eye.

The display of additional information in open areas is difficult because of classical solutions using markers or 3D models. Objects on the outside that can be used as objects to be recognized are usually characterized by low contrast (they are affected by weather conditions: sunshine or cloudiness) and relatively large sizes. This fact makes it difficult to use them in the device location process. Therefore, the best solution is to base on GNSS supported by IMU, which allows to determine the absolute position of the user. The operation of the discussed system was based primarily on the absolute position coming from the GNSS antenna. In addition to the position determined using the navigation satellites, the mobile application has the ability to determine the location via Android's Network Location Provider and determined based on the triangulation of base stations in the GSM network or Wi-Fi signal (Wi-Fi signal). This position is delivered using the Android programming interface (API) created by Google. The GNSS position is definitely more accurate, but it requires a longer initialization time and the discovered horizon. Implementation of the mobile application was done in the Unity 3D environment with the Vuforia extension supported by C # scripts (in .NET technology). Main factors for selecting the Unity 3D and develop the environment of the designed system are showed on Figure 4 (Microsoft Support 2019, Unity 3D 2019).

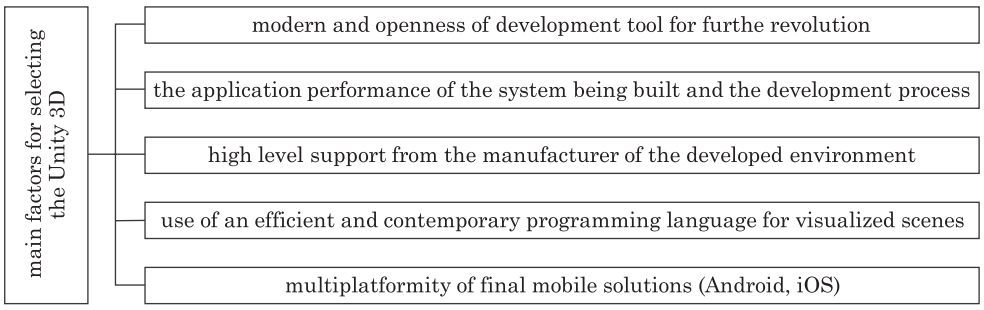

Fig. 4. Main factors for selecting the Unity 3D

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All these requirements meet the synergy of solutions in the form of UNITY 3D, which also includes other properties shown in the Figure 5.

The Vuforia environment allows to create an AR application based on five basic functionalities presented in the Table 1 (Lechner 2015, Vuforia Developer Portal 2019).

The main subject of the article is to propose a system of information about real estate/ transactions using new technologies in the field of AR, data processing and big data (Scholz and Smith 2016). Users/ customer, for the decision making process (at what price should the property be sold/bought), wants to get as much information as possible from the market in a short time. In case of the real estate market the location is very important (market conditions change along with the location) that is why obtained information should be filtered according to the questioning location (user/customer). At the moment, a great number of the fragmented data causes that the information that reaches the user doesn't have complete features. For example information about offers acquired from websites often does not include the exact location (brokers need to sign an exclusive agreement). Acquiring information on actual transaction prices takes time and analysis performed by a real estate appraiser. The proposed database will allow creating services dedicated for financial institutions (banks) to allow them to define the risk while offering credit for property purchase in the specified location. Also, investment funds will be able to easily assess their portfolio by accessing global statistics from distributed data sources (Fig. 6).

Taking into account the division of the use of AR technology into two internal and external environments, we can highlight the possibilities of its use regarding real estate (Carvalho et al. 2011, Mori et al. 2016). The first of them is the ability to display spatial models of residential real estate (Fig. 7).

Another option is to use AR in an external environment to display properties for sale (Pang et al. 2020). This solution has its limitations on the Polish market. There are very few exclusive contracts signed between brokers and sellers. This results in a small address database. Information without detailed addresses is placed on the Internet. The second lim-

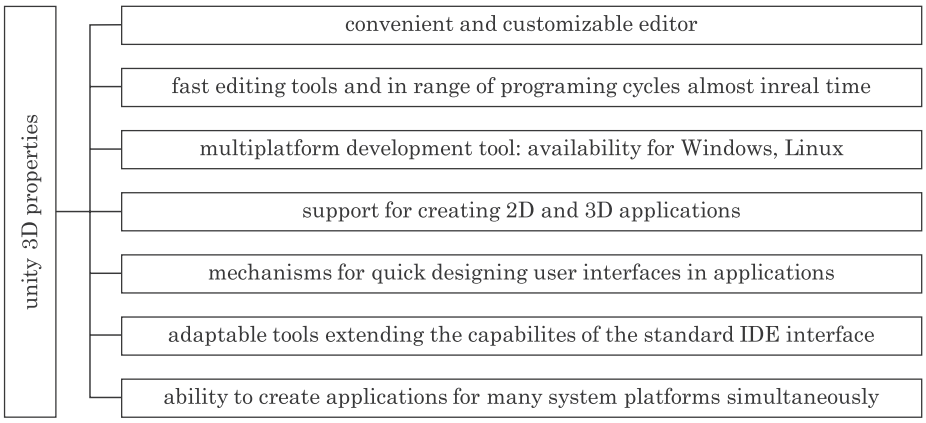

Fig. 5. Unity 3D properties

Table 1. Vuforia Features

Vision capabilities	Scalable recognition	Powerful creative palette	Supports popular tools	Supported devices
– images – objects – environments – text – markers	– Cloud Databases – Device Databases	– content: video playback – interactions: virtual buttons – FX: – background effects – occlusion management	– Xcode – eclipse – unity	– mobile devices (Android ICS and iOS) – digital eyewear (Epson BT-200 and ODG-X7)

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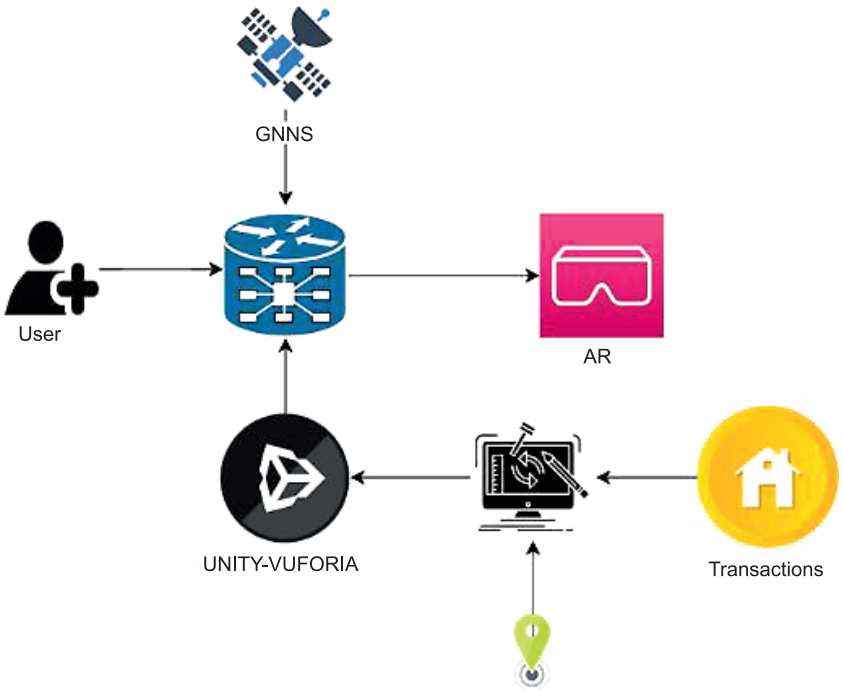

Fig. 6. Workflow

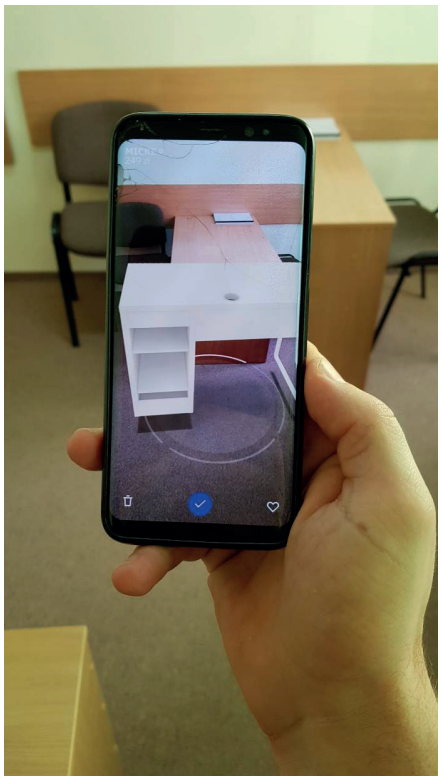

Fig. 7. Example of a flat with furniture in augmented reality (IKEA Place application)

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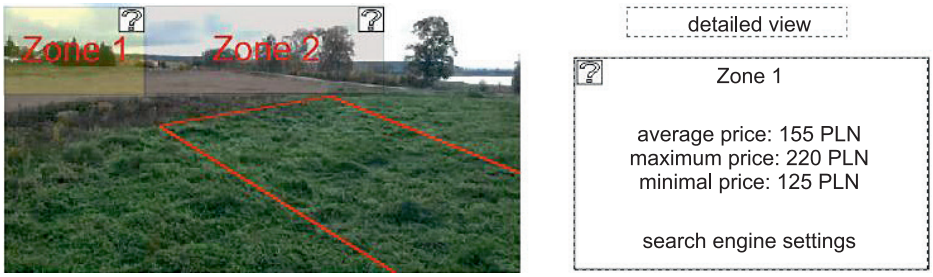

Fig. 8. An example of displaying information about transaction prices in a given area

itation is the poor accuracy (several meters) of determining the autonomous height based on single-frequency GNSS receivers in smartphones (Marchand et al. 2016). This results in the fact that the sample information displayed in the AR for an apartment on the 3rd floor will be displayed a few meters too high or too low, what may mislead the user. Therefore, the concept of displaying transaction price areas in a given area bypasses the limitation related to the precision of displaying information in AR. An example of a solution is shown in the Figure 8.

The user can choose the zone generated in augmented reality. Based on the detailed settings, the user selects the radius and direction of analysis. For the given settings, the main view displays the main information on average prices, maximum and minimum prices in a given area.

CONCLUSIONS

A public opinion poll on the functioning of the telecommunications services market and consumer preferences carried out by the Office of Electronic Communications in 2018 indicates that 74.8% of Poles have a smartphone. Smarfons are beginning to have more and more computing capabilities and are increasingly replacing computers in everyday use (Mekni and Lemieux 2014). Today, most websites are viewed on smartphones. That is why it is very important to create dedicated systems for mobile devices. Geoinformation Support System is such an offer. The GSS system uses the capabilities of smartphones (GNSS antenna, camera) in order to best display information about the real estate market. Each new solution appearing on the market has various limitations. At present, the biggest risk is seen in the area of technological solutions. In the system assumptions, three modules will be used: transaction data processing, data base search and transaction data storing and sharing (along with data sharing using AR technology). The current risks of the AR are classified based on the following aspects: technology, social acceptance, usability. However, there are still limitations with the technology that has to be overcome. AR system has to deal with vast amount of information in reality. Therefore, the used hardware should be small, light, easily portable and fast enough to display graphics. Also, AR tracking needs system hardware such as GNSS to provide accurate marker. These hardware obstacles need to be resolved for practical AR use. AR systems usually obtain a lot of information, and need software to filter the information, retain useful information, discard useless data and display it in a convenient way. Also, the creation of the database browsing system will be associated with the need to create appropriate dictionary search base. The use of augmented reality in the real estate market brings primarily benefits in four areas:

– new marketing options,
– clearer understanding of products,
– better engagement,
– Save time and resources.

The created service will have a very important feature of adapting to users' needs. The created database will allow for proper data filtering and sorting in order to create valuable information that is compatible with the expectations of different user groups.

