

Anita Kwartnik-Pruc¹, Aneta Mączyńska², Bogusław Gabryś³

The Problem of the Undetermined Legal Status of Land under Flowing. Poland – a Case Study

Abstract: The new Water Law Act, which entered into force on 1 January 2018, has introduced numerous changes regarding the management of land covered by water. One of the most important changes concerns the procedure for determining the course of the shoreline. According to the previous act, the shoreline was determined *ex officio* during the modernisation of the land register survey. After the change in the legal regulations, it is no longer obligatory. The natural change in the course of the shoreline results in a change in the extent of ownership rights and the need to define the legal status of the land adjacent to the water, as flowing waters and the land beneath in Poland belong exclusively to the State Treasury. The problem of the undetermined legal status of private land occupied by water is significant because the land covered with flowing water is not subject to civil turnover. Without performing a demarcation procedure between the land occupied by a watercourse and the adjacent land, the owner cannot sell the property. The lack of the obligation to determine the course of the shoreline during the modernisation of the land register survey results in the aggravation of the problem of the undetermined legal status of land under water. This work analyses the boundaries of plots occupied by the watercourse in two provinces (Świętokrzyskie, Śląskie) where the land register survey was modernised after the entry into force of the new Water Law Act. The aim was to determine the scale of the problem of the land use Wp (flowing water) occurring on private land.

Keywords: undetermined legal status of land, shoreline, land under water

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¹ AGH University of Science and Technology, Faculty of Mining Surveying and Environmental Engineering, Krakow, Poland, email: akwart@agh.edu.pl,  <https://orcid.org/0000-0002-7891-2988>

² Geodetic and Construction Company "Geo-Bud", Stąporków, Poland, email: aneta.maczynska@gmail.com,  <https://orcid.org/0000-0001-7632-5264>

³ Group of Construction-Ceramic Schools in Gliwice, Gliwice, Poland

1. Introduction

The new Water Law Act has been in force in Poland since 1 January 2018 [1]. The Act has introduced numerous changes regarding the management of land under water. One of the most important changes concerns the change in the procedure for determining the course of the shoreline. Before the Water Law Act was amended, the shoreline was determined *ex officio* during the modernisation of the land register survey. This was the responsibility of the district governor – the same authority that keeps the register of land and buildings. Article 15b of the Act which is no longer in force [2] introduced the obligation to determine the shoreline during modernisation activities. There is no such provision in the new Act, which means in practice that it is no longer obligatory to determine the shoreline during modernisation activities.

Pursuant to Article 211 section 2 [1], inland flowing waters and ground waters are the property of the State Treasury. If inland flowing waters naturally take up land that is not owned by the water owner, the land becomes, by virtue of law, the property of the State Treasury [3]. Natural and permanent occupation of land by a watercourse makes it necessary to determine its legal status, as the land changes its owner and becomes the property of the State Treasury [4]. In order to determine the legal status of the land occupied by a watercourse, it is necessary to determine the shoreline and separate the land covered with flowing water from the adjacent land [5].

In Poland, the course of the shoreline is entered into the register of land and buildings and marked on cadastral maps. According to the Polish legislation [6 – § 46], the watercourse shoreline is the boundary of the cadastral parcel. Due to natural factors, the course of the shoreline changes over time [7]. The change in the course of the shoreline results in a change in the boundary of the cadastral parcel and the extent of the ownership rights, which has already been mentioned in [8, 9].