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PILOT JUDGMENTS OF THE EUROPEAN COURT OF HUMAN RIGHTS ON SYSTEMIC PROBLEMS IN THE PROPERTY RIGHTS IN EASTERN EUROPEAN STATES

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ABSTRACT

The article examines the issues related to the impact of the ECtHR pilot judgments on improving the legal systems of Eastern European states in the field of property rights protection in accordance with Article 1 of Protocol 1 to the European Convention on Human Rights. The subject of the study is the changes taking place in the legislation on property protection in Eastern European states due to the influence of pilot judgments. Special attention is paid to the relevant principles of property rights established by the case-law of the ECtHR. A brief overview of some pilot regulations adopted in relation to Eastern European states is given; an assessment of the effectiveness of the general measures taken is given. The conclusion is substantiated that many systemic problems in the field of protection of property rights of these states are largely related to the legacy of the Communist regime.

Key words: protection of property, pilot judgment, structural (systemic) problem, case-law of the ECtHR

INTRODUCTION

The Convention for the protection of human rights and fundamental freedoms (Convention), adopted in Rome on November 4, 1950, celebrates its 70th anniversary in 2020. Over the years, dozens of countries around the world have become parties of the Convention, and it is rightly considered as one of the fundamental guarantees of respect for and protection of human rights. Several Protocols have been adopted to the Convention, both supplementing the text of the international instrument itself with independent rights and modifying its provisions. In particular, article 1 of Protocol No. 1 to the Convention establishes the right of protection of property, providing that it can be applied equally to both individuals and legal entities In the judgment of the "Marckx v. Belgium" case the European Court of Human Rights (ECtHR) noted the following: "by recognizing that everyone has the right to the peaceful enjoyment of his possessions, Article 1

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(P1-1) is in substance guaranteeing the right of property… Indeed, the right to dispose of one's property constituents is a traditional and fundamental aspect of the right of property" (Marckx v. Belgium, 1979, § 63).

This article provides an overview of how Eastern European countries, which are members of the Council of Europe have approached the problem of solving systemic problems related to the violation of the right to property, namely article 1 of Protocol No. 1 to the Convention. A systematic study of issues associated with the protection of property rights related to pilot decisions will significantly expand the existing understanding of this phenomenon and assess the trends in the case-law of the ECtHR. The study of problematic issues of implementation of pilot regulations in the field of property protection in relation to the Eastern European states makes it possible to determine certain aspects of the impact of the relevant regulations on the development of national legislation.

The main purpose of Article 1 of Protocol No. 1 (A1P1) is to protect a person from unjustified interference by a state in peaceful use of his "property". However, in accordance with Article 46 of the Convention, "the High Contracting Parties refuse to abide by the final judgment of the Court in any case to which they are parties". The fulfillment of this General obligation may entail state's adoption of not only individual but also General measures, in particular, the adoption of laws, changes in law enforcement practices, etc. In this regard, the European Court of Human Rights has issued 6 pilot judgments in respect of Eastern European states, providing for the adoption of General measures to protect the property rights of several thousand citizens.

RESEARCH STAGES AND METHODS

To achieve the intended goal of the study, the following stages and research methods are used. This study starts with a brief analysis of the essence and prerequisites for creating a pilot judgment procedure. The second stage is devoted to a General overview of article 1 of the Protocol No. 1 to the Convention and the systemic problems of the legal systems of Eastern European states. The third stage is related to the study of the main elements of the interpretation of the right to protection of property, which is given by the European Court of Human Rights. Next, all pilot regulations for Eastern European states are reviewed, based on which it has been identified the problematic aspects of implementation of common measures to address legal dysfunctions in the area of property rights. The subject of the study is the systemic problems of Eastern European states in the field of property rights and pilot rulings of the European Court of Human Rights. In the process of working on the study, we used system, comparative legal, historical and legal methods, as well as methods of interpretation, logical and structural analysis.

THEORETICAL FRAMEWORK

The study is based on the analysis of the systemic problems of the legal systems of Eastern European states in the field of property rights protection in the context of the ECtHR pilot regulations. Special theoretical attention is paid to the authors who study the pilot judgment procedure in general (Buyse 2009, De Salvia 2006, Fyrnys 2011, Garlicki 2007, Czepek and Lubiszewski 2015, Maćkowiak 2016, Paraskeva 2007, Wildhaber, 2011). At the same time, the legal positions of some authors on the interpretation of Article 1 of Protocol No. 1 to the Convention, which enshrines the protection of property, were also examined (Harris and O'Boyle 2014, Rozakis 2014). In this regard, some authors give their arguments about why the legal systems of Eastern European states face issues related to compensation for past injustices (Karadjova 2004). Experts' research on the impact of the ECtHR pilot judgments on the elimination of structural (systemic) problems presents a special interest for the current research (Fribergh 2008, Ispolinov 2017, Saccucci 2012, Tomuschat 2011).

PILOT JUDGMENT PROCEDURE

The pilot judgment procedure allows the European Court of Human Rights to prescribe in its judgments not only individual measures (just satisfaction), but also general measures that are binding on the

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Respondent states. The pilot judgment procedure was firstly applied by the ECtHR in 2004 – it was done only after this procedure was consolidated in the Rules of the Court in 2011. This fact testifies to the rapid reaction of the ECtHR to the increase in the number of clone complaints caused by the presence of structural (systemic) problems in the legal systems of the Council of Europe member states. According to Michele De Salvia, "the dizzying increase in the number of complaints since 1999 has put the Convention system under stress…"(De Salvia 2006, p. 10). After the Interlaken conference in 2010, the pilot judgment procedure began to develop more intensively, which is why some authors suggest dividing the development of the pilot resolution procedure into pre- and post-Interlaken periods (Czepek and Lubiszewski 2016, p. 84, Ilchenko 2013, p. 6).

Former President of the European Court of Human Rights, L. Wildhaber, calls the pilot judgment procedure as "the boldest attempt to solve the problem of the imperfection of national legislation or law enforcement practice" (Wildhaber 2011, p. 209). Jakub Czepek notes that the pilot judgment procedure has become a necessary element of the Strasbourg landscape over the years (Czepek 2018, p. 347). Indeed, today the pilot decision procedure is a fairly flexible mechanism focused primarily on solving the primary task of reducing the Court's workload – automatic rejection of similar complaints. Another aspect of the study of the legal nature of the pilot judgment procedure is the reinterpretation of the role of the ECtHR due to the acquisition of new properties and qualities. As correctly noted by V. Sadurski, the pilot judgment procedure has partially changed the role of the Court: from a means of resolving conflicts to addressing large-scale and systemic human rights problems (Sadurski 2008, p. 95).

According to Costas Paraskeva, the end of the cold war facilitated the entry of the former Communist states of Eastern Europe into the Council of Europe (Paraskeva 2007, p. 3). At the same time, the number of potential applicants has almost doubled: from 450 to 830 million people. as a result, the number of repeated complaints has increased – according to Cristian Tomuschat, an average of 20% each year (Tomuschat 2009, p. 11). The Council of Europe's acceptance of post-communist states as members of the organization drew criticism from several authors, who referred to the lack of "stable and functioning democratic institutions" in the legal systems of Eastern European states (Harmsen 2001, p. 19). According to some authors, structural dysfunctions of legal systems "with deep-rooted Communist traditions" have blocked the Court's activities (Buyse 2009, p. 2, Fyrnys 2011, p. 1231). Former Deputy Secretary-General of the Council of Europe (1993–1997), professor Peter Leuprecht, expressed concern that "some of the new member states have rushed to ratification without bringing domestic legislation and reality into line with its requirements" (Leuprecht 1998, p. 327). In turn, the former head of the Committee on Legal Affairs and human rights of the parliamentary Assembly of the Council of Europe, Andrew Drzemczewski, stated that the expansion of the Council of Europe poses a serious threat to the ECtHR since the legal standards in several new member states from Eastern Europe are much lower than the Convention standards (Drzemczewski 2000, p. 10)

Pilot judgments issued by the European Court concerning Eastern European states are to some extent related to remnants of Communist regimes in these countries. Ireneusz Kaminski, investigating the case-law of the ECHR, calls these "historical situations" which include events that occurred shortly after World War II (Kaminski 2010, p. 10). Mariana Karadjova rightly points out that the path to democracy for Eastern European societies (necessarily) faces questions related to compensation for past injustices (Karadjova 2004, p. 362). Indeed, if we look at the pilot judgments issued by the European Court concerning Poland, Albania, Romania, Bosnia and Herzegovina, Croatia, Macedonia, Serbia and Slovenia, all the structural (systemic) problems were related to "defects" that were the result of the "Communist past" (Tab. 1). As noted by Tom Tabori although most states in Eastern Europe have enacted some form of legislation concerning the restitution of property confiscated by former regimes, some have opted to do nothing in this respect, while others have made provision within certain limits (Tabori 2013, p. 195).

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Table 1. List of pilot judgments issued by the European Court of Human Rights in respect of Eastern European countries recognizing violations of property rights

Pilot judgments	Date of acceptance	Structural (systemic) problem
Broniowski v. Poland (application No 31443/96)	22.06.2004	lack of an effective compensation mechanism for property lost by Polish citizens repatriated from territories beyond the Bug river
Hutten-Czapska v. Poland (application No 35014/97)	19.06.2006	deficiencies in the rent-control provisions of the housing legislation; the system imposed some restrictions on landlords' rights, in particular setting a ceiling on rent levels which was so low that landlords could not even recoup their maintenance costs, let alone make a profit
Suljagic v. Bosnia and Herzegovina (application No 27912/02)	03.11.2009	systemic problem due to deficiencies in repayment scheme for foreign currency deposited before the dissolution of the Socialist Federal Republic of Yugoslavia (SFRY)
Maria Atanasiu and Others v. Romania (applications No 30767/05 and 33800/06)	12.10.2010	ineffectiveness of the system of compensation or restitution, a recurring and widespread problem in Romania; the three applicants complained of the delays on the part of the Romanian authorities in giving a decision on their applications for restitution or compensation of property nationalized or confiscated by the State before 1989
Manushaqe Puto and Others v. Albania (applications No. 604/07, 43628/07, 46684/07 and 34770/09)	31.07.2012	non-enforcement of administrative decisions awarding compensation for property confiscated under the communist regime in Albania
Ališić and Others v. Bosnia and Herzegovina, Croatia, "the former Yugoslav Republic of Macedonia", Serbia and Slovenia (application No. 60642/08)	16.07.2014	the systemic problem resulting from the failure of the Serbian and Slovenian Governments to include the applicants and all others in their position in their respective schemes for the repayment of "old" foreign-currency savings deposited in the former Socialist Federal Republic of Yugoslavia (SFRY)

GENERAL OVERVIEW

Article 1 of Protocol 1 to the Convention explicitly grants the state broad powers to interfere with property rights for the public interest. David Harris and Michael O'Boyle note that every year the ECtHR receives many cases from Central and Eastern Europe on the restoration of property rights related to events during the Communist regime (Harris and O'Boyle 2014, p. 1200). Analyzing the statistics of judgments adopted by the ECtHR in 2019, we can say that property issues continue to be in the spotlight. In 2019, the ECtHR issued 884 judgments, of which 131 related to article 1 of Protocol No. 1. Most of the rulings applying article 1 of Protocol No. 1 were made against Eastern European states: Russia – 26 judgments, Bosnia and Herzegovina – 15, the Republic of Moldova – 15, and Ukraine – 10 (2019, official statistics of the ECtHR). However, article 1 of Protocol No. 1 is often applied in conjunction with Article 13 of the Convention when applicants lack effective remedies.

The right to property is one of the most controversial provisions in the context of the discussion of the draft Convention. Vice President of the European Court of Human Rights Christos Rozakis claims that the states that had the most objections to the inclusion of this right in the Convention were the states with socialist ideas of their governments, which doubted that the right of property was a fundamental human right; the right of property has now grown into one of the most important rights contained in the Convention, judging from the number of appeals each year (Rozakis 2016). The right to property has now become one of the most important rights contained in the Convention, judging by the number of appeals filed annually with the judicial Registry. One might say that it is a right that protects the 'haves' against the 'have-nots'. The European Court of Human Rights

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(ECtHR) views the structure of A1P1 as reflecting the search inherent in the Convention for a fair balance between the general interest of the community and the protection of individual rights (2013, p. 194).

As practice shows, there is an erroneous identification of a system problem with a systemic problem. This identification in the erroneous both polish and foreign literature was also pointed out by Czepek and J.M. Lubaszewski (Cepek and Lubachevsky 2016, p. 84). It is noteworthy that the case law of the ECtHR does not explain the differences between these concepts, although, in our opinion, there is a difference. In the first pilot judgment (Broniowski v. Poland, Hutten-Czapska v. Poland). The ECtHR has designated the identified problems as "systemic". However, in many other judgments the problem has been designated as "structural". As for the Rules of Court, it includes both definitions: "the court may initiate a pilot judgment procedure and issue a pilot judgment if the facts of the application indicate in the relevant Contracting Party that there is a structural or systemic problem…" (Rules of Court. Rule 61).

The difference between a systemic and structural problem is not always highlighted not only by researchers, but also by lawyers and judges of the ECtHR themselves. The lack of certainty on this issue is why many researchers use these two terms without distinguishing between them. According to Maria Mačkowiak, the problem of lack of terminological uniformity often arises from an incorrect translation of article 61 of the ECHR Regulation (Mačkowiak 2016, p. 123). Such inaccuracies can be found also in unofficial translations into Russian and Polish of pilot judgment published in various scientific and analytical journals and websites. For example, on the official website of the ECtHR, in the factsheet about the pilot regulations, all problems are listed as "structural", while the ECtHR in its rulings noted some as "systemic" (Factsheet 2020).

The difference between systemic and structural problems is very subtle and difficult to distinguish. A systemic problem is a dysfunction of the legal system due to deficiencies in legislation. Andrea Saccucci, in turn, divides systemic problems into legislative and administrative problems (dysfunctions) (Saccucci 2012, p. 271). A classic example of a systemic problem is the case "Broniowski v. Poland", in which the ECtHR recommended that the Polish authorities take" appropriate legislative measures". The structural problem concerns shortcomings not only in legislation, but also in law enforcement practice. It follows that a systemic problem arises when national legislation is not functioning properly, and a structural problem arises when we are dealing not only with legislative shortcomings, but also with "defects in justice" (Mačkowiak 2016, p .123).

RELEVANT PRINCIPLES OF THE RIGHT TO PROPERTY ESTABLISHED BY THE CASE-LAW OF ECtHR

As the Court has stated on some occasions, Article 1 of Protocol No. 1 comprises three distinct rules: the first rule, set out in the first sentence of the first paragraph, is of a general nature and enunciates the principle of the peaceful enjoyment of property; the second rule, contained in the second sentence of the first paragraph, covers deprivation of possessions and subjects it to certain conditions; the third rule, stated in the second paragraph, recognizes that the Contracting states are entitled, amongst other things, to control the use of property in accordance with the general interest and to secure the payment of penalties. The three rules are not, however, "distinct" in the sense of being unconnected. The second and third rules are concerned with particular instances of interference with the right to peaceful enjoyment of property and should, therefore, be construed in the light of the general principle enunciated in the first rule (see James and Others v. the United Kingdom, 21 February 1986, § 37, Series A no. 98, and Iatridis v. Greece, No. 31107/96, § 55, ECHR 1999-II).

The autonomy of the concepts used in the Convention is typical not only for article 1 of Protocol No. 1, but also for the Convention as a whole. Autonomous interpretation allows for flexibility of legal regulation, the ability to quickly respond to changes in the structure of society: the emergence of new types

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of property relations, the emergence of new products of human activity in the field of intellectual activity.

The concept of "possessions" in the first part of Article 1 of Protocol No. 1 is an autonomous one, covering both "existing possessions" and assets, including claims, in respect of which the applicant can argue that he or she has at least a "legitimate expectation". "Possessions" include rights *in rem* and *in personam*. The term encompasses immovable and movable property and other proprietary interests.

Article 1 of Protocol 1 to the Convention provides for such a concept as "legitimate expectations". "Legitimate expectations" under the ECHR are an expanded notion of conventional ideas of property, arising in contexts where the ECtHR considers that there is some special aspect of individual interests that merits protection. In Broniowski v. Poland (2005) EHRR a protected legitimate expectation was held to have arisen from a promise made to provide land to those displaced after World War II (Sales 2006, 144).

Despite the breadth of the scope of the property right and the diversity of its objects in the case-law of the ECHR, the property right itself is not considered absolute. The ECtHR, when considering an application for violation of property rights, first determines whether a particular object or right is property protected by the Convention, and then finds out whether the plaintiff's property right was violated, because the state fulfilled or failed to fulfill its obligations under the content of the property rules.

In cases involving an alleged violation of Article 1 of Protocol No. 1, the European Court must ascertain whether because of the state's action or inaction the person concerned had to bear a disproportionate and excessive burden. In assessing compliance with that requirement, the Court must make an overall examination of the various interests in issue, bearing in mind that the Convention is intended to safeguard rights that are "practical and effective" (Broniowski v. Poland, § 151). However, with the increasing attention to the protection of human rights, the Court could do more (Zheng 2014, p. 33).

Thus, it can be argued that the structure of Article 1 of Protocol No. 1 is complex in its own way, and its elements are developed over time in the process of interpretation by the European Court of Human Rights.

PILOT JUDGMENTS AND THE RIGHT TO PROTECTION OF PROPERTY

The European Court of Human Rights issued its first pilot judgment in 2004 in the case "Broniowski v. Poland", and the pilot judgment procedure itself was enshrined in Rule 61 of the ECHR Rules in 2011. as of 1 February 2020, the European court of human rights issued 31 pilot decisions in respect of 17 states parties to the Convention. Since the introduction of this procedure, the ECtHR has developed a significant practice of issuing pilot judgments, mostly concerning Eastern European states.

From 2004 to 2019, the European Court of Human Rights issued 6 pilot judgments stating the existence of a structural problem in the field of property protection in respect of 8 Eastern European states. Violations of property rights were mostly found by the ECtHR in Eastern European countries. These violations were related to the absence or inefficiency of compensation or restitution systems, non-payment by the state of social benefits, allowances, pensions provided for by national legislation, non-provision of legal housing, etc. It should be noted that for the first time, the pilot judgment procedure was initiated on this basis.

The pilot judgment procedure is aimed at eliminating structural (systemic) problems in the legal systems of the Respondent states of the Convention. One of the goals of the pilot order procedure, as noted by the then-current Registrar of the ECtHR, Erik Friberg, is an indicative goal, manifested in "encouraging the Respondent state to protect the Convention rights" (Friberg 2008, p. 86).

Professor Dothan S. believes that the ECHR prefers to test its innovations in Eastern European countries, whose reputation in human rights issues from a European point of view is far from ideal (Dothan 211, p. 115). Professor of MSU Alexey Ispolinov notes that "this reduces the very value and weight of possible objections from these countries and is not so dangerous for the reputation of the Court" (Ispolinov 2017, p. 26).

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Indeed, the first pilot judgment was issued in 2004 against Poland, whose legal system was in a state of restructuring.

The Grand Chamber of the European Court of Human Rights adopted a judgment on June 22, 2004, in the case "Broniowski v. Poland", which revealed a systemic problem in the Polish legal system that deprives an entire category of people (approximately 80,000 people) of the right to freely use their property. A Polish citizen complained that he had not received the compensation due to him for property lost by Polish citizens repatriated from territories beyond the bug river that had been transferred to Ukraine, Belarus, and Lithuania. Following the adoption of this decision and the postponement of the Court's consideration of similar complaints, Poland in July 2005 adopted a new law providing for financial compensation for property left behind by the bug river. The court recognized that the new law and the compensation scheme were effective in practice. In 2007 and 2008, it deleted from the list of more than 200 similar cases that had been postponed and decided that further use of the pilot decision-making procedure was not necessary. Judge L. Garlicki notes that the main feature of this pilot order is that it indicated "not a simple recommendation, but a command" what to do. In addition, a former judge of the Polish constitutional court, and later a judge of the European Court of Human Rights, draws attention to the fact that the pilot decision in this case "rose" above the specific context of the individual complaint and gave the decision a constitutional character (Garlicki 2007, p. 185).

Antoine Buyse, a Professor at the Netherlands Institute of human rights, notes that the case "Broniowski v. Poland" was followed by a period when the ECtHR tested the pilot judgment procedure and applied it as an exceptional measure (Buyse 2009, p. 1894). The value of the first pilot judgment in the "Broniowski v. Poland" case is that the ECtHR in this case was first formed a constitutive basis to the legal nature of a pilot judgment.

In the pilot judgment in the case "Hutten-Czapska V. Poland" dated June 19, 2006, the Court noted as a systemic problem the shortcomings of the provisions of the housing legislation regulating the issues of renting housing. The system provided for a number of restrictions on the rights of homeowners, in particular, it set an upper limit on rent, which was so low that homeowners could not even reimburse their expenses for the maintenance and maintenance of rented housing, let alone make any profit. The Court estimated that this issue potentially affected about 100,000 rental homeowners.

Shortcomings in the system for the return of foreign currency deposits deposited before the collapse of the Socialist Federal Republic of Yugoslavia (SFRY) were revealed in the case "Suljagic v. Bosnia and Herzegovina" of 3 November 2009. The applicant, a Bosnian citizen, filed a complaint that the state did not issue bonds that, in accordance with Bosnian law, would allow citizens to return their deposits deposited in Bosnian banks before the collapse of the SFRY. The ECtHR noted that it is considering more than 1,350 similar cases. Subsequently, the authorities of Bosnia and Herzegovina issued government bonds intended to repay foreign exchange savings. The government of Bosnia and Herzegovina decided to issue these bonds for the first time on October 21, 2009, and on March 24, 2010. The government of Bosnia and Herzegovina also issued a resolution on the payment of outstanding payments related to the payment of interest on the bonds.

The inefficiency of the compensation or restitution system is a recurring and widespread problem in Romania as well. Three applicants in the case "Maria Atanasiu and Others v. Romania" filed a complaint about the delay in the decision of the Romanian authorities on their applications for restitution or compensation for property nationalized or confiscated by the state before 1989.

The Romanian Parliament in 2013, passed Act No. 165/2013 on the completion of the process of restitution or alternative compensation for real estate that was illegally transferred to state ownership under the Communist regime in Romania. The law established that the amount of compensation awarded will be paid in installments over a period of seven years. The law

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also established mandatory deadlines for each stage of the administrative process for processing applications for restitution and provides for the possibility of judicial review, which allows national courts not only to verify the legality of administrative decisions but also to take measures to implement restitution or compensation if necessary.

As part of the pilot judgment procedure in the case "Maria Atanasiu and Others v. Romania", the European Court has approached with caution and understanding the assessment of the remedies established by the Romanian authorities.

It is very significant that the European Court took into account the fact that the judicial or administrative practice of applying the adopted Law No. 165/2013 has not yet been formed, and therefore it is not fully justified to recognize new obligations for the Romanian authorities to take additional measures. However, the new legislative mechanism has not been recognized yet as an effective mechanism by the Court. The Romanian authorities are currently in the process of searching for optimal ways to apply the adopted amendments in practice.

The failure to comply with administrative decisions to pay compensation for property confiscated by the Communist regime in Albania was indicated in the case "Manushaqe Puto and Others v. Albania" of 31 July 2012. The case concerned 20 Albanians who, despite the fact that their hereditary right to land plots was recognized by the authorities, did not receive compensation payments in accordance with the effective administrative decisions to pay compensation instead of restitution in one of the ways prescribed by law. There were 80 similar cases pending before the Court.

In December 2015, the Albanian Parliament adopted Act No. 133/2015 "on the circulation of property and the completion of the property compensation process" (entered into force in February 2016). The law is aimed at enforcing all decisions to obtain the compensation that have not been executed, and also applies to applications that are pending before national courts. Besides, The Act established a compensation Fund (Financial Fund and land plot Fund) to provide the necessary resources to pay compensation to former owners.