In Poland, the shoreline of a natural watercourses is determined in administrative proceedings according to three criteria [10, 11]. In the first place, the shoreline is drawn along the clear edge of the shore, if such exists. The upper edge of the slope is considered to be the distinct edge of the shore. If, however, there is no distinct edge of the shore, the shoreline runs along the boundary of permanent grass growth. However, if the boundary of permanent grass growth is above the average water level from at least the last 10 years, then the shoreline runs along the line of intersection of the water table (at the water level according to the average water level for the last 10 years) with the adjacent ground. The draft delimitation of the land covered with water from the adjacent land provided by the applicant forms the basis for establishing the shoreline. It shall include:

- 1) a description including the applicant's designation with an indication of their registered seat and address, the adopted method of establishing the planned shoreline, determination of the legal status of the property in question with the designation of the owners together with an indication of their seats and addresses, and the method of the development of the land adjacent to the planned shoreline;

- 2) a relevant:
 - a) updated copy of the base map at the scale of 1:500, 1:1000, 1:2000 or 1:5000,
 - b) map of the as-built survey of hydrotechnical regulatory structures at the same scale as the inland water regulation draft is prepared and, if there is no such map, other available materials.

The shoreline of the natural watercourse is established based on the draft delimitation of land covered with water from adjacent land by way of an administrative decision issued by the minister responsible for water management.

The model for determining the course of the shoreline proposed by the Polish legislator is quite a unique one. In the countries of Western Europe, Australia or the USA, the shoreline is determined according to the central line of the water [12–16].

It is also problematic to measure the boundary of a watercourse [5]. Therefore, various measurement methods are used for measurement, i.e. measurement by GPS (Global Positioning System) [17, 18], laser scanning [19–21], measurement by unmanned aerial vehicle (UAV) [22, 23].

The problem of the undetermined legal status of the land occupied by flowing waters is a significant one because, pursuant to Article 216 sections 1 and 2 [1], the land covered with inland flowing waters can not be subject to civil turnover. Therefore, failure to demarcate the land occupied by the watercourse from the land adjacent to it by the real estate owner makes it impossible to fully exercise their rights and sell such property. It is impossible to trade in land if its legal status is undetermined, as already discussed in [24–26]. The proximity of water also affects the price of real estate in the local real estate market [27]. The prices of real estate in the coastal region is lower [28, 29].

The problem of the undetermined legal status of the land under water does not only concern Poland, but many other countries around the world, as noted in [30, 31]. This is due to the complexity of the legal issues of the land covered by public and private waters [32–34]. The legal issues regarding the land covered with water were already discussed in ancient Roman law [35]. However, despite the passage of time, this problem has never been fully solved [36, 37].

Considering the fact that there is no obligation to determine the course of the shoreline during the modernisation of the land register survey and due to the continuous changes to watercourse boundaries resulting from natural factors [38], it seems that the problem of the undetermined legal status of the land under water may even get worse.

Therefore, the first research objective was to verify whether the problem discussed above occurred in practice. The analysis covered the area of four cadastral districts in Końskie county and three cadastral districts in Bielsko county, in which the land register survey was modernised after the amendment to the Water Law Act [1].

On the basis of the analyzes, it was found that in Bielsko county and Końskie county there are different methods of marking cadastral parcels occupied by water in the cadastre. In Bielsko county, a separate parcel of land was divided for the part

of the ground under water. In Końskie county, there was no division. The part of the land under water was designated as the land use Wp (flowing water).

Because the study revealed that there was land excluded from the real estate turnover due to its undetermined legal status in each of the analysed cadastral districts in Końskie county, detailed studies were performed to determine the scale of the problem of the occurrence of the land use Wp (flowing water) on private land. It was also analysed whether the lack of the need to establish the shoreline during the modernisation of the cadastral survey would have a significant effect on the possibility of managing land adjacent to flowing waters.

The study was carried out with the use of GIS spatial analyses, which are increasingly used in all fields of science. They can be successfully used to visualise the phenomena of cartographic presentation of digital maps or to conduct spatial analyses for various purposes [39–41]. GIS analysis can be used to model flood risk [42, 43].

2. Materials and Methods

For the purposes of this study, the data on the boundaries of the cadastral parcels were obtained from the County Geodetic and Cartographic Documentation Centre in Końskie and in Bielsko-Biała. The authors used a digital-vector cadastral map showing the boundaries of cadastral parcels and land uses. The analyses were carried out in the south-eastern part of Poland, in Końskie county in Świętokrzyskie province and in Bielsko county in Śląskie province (Fig. 1).