The next systemic problems that arose in post-communist states due to the inability of the governments of Serbia and Slovenia to include applicants in the scheme for the return of "old" foreign exchange savings deposited in banks of the former Socialist Federal Republic of Yugoslavia (SFRY) were established by the Grand Chamber of the ECtHR in the case "Alisic and Others v. Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Serbia and Slovenia" dated 16 July 2014. The applicants (citizens of Bosnia and Herzegovina) claimed that they could not receive their "old" currency savings deposited in two banks that were located in the territory of Bosnia and Herzegovina after the collapse of the SFRY. The court considered it appropriate to apply the pilot judgment procedure since it was considering more than 1,850 such complaints involving more than 8,000 applicants.

The court held that Serbia and Slovenia must take all necessary measures, including legislative amendments, within one year to allow applicants, as well as other persons in a similar situation, to return their "old" currency savings on the same terms as citizens of Serbia and Slovenia who have savings in national branches of Serbian and Slovenian banks.

In order to implement the prescribed measures, the government of Serbia has prepared a bill establishing a scheme (system) for the payment of "old" savings in accordance with the regulations of the European court of justice. The Serbian authorities indicated that the draft law also provides for the payment of foreign currency savings deposited in branches of Serbian banks in other states. The bill does not apply to depositor applicants who used their "old" savings during the privatization process.

As for the general measures taken by the representatives of Slovenia, the situation looks more dynamic and progressive. In July 2015, Slovenia adopted an Act, which established a corresponding scheme for depositors to exercise their right to receive their "old" foreign exchange savings.

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The adopted Act sets the following interest rates for existing "old" deposits. According to the information provided, as of the beginning of 2016, the Slovenian authorities received almost 14,000 applications from depositors to verify unpaid "old" savings. By September 16, 2016, they had made payments of foreign currency savings to almost 5100 depositors for a total of 63.6 million euros. At the same time, according to the authorities, another 385 million euros will be required from the budget for the implementation of subsequent payments. Thus, the adopted law provided for the creation of a remedy, restoring the rights of depositors of "old " savings and ensuring equal conditions for depositors of all branches while maintaining the real value of assets after more than 20 years.

It should be noted that in this process, depending on the timeliness of the implementation of General measures, two different results are observed. The Serbian authorities did not take a number of legislative measures within the prescribed period, while in Slovenia the adopted law not only entered into force but also provided initial data on the implementation of this act. However, with regard to the effectiveness of the measures taken by the authorities of Serbia and Slovenia, both the Committee of Ministers and the European Court of Human Rights have yet to assess not only the effectiveness of individual measures but also the completeness and timeliness of the set of measures to address the identified systemic problems.

Some authors attribute the effectiveness of cooperation between the European Court and the Respondent states to the nature of the alleged violation, the assessment of national authorities, and the political and economic advantages of this cooperation (Wildhaber 2008, p. 66). It is clear that the pilot judgment procedure allows for a dialogue between national authorities and the Committee of Ministers, as well as between national authorities and other stakeholders. This creates conditions that increase the chances of finding more effective and coherent reforms and measures to address the national systemic problem.

CONCLUSIONS

A significant part of the systemic problems identified by the European Court of Human Rights in the first years of testing the pilot judgment procedure is related to the remnants of the post-Communist regimes of the Eastern European parties to the Convention. In these cases, the pilot judgment procedure is a necessary tool for eliminating such dysfunctions of national legal systems that affect the rights of a significant number of persons.it is essential for the European Court of Human Rights to overcome these negative consequences of the Communist legacy of the legal systems of the Respondent states. Overcoming very persistent and complex systemic dysfunctions related to the protection of the right to property in these states (compensation for property lost by Polish citizens repatriated from the territories beyond the bug river; shortcomings in the foreign exchange Deposit return system in Bosnia and Herzegovina; inefficiency of the compensation or restitution system in Romania; inability of the governments of Serbia and Slovenia to include applicants and others in the scheme for the return of foreign exchange savings deposited in banks of the former Yugoslavia; non-payment of compensation for property confiscated by the Communist regime in Albania, etc.) is one of the key directions of the ECtHR in the framework of the pilot judgment procedure for the harmonization and unification of the legal space of the Council of Europe.

Another example, according to Antoine Buyse, is the first two full-fledged pilot judgment in the cases of "Broniowski v. Poland" and "Hutten-Czapska v. Poland", which showed a different attitude of the state to the implementation of general measures (Buyse 2009, p. 1896). While in the first case, the Polish authorities expressed their full readiness to cooperate, in the case of "Hutten-Czapska v. Poland", the authorities expressed doubts as to whether the pilot judgment procedure could be applied at all. This is due to the differences of opinion that have arisen between the higher courts of Poland, on the one hand, and the Executive and legislative authorities, on the other.

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For the effectiveness of the remedies created, Eastern European states need to constantly monitor the state of legislation, improve certain aspects of law enforcement practice, and, equally important, allocate the necessary budget funds in a timely and sufficient manner to award compensation.

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CHOSEN STATISTICAL METHODS FOR THE DETECTION OF OUTLIERS IN REAL ESTATE MARKET ANALYSIS

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ABSTRACT

The paper contains the comparison of mechanism of two separately constructed statistical methods for the detection of outliers in real estate market analysis. For this purpose, databases with various types of real estate from local markets were created. Then the estimation of parameters of functional models describing dependencies prevailing on the examined markets was carried out. Subsequently, statistical tools called Baarda's method and model residual analysis were used to detect outliers in the collected datasets. The last stage was a comparison of the obtained results of the parameters' estimation of the analyzed models and the measures of their quality, before and after the removal of outliers. The obtained results indicate that algorithms of chosen statistical methods, detecting outliers, allow to eliminate a smaller number of them, at the same time obtaining an improvement of the parameters of the functional model and its adjustment to the analyzed dataset. Therefore the conclusion is that a simple statistical method, which is the study of the occurrence of cases deviating from the functional model based on the analysis of residues can generate the same results as the use of a much more complicated algorithm as the one proposed by Baarda.

Key words: statistical methods, real estate market analysis, outliers, model residual analysis, Baarda's method

INTRODUCTION

Statistics knows a lot of methods of detecting outliers which differ in their calculation algorithms (Śpiewak 2018). Some of them have more complicated formula, others less. A question arises – is it possible to formulate criteria which allow to detect outliers from functional model matched to the observations so that the number of removed observations were as low as possible with the best values of the determination coefficient and the residue variance estimator? This gives the premise for searching for such kind of criteria for the selection of optimal statistical methods that look for gross errors in the analyzed databases, among others, depending on functional model used, type of property and number of properties.

The main purpose of research was comparison of two separately constructed methods which are model residual analysis and Baarda's method. Model residual analysis is widely known method of detection of outliers. Baarda's method is less popular and it is often used for looking for gross errors, e.g. in geodetic

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network adjustment. The one thing which is common for analyzed methods is the fact that searching for outliers is preceded by building a model of multiple regression.

Results from conducted research may be helpful in different fields of science where functional model matched to data is built, for example in forecasting trends of currency price in economical studies, in environmental engineering for rating of air or water quality or in medical science for predicting patients' comfort after taking medicines in treating specific illness.

In the article research was conducted on seven datasets which were information about various types of real estate, sold on local markets. Subsequently, for every analyzed database, the basic characteristics of the random variable were determined, e.i. the average price, standard deviation and the median. Then the outliers, from the functional linear and non-linear model matched to observations, were found by using the model residual analysis and the Baarda's method.

LITERATURE'S REVIEW

The problem of detecting outliers is undertaken in many publications from various fields of science where we deal with large datasets and where the data comes from direct measurements (e.g. field or laboratory). In the scientific literature it is common to find references to the following statistical methods of detecting outliers:

- quartile criterion (Budka et al. 2013, Głowicka-Wołoszyn et al. 2018);
- interval estimation (Wiśniewski 2009, Korir 2019);
- Mahalanobis distance (Meyers et al. 2015, Li et al 2019);
- Cook distance (Cook and Weisberg 1982, Trzęsiok 2015);
- model residual analysis (Śpiewak 2017, Walesiak 1996);
- Grubbs test (Grubbs 1969);
- Hampel test (Hampel et al. 1986);
- active methods of robust estimation: Danish method, Huber method and Hampel method (Kamiński and Nowel 1992, Huber 1981, Hampel and Ronchetti, Rousseeuw and Stahel 1986);
- passive methods of robust estimation: Baarda's method and Pope's method (Baarda 1968, Pope 1961, Prószyński and Kwaśniak 2002).

However there has been no publication in which an attempt has been made to formulate criteria for selecting statistical methods to search for outliers in the analyzed datasets. This work is an excerpt from an attempt to determine such criteria based on two selected methods: model residual analysis and Baarda's method.

Model residual analysis is widely applied in many research from different fields of science, not only to find outliers, e.g. Dąbrowski and Adamczyk (2010) about global attributes utilization in predicting and forecasting a real property market value, Bittner (2007) about construction of multiple regression model in real estate valuation, Plonsky and Ghanbar (2018) about multiple regression in L2 research or Świderski et al. (2018) about road safety level in Poland. Model residual analysis is simple tool to detect outliers from model matched to examined datasets. Much more advanced algorithm is Baarda's method which relies on statistical test verifying hypothesis about lack of outliers among observations. This method, more complicated than model residual analysis, is often used in economic analyses (Orwat 2006, Dehnel and Gołata 2010, Majewska 2011) and in geodetic calculations (Kamiński and Nowel 1992, Wiśniewski 2009, Huber 1981). The main question is which of them gives better results in context of number of detected outliers in relation to increase of the determination coefficient and decrease of the standard estimation error. To answer to above questions, the research was conducted on seven datasets containing information about real estate sold in local markets in short time (up to six months).

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METHODS AND MATERIALS

Model Residual Analysis

Residuals from the model reflect the differences between the values of the explained variable, observed and predicted by model. A well-matched model is characterized by small residuals for typical observations and large ones for outliers. Identifications of outliers based on model residuals can be performed using standardized residual values (Walesiak 1996), rejecting those observations which distance from the regression hyperplane is greater than the doubled residual standard deviation (Śpiewak 2017).

Baarda's Method

The basis of passive robust estimation methods are statistical tests that allow, after estimating the model parameters by the method of least squares, to determine which observations may be suspected to be gross errors. This group of methods includes Baarda's method (Kamiński and Nowel 1992, Proszyński and Kwaśniak 2002, Śpiewak 2018) where the zero hypothesis in form "there are no outliers in the examined dataset" is verified. To perform statistical test, the suitable test statistics which comes from *chi-square* distribution should be calculated. If test statistics is in critical area then the zero hypothesis is rejected in favor of the alternative hypothesis at given significance level what means that there is at least one outlier in dataset.

RESEARCH MATERIAL

The calculations were carried out on several datasets that contained information about real estate sold on local markets (in the cities of Sieradz, Skarżysko-Kamienna, Kraków, Rzeszów, Przeworsk and Busko-Zdrój) in a short period (up to six months). Each of the land properties designated in the local plan for single-family housing was described by following features: topography, sunlight, access to public transport, location, shape, fashion, basic function, utilities, road type, surroundings and land area. Housing properties have been assigned the following attributes: usable area, the area of the appendant rooms, number of rooms, storey, location, communication, sourroundings, building condition, elevator, balcony, greenery/recreation, monitoring, window exhibition, building technology and parking possibilities. Then, for each dataset, parameters of linear and non-linear functional models were estimated, describing the relationships prevailing in the examined markets. Statistical tools as Baarda's method and residual analysis were used to detect outliers in the analyzed datasets. The last stage was a comparison of the obtained results of estimation parameters of the analyzed models and their quality measures, before and after removal of outliers. Table 1 contains the basic characteristics of the examined datasets:

- $C_{med.}$ – average unit price;
- Me – median of unit price;
- σ_{n-1} – prices' standard deviation;
- R^2 – determination coefficient;
- σ_0 – standard estimation error;
- V – variation coefficient;
- n – number of observations;
- o – the number of removed outliers;
- R^2 - R_0^2 the difference between the value of the determination coefficient after and before the application of statistical methods searching outliers;
- o/n – the percentage of atypical observations in relation to the initial number of properties in the database no. 1. Results for database no. 2–7 are contained in the appendix 1 (Tab. appx. 1).

The following abbreviations have been used in the Table 1 and in the figures:

- LM-B – linear model before removal of outliers,
- LM-AR – linear model after application residual analysis,
- LM-MB – linear model after application Baarda's method,
- NM-B – non-linear model before removal outliers,
- NM-AR – non-linear model after application residual analysis,
- NM-MB – non-linear model after application Baarda's method,
- AR – residual analysis,
- MB – Baarda's method.

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Table 1. The extract of summary of obtained results

Database 1 contains information about land properties										
Method	C_{medium} [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B	52.80	41.67	53.16	0.60	33.97	0.64	73			
LM-AR	44.17	34.15	39.86	0.83	16.65	0.38	45	28	0.23	0.38
LM-MB	48.25	42.08	41.43	0.62	25.79	0.53	64	9	0.02	0.12
NM-B	52.80	41.67	53.16	0.78	28.54	0.23	73			
NM-AR	46.21	39.61	50.11	0.86	25.12	0.54	67	6	0.08	0.08
NM-MB	47.69	39.79	49.80	0.85	26.83	0.56	66	7	0.07	0.10

Source: own study

There are figures which present:
- a change of determination coefficient value R^2 compared to its initial value R^2_0. including the percentage of observations considered outliers (Fig. 1. Fig. 2.)
- a change of standard estimation error σ_0 compared to its initial value $\sigma_{0\text{pocz}}$. including the percentage of observations considered outliers (Fig. 3. Fig. 4).
- a change of R^2 value and σ_0 value and percentage of outliers after application Baarda's method and residual analysis in linear (Fig. 5) and non-linear model (Fig. 6).

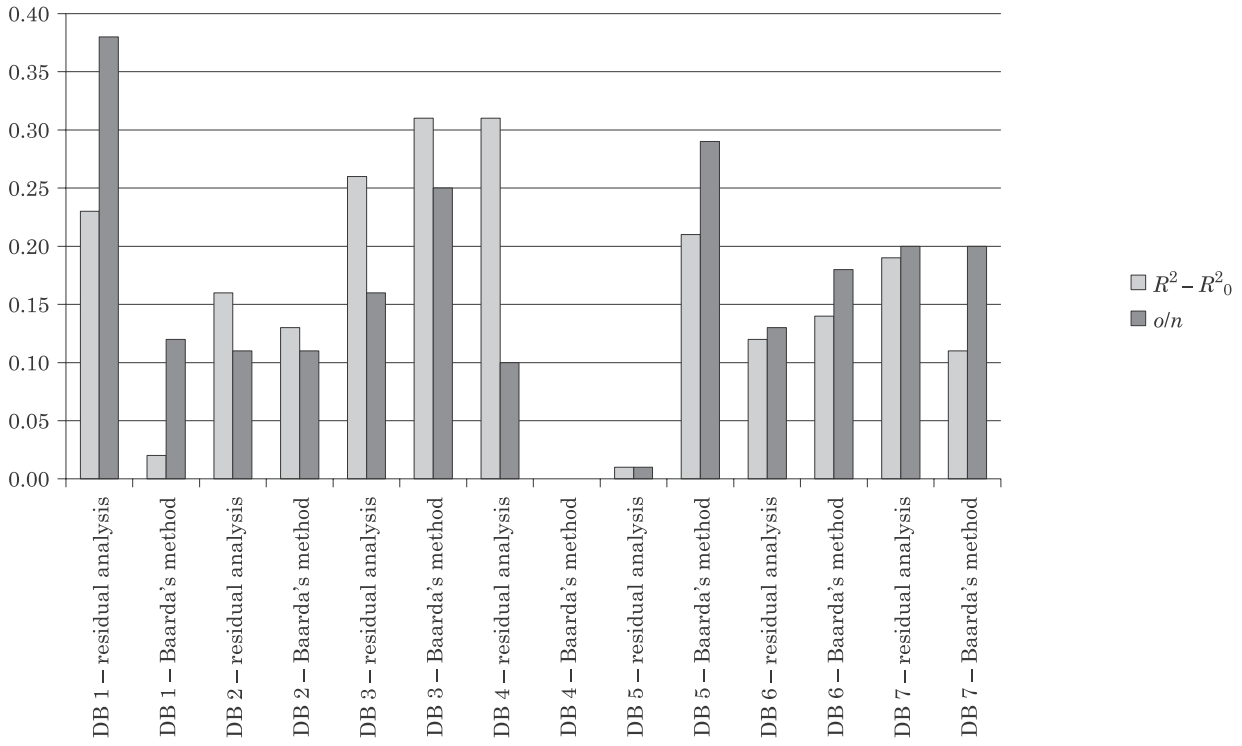

Fig. 1. A change of the value of the determination coefficient in a linear model
Source: own study

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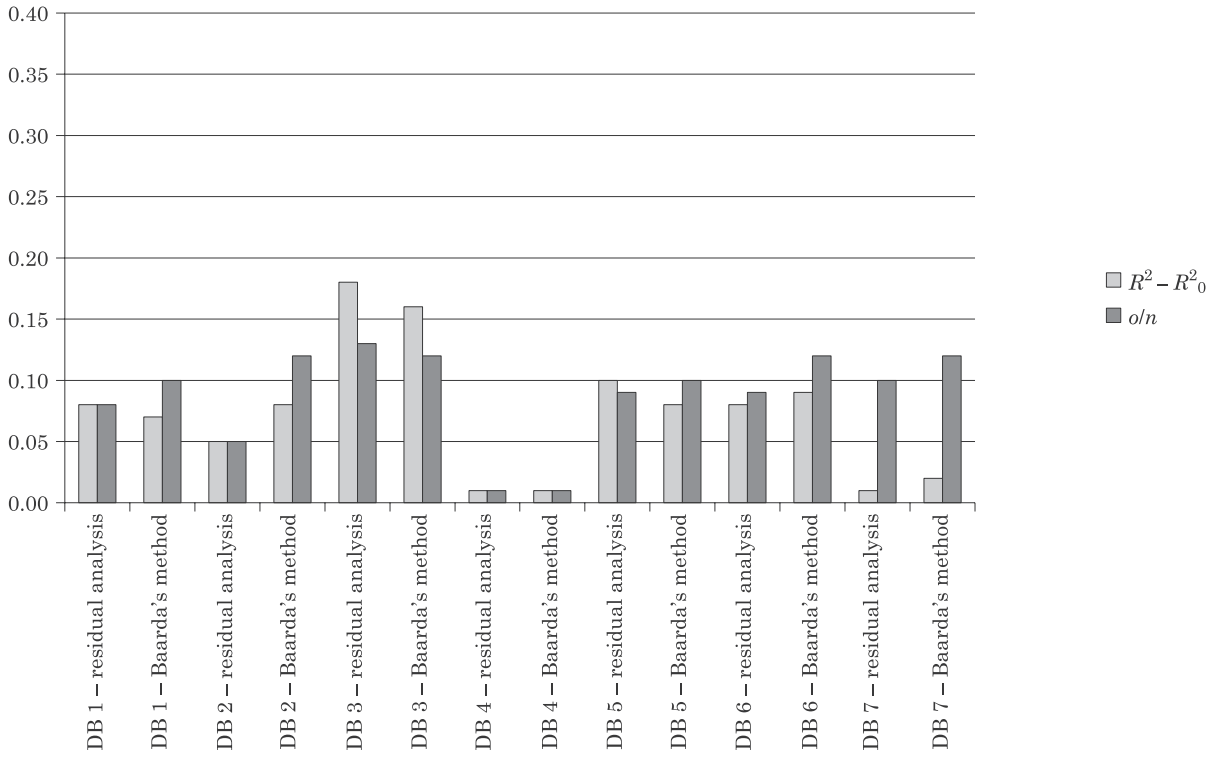

Fig. 2. A change of the value of the determination coefficient in a non-linear model
Source: own study

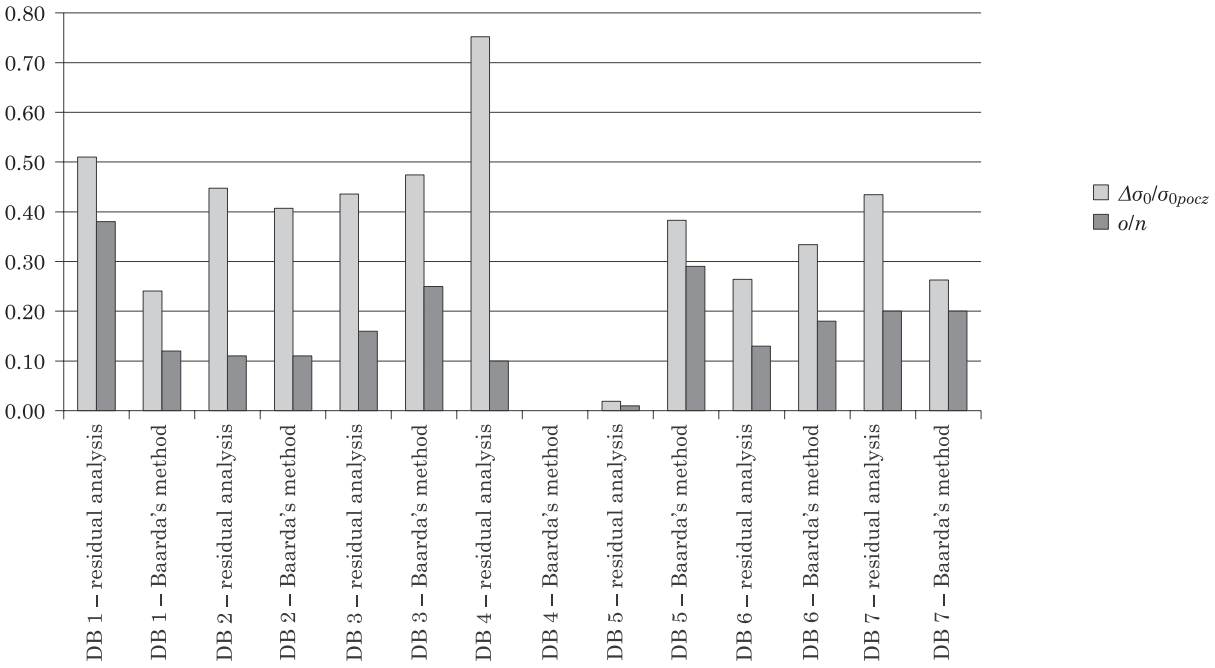

Fig. 3. A change of the value of the standard estimation error in the linear model
Source: own study

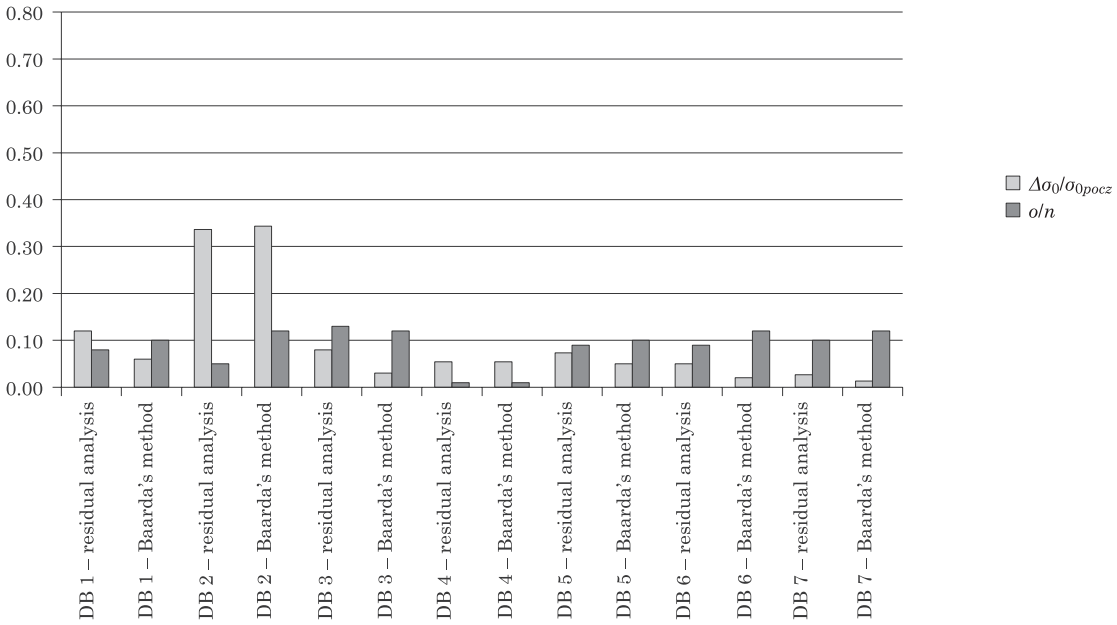

Fig. 4. A change of the value of the standard estimation error in the non-linear model
Source: own study