Fig. 1. Location of the study

The course of the natural watercourse boundaries in the area of Końskie county was analysed in four cadastral districts: Wąsosz, Janów, Kozia Wola and Czarna (Fig. 2). These cadastral districts were selected due to the modernisation of the land register survey carried out in 2018, i.e. after the change in the regulations on the procedure for determining the shoreline of the flowing waters.

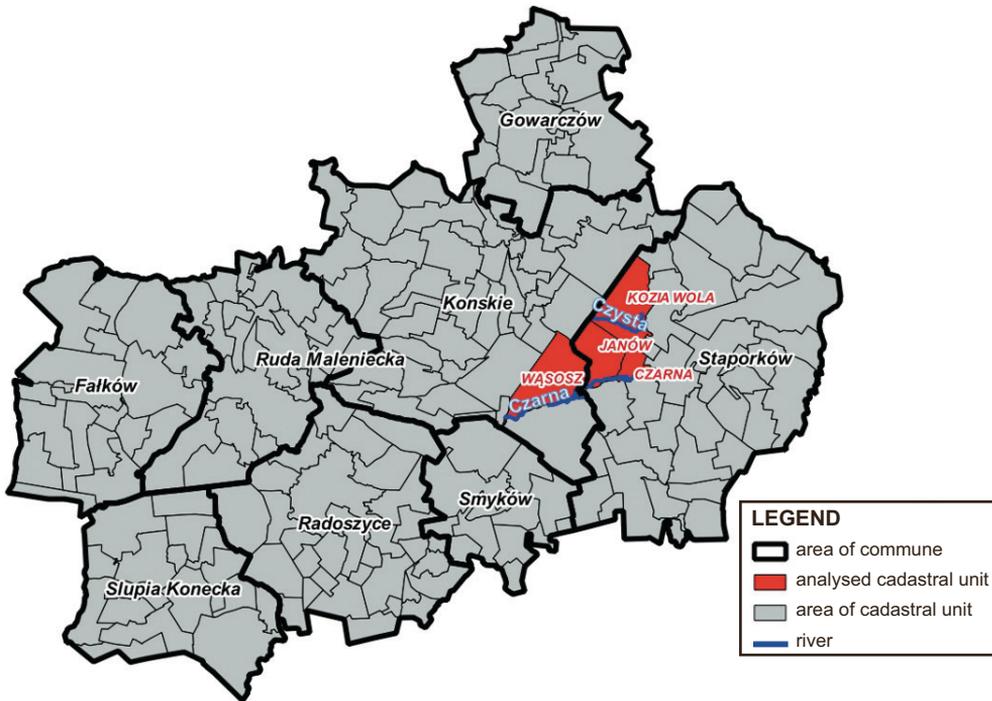


Fig. 2. Analysed cadastral districts

The course of the natural watercourse boundaries in the area of Bielsko county was analysed in three cadastral districts: Czaniec, Hecznarowice, Jaworze (Fig. 3). These cadastral districts were selected due to the modernisation of the land register survey carried out in 2018, i.e. after the change in the regulations on the procedure for determining the shoreline of the flowing waters.

According to the information obtained from the authority running the register of land and buildings in Końskie county, the boundaries of the cadastral parcels occupied by watercourses were not established during the modernisation activities. The only thing that was determined was the extent of the land occupied by the watercourse. The actual extent of the land occupied by water in the field was determined by the method described in [44] using the vectorisation of the current orthophotomap. The actual extent of the land currently occupied by the flowing waters in the field was presented on the cadastral map as the land use Wp (Fig. 4a).