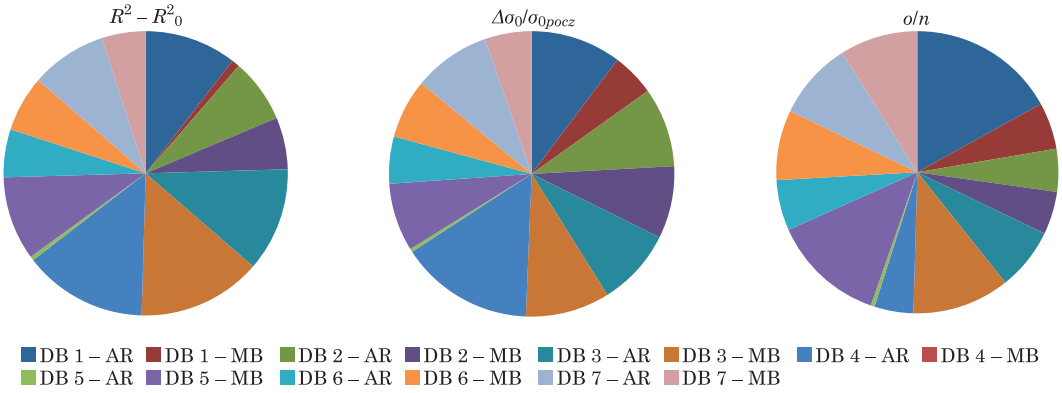

Fig. 5. Results after application residual analysis and Baarda's method in linear model
Source: own study

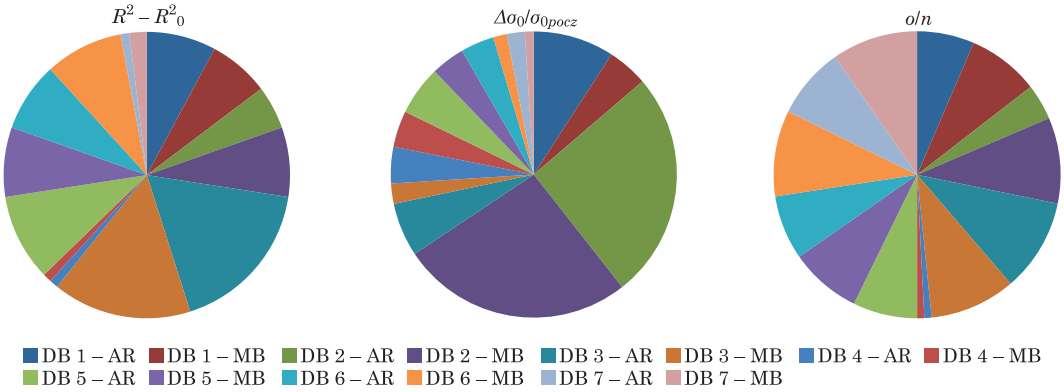

Fig. 6. Results after application residual analysis and Baarda's method in non-linear model
Source: own study

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CONCLUSIONS

In the examined datasets. both tested algorithms perform the function of searching outliers from a linear or non-linear model matched to the observations. The exception is database 4 (Tab. appx. 1) where the Baarda's method did not detect cases departing from the linear model (Tab. 1, Fig. 1). Removal large amount of data does not always cause a significant increase of determination coefficient value and reduce the value of the residue variance estimator, e.g. in database 1 after using Baarda's method for a linear model. In a few cases, model residual analysis gives better results than Baarda's method because the smaller number of outliers is rejected when the increase of determination coefficient is at the similar level, e.g. in datasets 3 and 6 (Fig. 1) and databases 1, 6 and 7 (Fig. 2). A similar effect was achieved for decreasing the value of the residue variance estimator, e.g. in databases 3 and 6 in the linear model (Fig. 3). In the non-linear model, both methods cause change of the σ_0 value at a similar level with a comparable percentage of outliers (Fig. 4). Therefore the conclusion is that a simple statistical method, which is the study of the occurrence of cases deviating from the functional model based on the analysis of residues, generates the similar results as the use of a much more complicated algorithm as the one proposed by Baarda.

It is important to underline that both algorithms used in this article detected outliers from model well matched to data. We obtained increase of the value of the determination coefficient and decrease of standard estimation error but eliminated observations may also be valuable information from analyzed markets (from another point of view, regarding unusual behavior).

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APPENDIX 1

Table appx. 1. Summary of obtained results

Database 2 contains information about land properties										
Method	$C_{med.}$ [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B	39.44	18.66	37.82	0.77	18.27	0.46	65	–	–	–
LM-AR	36.78	13.20	38.19	0.93	10.10	0.27	58	7	0.16	0.11
LM-MB	34.42	13.20	34.31	0.90	10.84	0.31	58	7	0.13	0.11
NM-B	39.44	18.66	37.82	0.74	18.27	0.46	65	–	–	–
NM-AR	31.29	15.25	33.12	0.79	12.12	0.39	62	3	0.05	0.05
NM-MB	29.56	17.26	28.76	0.82	11.99	0.41	57	8	0.08	0.12
Database 3 contains information about land properties										
Method	$C_{med.}$ [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B	50.22	31.12	43.33	0.46	32.21	0.64	69	–	–	–
LM-AR	41.18	27.38	33.82	0.72	18.18	0.44	58	11	0.26	0.16
LM-MB	40.90	26.00	34.63	0.77	16.94	0.41	52	17	0.31	0.25
NM-B	50.22	31.12	43.33	0.68	27.43	0.55	69	–	–	–
NM-AR	48.40	27.89	35.61	0.86	25.25	0.53	60	9	0.18	0.13
NM-MB	47.12	26.61	34.84	0.84	26.54	0.56	61	8	0.16	0.12
Database 4 contains information about land properties										
Method	$C_{med.}$ [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B	51.49	31.66	92.30	0.43	70.20	1.36	86	–	–	–
LM-AR	36.83	30.00	33.60	0.74	17.41	0.47	77	9	0.31	0.10
LM-MB	51.49	31.66	92.30	0.43	70.20	1.36	86	0	0.00	0.00
NM-B	51.49	31.66	32.30	0.87	19.64	0.38	86	–	–	–
NM-AR	46.29	33.69	31.12	0.88	18.58	0.40	85	1	0.01	0.01
NM-MB	46.29	33.69	31.12	0.88	18.58	0.40	85	1	0.01	0.01
Database 5 contains information about land properties										
Method	$C_{med.}$ [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B*	55.06	54.73	34.14	0.65	20.34	0.37	185	–	–	–
LM-AR	54.93	54.73	34.18	0.66	19.96	0.36	183	2	0.01	0.01
LM-MB	68.75	56.07	32.61	0.85	12.55	0.18	131	54	0.21	0.29
NM-B	55.06	54.73	34.14	0.72	18.30	0.33	185	–	–	–
NM-AR	49.13	50.74	31.55	0.82	16.96	0.35	168	17	0.10	0.09
NM-MB	51.38	52.05	36.89	0.80	17.33	0.34	166	19	0.08	0.10

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cont. Table appx. 1.

Database 6 contains information about flat properties										
Method	$C_{med.}$ [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B	3180.41	3204.23	659.54	0.73	341.84	0.11	77	–	–	–
LM-AR	3217.86	3203.70	662.54	0.86	251.50	0.08	67	10	0.12	0.13
LM-MB	3155.20	3158.71	627.65	0.87	227.75	0.07	63	14	0.14	0.18
NM-B	3180.41	3204.23	659.54	0.68	351.37	0.11	77	–	–	–
NM-AR	2985.12	3101.25	625.99	0.76	333.89	0.11	70	7	0.08	0.09
NM-MB	2874.02	3000.85	648.12	0.77	344.27	0.12	68	9	0.09	0.12
Database 7 contains information about flat properties										
Method	$C_{med.}$ [PLN/m^2]	Me [PLN/m^2]	σ_{n-1} [PLN/m^2]	R^2	σ_0 [PLN/m^2]	V	n	o	$R^2 - R_0^2$	o/n
LM-B	2575.52	2432.25	871.68	0.73	454.71	0.18	101	–	–	–
LM-AR	2585.13	2427.70	921.38	0.92	257.11	0.10	81	20	0.19	0.20
LM-MB	2650.25	2447.23	844.68	0.84	335.11	0.13	81	20	0.11	0.20
NM-B	2575.52	2432.25	871.68	0.83	324.71	0.13	101	–	–	–
NM-AR	2521.08	2432.25	856.47	0.84	316.12	0.13	91	10	0.01	0.10
NM-MB	2516.60	2469.87	870.64	0.85	320.43	0.13	89	12	0.02	0.12

*Explanations as in Table 1
Source: own study

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WATER-LAW PERMISSION AS AN ADMINISTRATIVE AND LEGAL INSTRUMENT FOR THE MANAGEMENT AND PROTECTION OF WATER RESOURCES*

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ABSTRACT

In the Member States of European Union, including Poland, the legal framework for the management and protection of water resources is determined in the Water Framework Directive 2000/60/EC (WFD). The aim of the article is to determine the impact of the revision of legal provisions in the field of water law licensing caused by the Directive implementation on the currently applicable framework for the protection and management of water resources in Poland. Based on the legal regulations and statistical data it was found that the implementation of WFD and related directives regarding sewage treatment plants limiting the inflow of nitrogen compounds from agriculture and priority substances to surface waters, contributed to an extension of scope of the activities that require this permission. That scope extension concerns both the protection of water resources in terms of quantity and quality e.g. water abstraction, agricultural fertilization, reclamation of water reservoirs, protection of flood risk areas and use of waters for economic and service purposes. All this indicates a more restrictive approach of the legislator to the protection of the most valuable resource in the environment, which should contribute to possible achievement of a good state of surface water, as is the main goal of the WFD.

Key words: Water Framework Directive, legal provisions, water-law permission, wastewater treatment

INTRODUCTION

Waters are a vital resource to human livelihood. Unfortunately, anthropogenic activities contribute to water deficits in both quantitative and qualitative terms. This problem includes not only poor countries but also ones with a well-developed economy in Europe. An example of such a country is Poland, which has the water resources at the level of about 1600 m^3 per capita during the year. It is the third last place in European countries, only Belgium and Malta having lower water resources (EUROSTAT 2017,

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Gutry-Korycka et al. 2014). Therefore, waters should be subject to special organizational and legal protection both at EU level and in national legislation.

In Europe, the legal framework for the management and protection of water resources is determined in Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1–73) – WFD. The main message contained in the preamble of the Directive is „Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such". This confirms that water is an indispensable and irreplaceable resource of the environment and hence, its protection is necessary to maintain life on Earth. The goals of the WFD were to establish a framework for the protection of all categories of waters such as inland surface waters, transitional waters, coastal waters and groundwater. Accordingly, the following measures were imposed:

– prevention of further deterioration and protection and enhancement of the status of aquatic ecosystems;
– promotion of sustainable water use based on a long-term protection of available water resources;
– enhancement of protection and improvement of the aquatic ecosystems;
– assurance of the progressive reduction of groundwater pollution. However, the most important aim of the WFD was to achieve a good ecological status of waters by 2015 in EU member states (Farmer 2012, Ciechanowicz-McLean 2014, Voulvoulis et al. 2017, Zębek 2018).

The good ecological status of water bodies is determined in the Annex V based on separate hydromorphological and physico-chemical water parameters, as well as on bioindicators, such as phytoplankton, other aquatic flora, benthic invertebrates and fish (Zębek 2017, Zębek and Napiórkowska-Krzebietke 2019).

In order to protect water resources, the WFD introduced provisions regulating water use and defined this activity in the Article 2(39) as water services together with any other activity identified under Article 5 and Annex II having a significant impact on the status of water. Water services means all services provided to households, public institutions or any economic activity involving the collection, retention, storage, treatment and distribution of surface or ground, as well as sewage collection and treatment facilities which subsequently discharge into surface water. In this range, water reservoirs should be characterized in terms of anthropogenic pressure and the directions of their protection determined. Data that can be the basis for determining such impacts on the aquatic environment include:

– results of monitoring – quantitative, physicochemical, biological and morphological status of waters;
– land use, e.g. by agriculture, industry, urban planning, landfills, including unsafe, protected areas;
– water and sewage management, area and point sewage discharges;
– hydrotechnical facilities, i.e. retention reservoirs, water barriers, levees, metastatic channels and drained areas (Barszczyńska and Kubacka 2008, Durkowski et al. 2015).

Therefore, under Article 4 of the WFD the Member States are obliged to implement the necessary measures to prevent deterioration of the status of all bodies of surface water, including progressive reduction of priority substance pollution, as well as to protect, enhance and restore these water bodies.

In the field of water protection, Poland, being a member of the EU since 2004, has been obliged to implement the provisions of the Water Framework Directive in two Water Law Acts of 2001 and 2017 (Maciejewski and Walczykiewicz 2006, Zębek 2017, 2018). However, the provisions of the water law in force at that time had been shaped earlier, namely since the adoption of the first Water Law Act of 1974.

One of the important legal and administrative instruments in the water protection is the system of water law approvals containing water-law permits (Zębek et al. 2016). This permission takes the form of an administrative decision required by the Water Law Act. The purpose of the article is to determine the impact of the revision of legal provisions in the field of water law licensing caused by the Water Framework

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Directive implementation on the currently applicable framework for the protection and management of water resources in Poland.

The article uses a dogmatic and legal method based on the following analyzed materials: literature, statistical data of Eurostat and the Polish Water Management, EU (Directives 91/271/EWG, 91/676/EWG, 2000/60/EC and Directive 2006/11/WE) and Polish legal regulations in the range water protection from 1974 of the first Water Law Act to 2001 and 2017 of the next Water Law Acts in force after Poland's accession to the EU.

THE FIRST STAGE OF WATER-LAW PERMISSION EVALUATION

The water-law permission is an instrument created in the Water Law Act of 1974 (Journal of Laws No. 38, item 230 as amended) in Chapter 1a entitled Water management. According to Article 19a water management consists in shaping, protecting and using ground and surface water resources in accordance with the principle of sustainable development. It is worth noting here that the legislator referred to the most important principle of environmental law – sustainable development. This means using water resources to meet the basic needs of present and future generations while guaranteeing economic development. The water management mainly involved the protection of surface and groundwater resources against pollution and over-exploitation, protection against flooding and drought, shipping and energy use of water, providing the population and water of adequate quality, as well as satisfying the needs of the population in terms of health, hygiene and rest. According to this act, the water-law permission has been classified as one of the water management instruments currently in force.

Detailed legal solutions regarding water licensing were regulated by Chapter 2 Water law-permission in Articles 20–35. This permission was required for the use of water beyond common and ordinary use of water – to special use of waters and for the construction of water facilities. The use of waters includes use for the needs of the population and the national economy; however, it cannot cause water pollution or damage in water environment (Article 41). The common use of water concerns surface public waters and serves to meet the needs of personal and household or agricultural use without the use of special devices and for leisure and tourism, water sports and fishing (Article 47 and 48). The ordinary use of water concerns the owners of land on which there are water for personal, household or agricultural purposes (Article 49). However, the scope of legal regulations for special use of water includes: abstraction of surface and underground waters; run off sewage into waters or into the ground; collecting sewage and waste on coastal land and within mining areas for medicinal waters; making inter-shore transport with fixed equipment; draining or water supply by means of devices passing through the land of another owner; ice mining and cutting plants; extraction gravel, sand and other materials in the area exposed to danger of flooding for purposes other than meeting the needs of a household or individual farm; floating wood or other materials; water use for fishing purposes and water transport (Article 53). Water law permits in accordance to Article 55(1–3) are issued by the staroste (county foreman) or voivode (province foreman) for undertakings that may have a significant impact on the environment (e.g. steel mills, mines, heavy industry) and by the Minister of the Environment for water transfers (Paczuski 1998, Zębek 2002).

Thus the legislator introduced the requirement to obtain a water permit for activities that could have a significant impact on water ecosystems in the range of water collection, sewage and waste collection on land near water bodies, extracting materials and cutting plants from water bodies, water transport, and use of waters for navigable and fishing purposes. It can be considered that these water law provisions initiated the creation of a full range of activities that require this permit currently in force.

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THE SECOND STAGE OF WATER-LAW PERMISSION EVALUATION

The next stage of water law evaluation included adopting a new Water Law Act of 2001 (Journal of Laws of 2017, item 1229). It was a very important period in shaping water law for two reasons. Firstly, a new Water Directive was adopted in 2000, and secondly, Poland became a member of the EU in 2004. This meant that it was obliged to fully implement the provisions of this directive into its national legislation. According to Article 2, the scope of activities included in water management was extended. Water resources management serves the needs of the population, economy, water protection and the environment associated with these resources, in particular ensuring adequate water quantity and quality for the population; protection of water resources against pollution and improper or excessive exploitation; maintaining or improving the condition of aquatic and water dependent ecosystems; flood and drought protection; providing water for agriculture and industry; meeting the needs related to tourism, sport and recreation; and creating conditions for energy, transport and fisheries use of waters. In comparison to earlier water law, the legislator paid more attention to the protection of not only water reservoirs but also ecosystems dependent on them, while expanding the scope of industrial activity and agriculture.

The water-law permit was also qualified for water management instruments but its scope was significantly expanded. This permission was required not only for special water use but also for others activities. The scope of special use of waters regulated Article 37 with the following elements: collection and drainage of surface or groundwater; discharge of sewage into waters or into the ground; water transfers and artificial groundwater supply; damming and retention of inland surface waters; use of water for energy, navigation and rafting purposes; extracting stone, gravel, sand and other materials from waters, as well as cutting plants out of water or from the shore and fishing use of inland surface waters. Therefore, it is noticeable that the scope of activity requiring a water law permit was expanded, in particular concerning water transfer and artificial groundwater supply; damming and retention of inland surface waters and use of water for energy purposes. This is very important, especially because of the protection of watercourses used within small hydropower plants by hydroelectric power plants and the associated water damming. These actions cause negative effects on the functioning of such water reservoirs, e.g. change of water flow speed, reconstruction of biocenosis, creation of stagnation with slow flow rate enriched in nutrients and causing overgrowing of these parts of watercourses by macrophytes (Zębek 2014). Importantly, a limit value of 5 m^3 per day has been introduced that separates ordinary and special use of waters. This applies to the collection of surface and underground waters as well as the agricultural use of sewage (Article 36). The values exceeding 5 m^3 per day qualify a given activity for the special use of waters requiring a water permit. This applies to the discharge of treated sewage to a receiver (river) from a wastewater treatment plant (Zębek et al. 2016).

The water-law permit apart special use of waters was also required for other activities under Article 122. It was included:

- water regulation, development of mountain streams, shaping of natural watercourse beds, change of landform on land adjacent to water, affecting water flow conditions;
- execution of water facilities;
- leading levees of bridges, tunnels, pipelines, culverts through surface flowing waters;
- leading power and telecommunications lines on inland waterways;
- collecting sewage and waste within mining areas created for medicinal waters;
- drainage of building structures and mining plants;
- introduction substances that inhibit the development of algae into surface waters;
- remediation of surface or groundwaters;
- introducing industrial sewage containing substances particularly harmful to the aquatic environment into the sewage system;
- long-term reduction of the groundwater level;
- groundwater damming.

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Thus, the water construction was ordered, especially in tourist infrastructure, fish farming, water transport, water power engineering as well as shaping water resources. This is reflected in the extensive definition of water devices under Article 9(19) as devices for shaping and using water resources. These include: buildings: damming, venting, flood and regulating, as well as canals and ditches; reservoirs and water steps; fish ponds and ponds for wastewater treatment, recreation or other purposes; facilities for the collection of surface and underground waters; hydropower facilities; outlets for sewage facilities for discharging wastewater into water or water facilities and outlets for discharging water into waters or water facilities; fixed equipment for fishing or for obtaining other aquatic organisms; retaining walls, boulevards, wharfs, bridges, marinas, bathing areas; and fixed equipment for inter-shore transport. Water devices are very important in the concepts of spatial development of urban areas, especially when planning the development of lake shores for tourist and recreational purposes by concreting the banks, building bridges (Antolak and Małkowska 2019). It is also worth noting that the scope of activities requiring a water law permit has been extended by two very important aspects related to water pollution. The first concerns the introduction into the water bodies of substances that inhibit the growth of algae. It is associated with the eutrophication process resulting from the excessive inflow of nutrients to water bodies and cyanobacterial blooms. To limit the growth of these algae, chemical compounds, e.g. aluminum sulfate, are applied to the water body. Admittedly, it limits their development but at the same time eliminates other water organisms necessary in the process of water self-purification (Szymańska and Zębek 2014, Zębek 2017). Secondly, it concerns the introduction of industrial wastewater containing particularly harmful substances into sewage systems. These substances are divided into two groups: 1) it should be eliminated from the aquatic environment, e.g. heavy metals and 2) their inflow to water reservoirs should be limited, e.g. nutrients (nitrogen and phosphorus). Thus, the legislator, by introducing these requirements, significantly strengthened the quality protection of waters, such as restorative methods and limiting the inflow of harmful substances, respectively.

The staroste is the authority competent to issue water law permits under the Article 140(1). In special cases, the voivodeship marshal is the competent authority for the following activities: for projects that can always have a significant impact on the environment, the use of water and the construction of water facilities in artificial water reservoirs situated in flowing waters, construction of flood protection buildings, water transfers and introduction of inhibiting substances of algae growth to surface waters (Kałużny 2016, Łuczak and Tomaszewska 2017).

THE LAST STAGE OF WATER-LAW PERMISSION EVALUATION

The Water Law Act of 2017 (Journal of Laws of 2018, item 2268 as amended) is currently in force, which is a significant extension of the provisions for the protection of water resources contained in the Water Law Act of 2001. In this Act, the scope of activities requiring a water law permit has been significantly expanded, both as part of the special use of waters and other activities affecting aquatic ecosystems. According to Article 34 in the special use of water has been added:

- drainage of land and crops;
- water use in ponds and ditches;
- introducing into the sewage system industrial sewage containing substances particularly harmful to the aquatic environment (early was as other activities required the water-law permission);
- practicing in waters of sport, tourism or recreation with the watercraft equipped of an engine power above 10 kW, excluding waterways;
- raising fish in cages;
- providing water for the operation of facilities enabling fish migration;
- water use for business purposes;
- the use of waters in artificial water reservoirs located in flowing waters, intended for farming or breeding fish and other aquatic organisms;

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– organization of leisure or water sports as part of business operations.

Thus, the legislator pays special attention to the aspects of economic activity, especially in the field of water services and water sports, fish farms and protection of fish in regulated watercourses, enabling them to migrate at water damming devices for energy purposes. As part of other activities under the Article 389, the scope of activities related to carrying out bridge structures, pipelines or culverts through flowing surface waters and through levees, as well as overhead power and telecommunication lines through inland waterways and levees was clarified (Szachułowicz 2017, Szuwalski 2019). Here, there has been an enhanced protection of aquatic ecosystems and flood protection structures during the implementation of investments in the field of water engineering and energy. The extension of these provisions is the requirement to obtain a water law permit in relation to activities included in the Article 390 precisely when locating new projects that may significantly affect the environment and new buildings in areas of particular flood risk. In addition, in these areas this requirement applies when collecting sewage, animal faeces, chemicals, as well as other materials that can pollute water, and carrying out recovery or disposal of waste, including storage.

The Water Law Act of 2017 changes the water resources management system, replacing the existing authorities competent in matters of water man-

Fig. 1. Regions for water management in Poland
Source: own study based on Wody Polskie… (2019)

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agement with one entity, which is to be the Polish Water Management. This entity is to implement a catchment policy for water management at each level of the catchment, water region and river basin (Ćwiek et al. 2017, Rakoczy 2018). The organizational structure of Polish waters consists of: National Water Management Board – Regional Water Management Boards (RWM) – Catchment Boards – Water Supervision with 11 regions for water management (Fig. 1). In accordance to Article 397(1) the Polish Waters are the competent authorities for water law permission. The director of the regional water management board of Polish Waters is competent to issue this permit in the following cases: the construction of flood protection buildings, water transfers, introducing into the surface water substances that inhibit the development of algae, the reclamation of surface waters or groundwater, the extraction of surface water from stone, gravel, sand and other materials, as well as for cutting plants from the water or shore, introducing into the sewage system industrial sewage containing substances that are particularly harmful to the environment and making water devices in artificial water reservoirs located in inland flowing waters. However, in the other cases not mentioned, the water permit is issued by the director of the management of the Polish Waters catchment.

DIRECTIVE SOLUTION IMPLEMENTATION VS. FRAME OF WATER PROTECTION IN POLAND

The changes in the evaluation of water law in the range of water-law permission were caused by primarily increased concern for water resource protection in terms of both quantity and quality in European Union countries postulated in the Water Framework Directive 2000/60/WE. It should be noted, however, that the implementation of the provisions of the WFD has caused many difficulties in EU member states, especially in the monitoring system and financial measures (Boscheck 2006, Maciejewski and Walczykiewicz 2006, Chon et al. 2010, Bouleau and Pont 2015, Kondouri at al. 2016, Vlachopoulou et al. 2017). These solutions were adopted and implemented into the Polish legislation, particular in analysed Water Law Acts of 2001 and 2017. Changes in these acts were also associated with the implementation of not only WFD provisions but related directives regarding municipal wastewater treatment (Directive 91/271/EWG, OJ L 135, 30.5.1991, p. 40–52), agricultural pollution (Directive 91/676/EWG, OJ L 375, 31.12.1991, p. 1–8) and particularly harmful substances (Directive 2006/11/WE, OJ L 64, 4.3.2006, p. 52–59). The objective of the Directive 91/271/EWG was to protect the environment from the adverse effects of the sewage discharges mentioned above. In this range the Member States were obliged to ensure that all agglomerations are provided with collecting systems for urban wastewater at the latest by 31 December 2000 for those with a population equivalent of more than 15000 (p.e.), and at the latest by 31 December 2005 for those with between 2000 and 15000 (Article 3). For full sewage treatment the most important are the biological methods leading to the removal of excessive amounts of nutrients nitrogen and phosphorus from wastewater contributing to the process of eutrophication of surface waters. Municipal sewage are the main resource of the phosphorus derived from washing used for social purposes (Szymańska and Zębek 2014). According to the Directive this stage of sewage treatment was called as secondary treatment of urban wastewater by a process generally involving biological treatment with a secondary settlement or other process in which the requirements established in Table 1 of Annex I are respected. Under the Article 4 the Member States are required to ensure that urban wastewater entering collecting systems shall before discharge be subject to secondary treatment or an equivalent treatment to the latest by 31 December 2000 for all discharges from agglomerations of more than 15000 p.e., and to the latest by 31 December 2005 between 10000 and 15000 p.e. In Poland in accordance to the provisions of Article 5 in conjunction with point 3 of Annex I.B to Directive 91/271, the currently valid norm in the range of minimal equivalent number of population covered with the wastewater treatment amounts to over 10,000. The effect of introducing these regulations was a significant increase in the share of the

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Table 1. Share of the population connected to at least secondary urban wastewater treatment in 2007–2017 [%] in European countries

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	68.7	71.0	72.8	75.0	77.2	74.9	76.4	78.2	80.5	81.9	83.0
Bulgaria	39.6	41.3	42.7	45.1	53.7	53.9	54.6	54.8	60.7	61.8	63.2
Czechia	73.0	75.4	75.7	76.9	78.0	78.0	79.8	79.8	80.7	81.2	82.3
Denmark	–	–	89.4	88.0	88.4	88.4	90.1	91.0	90.8	91.5	91.8
Germany	91.9	–	–	95.6	95.5	95.4	95.4	95.6	95.8	96.0	–
Estonia	83.5	84.5	84.5	83.3	86.1	86.2	87.1	88.0	87.6	87.8	87.9
Ireland	59.0	–	71.0	–	63.0	58.8	59.4	60.0	60.6	61.2	61.2
Greece	85.0	–	87.4	87.4	88.2	92.0	92.9	92.9	93.4	93.4	–
Spain	–	88.0	–	93.0	–	94.8	–	92.9	–	–	–
France	–	–	–	77.7	79.8	80.1	80.0	79.0	80.0	80.0	80.0
Croatia	22.0	–	–	–	36.9	36.9	36.9	36.9	36.9	36.9	36.9
Italy	–	57.5	83.0	–	–	57.6	–	–	59.6	–	–
Cyprus	–	–	–	–	–	–	–	–	–	–	–
Latvia	66.7	56.9	63.2	60.3	71.5	81.4	83.4	85.1	90.3	91.5	95.0
Lithuania	–	–	–	–	–	63.1	64.3	69.4	72.3	73.5	73.8
Luxembourg	–	–	–	91.3	90.9	96.1	96.3	96.6	96.6	96.9	97.0
Hungary	49.8	50.0	52.1	69.5	70.9	72.8	72.7	73.5	76.5	78.1	79.2
Malta	8.4	14.8	15.2	6.6	92.3	91.9	91.8	91.6	–	14.5	14.9
Netherlands	–	99.3	–	99.3	99.4	99.5	99.4	99.4	99.4	99.5	99.5
Austria	–	92.6	–	93.9	–	94.5	–	95.0	–	99.8	–
Poland	**61.8**	**62.9**	**64.1**	**64.5**	**65.5**	**68.5**	**70.2**	**71.4**	**72.6**	**73.4**	**73.5**
Portugal	51.0	52.0	55.8	–	–	–	–	–	–	–	84.6
Romania	20.4	18.2	20.7	22.7	31.7	35.3	36.1	38.2	39.7	43.8	46.5
Slovenia	48.8	51.1	52.9	51.6	54.4	53.7	55.2	55.6	57.4	63.3	67.4
Slovakia	–	–	–	–	–	–	–	–	–	63.6	65.0
Finland	–	–	–	83.0	83.0	83.0	83.0	85.0	–	–	–
Sweden	94.0	94.0	94.0	94.0	94.0	95.0	95.0	95.0	95.0	95.0	95.0
United Kingdom	–	96.9	97.0	99.5	–	–	–	100.0	–	–	–
Iceland	–	2.0	–	1.0	–	–	–	–	–	–	–
Norway	66.0	68.0	66.2	65.8	67.8	68.9	68.8	68.9	71.8	68.4	68.6
Switzerland	–	–	–	98.0	–	–	98.0	–	–	–	–
Albania	–	–	–	–	–	–	–	9.9	8.0	7.0	7.3
Serbia	6.9	7.5	8.9	8.6	8.9	9.0	9.4	10.0	10.8	12.5	12.6
Turkey	31.1	31.4	35.2	37.6		42.0	42.7	43.2	55.4	56.3	–
Bosnia and Herzegowina	10.0	10.7	10.7	10.9	11.1	11.4	11.7	11.8	11.8	29.6	29.6
Kosovo (')	–	–	–	–	0.6	0.6	0.6	0.6	0.6	0.6	0.6

Source: own study based on Eurostat (2019)

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population connected to at least secondary urban wastewater treatment in 2007–2017 in EU (Tab. 1). The data show an increase in these values in the all European countries. The highest proportion of population subject to biological treatment was found in Sweden and Germany (95%) and the lowest in Serbia and Malta (12–14%), while Poland had at the average level of 73% similar to Lithuania and Norway.

The next Directive 91/676/EEC concerns the protection of waters against pollution caused by nitrates from agricultural sources. This Directive has the objective of reducing water pollution caused or induced by nitrates from agricultural source and preventing further such pollution. It is worth mentioning that nitrogen is a very important nutrient inflow from area sources, contributing to the phenomenon of surface water eutrophication. The Member States are obliged to limit these pollutions by introduction the suitable measures especially in the range of programmes and monitoring. However, the Directive 2006/11/EC concerns dangerous substances discharged into the aquatic environment. According to Article 3 Member States shall take the appropriate steps to eliminate pollution of the waters by the dangerous substances in the families and groups of substances in List I of Annex I (e.g. heavy metals, biocides) and to reduce pollution of the said waters by the dangerous substances in the families and groups of substances in List II of Annex I (e.g, nutrients). In this way, special protection was given to water reservoirs threatened by the inflow both nutrients and the most harmful substances not only for aquatic ecosystems but also for humans.

CONCLUSIONS

Changes in the legal provisions on water law in Poland were manly caused by the implementation the Water Framework Directive provisions and related directives including wastewater treatments, agricultural nitrogen pollutions and hazardous substances aspects. It is also shown that despite the difficulties in implementing the WFD, Poland similarly to other UE countries is striving to provide the suitable and effective measures to order water management to meet the requirements to achieve good surface water status. However, the implementation of the directives contributed to special protection of water bodies threatened by the inflow not only nutrients but also the most harmful substances for aquatic ecosystems and consequently other ecosystems and peoples. The effect of introducing these regulations was a significant increase in the share of the population connected to at least secondary urban wastewater treatment in 2007–2017 in EU at mean value between 60–70% included in Poland. This should be clearly reflected in the appropriate state of surface water quality, especially rivers.

Moreover, the water permits system used in Poland is very helpful tool in the management and protection of waters. The implementation of directive solution in the Water Law Act of 2001 and 2017 contributed to a significant increase in the scope of activities requiring water-law permission. Thus, water-law permission concerns both the protection of water resources in terms of quantity and quality. This is for two reasons: firstly, the amount of water drawn in above 5 m^3 per day was specified, which also applies to irrigation of fields in agriculture. Secondly, the same values apply to the discharge of wastewater into waters and into the ground or the use of sewage for agricultural fertilization. In addition, the scope of activity was expanded to include reclamation of water reservoirs, introduction of particularly harmful substances into waters, protection of flood risk areas and in particular the use of waters for economic and service purposes. There was also a change in the authorities competent to issue water-law permits from public administration (staroste, voivode, voivodship marshal) to the bodies included in the Polish Waters, which can be considered as centralized water management. All this indicates a more restrictive approach of the legislator to the protection of the most valuable resource in the environment, which should contribute to the improvement or at least not deterioration of water quality, which is the main environmental objective of water law.

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When considering the validity of the introduction of these restrictive legal regulations in the context of water resources usage, it should be taken into account that not only the water resources are the most important environmental good for human, but also these resources are used for economic purposes in accordance with the principle of sustainable development. By introducing very stringent requirements in terms of water consumption and protection, it is possible to inhibit economic development. On the other hand, too liberal legislation may result in a deficit of these resources in terms of both quantity and quality, and under these circumstances it will not be possible to fuel economic development. Therefore, an appropriate balance should be found between the rigidity of these regulations and exploiting the water resources for the economic development. Nevertheless, it is in the common interest to continue to strive for their rigorous dimension, and even consider whether to extend the scope of activities requiring a water permit instead of the requirement to comply with water management, e.g. for the construction of water facilities (platform) or the use of waste water for agricultural use.

However, it is difficult to assess the validity of the centralization of managing water resources because the system has been in place only for two years. The key metric of this analysis in the future should be the quality of surface and groundwater. It seems that in this system water management and protection should be better controlled. Nevertheless, the public administration performing tasks in the field of the environment needs to understand the peaks in water demand and protect these resources accordingly, taking into account the population and economic entities using water. In addition, based on the state of water quality they could introduce protective measures, e.g. water restoration. Therefore, the above argument suggests an analysis of the effectiveness of the system after a few years of its operation, and only based on proposals the possible changes in legislation can be introduced.

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