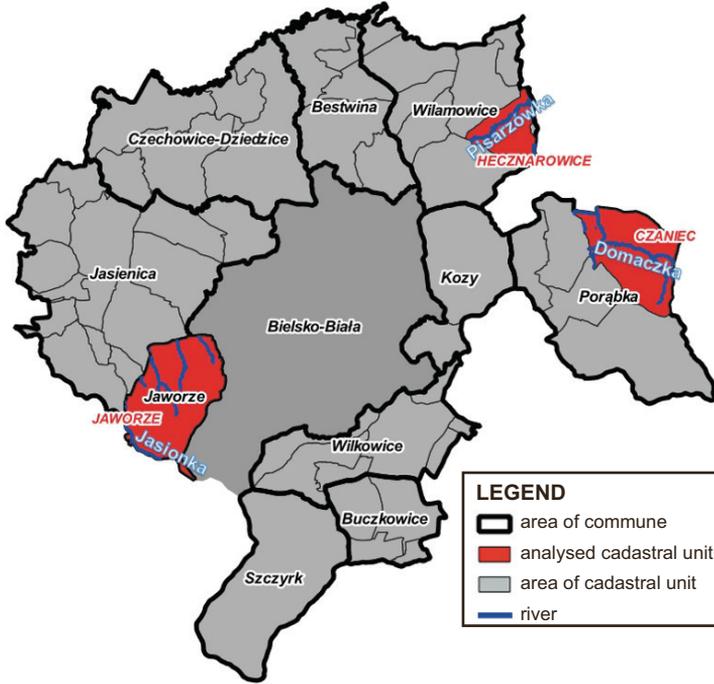


Fig. 3. Analysed cadastral districts

In Bielsko county, another method was proposed. A separate parcel was delineated for the land covered by water (Fig. 4a).

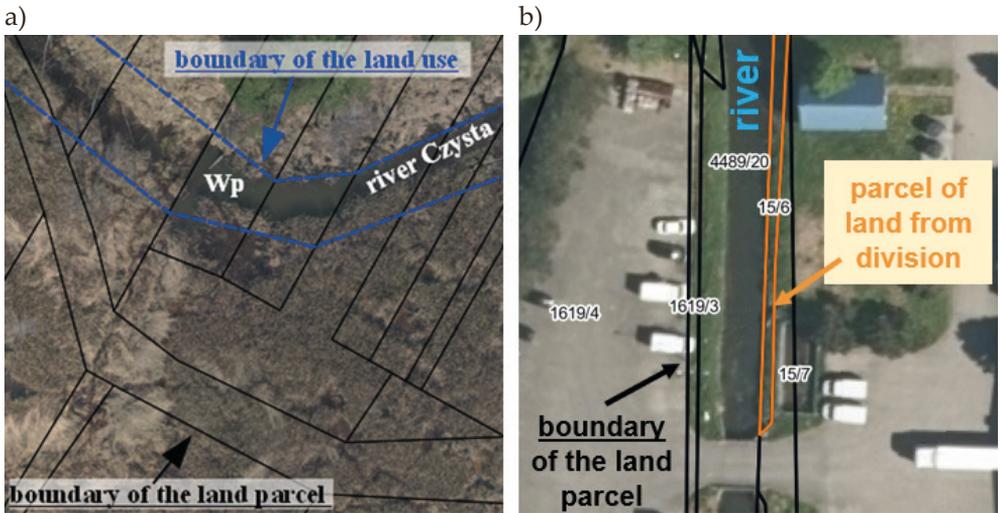


Fig. 4. Comparison of boundaries of cadastral parcels with area actually occupied by a watercourse (Wp): a) Końskie county; b) Bielsko county

First of all, it was checked whether the individual study objects had the problem of undetermined legal status of the land under water due to the land use Wp (flowing water) occurring on private plots. The first stage of the work involved the comparison of the course of the boundaries of cadastral parcels located along the watercourse with the area actually occupied by flowing waters marked on the cadastral map as the land use Wp, which allowed for the identification of problem areas. The analyses were performed with the use of GIS tools in the QGIS software.

The next step was to check the extent to which the lack of the obligation to determine the shoreline during the modernisation of the record survey affected the possibility of land trading. Using GIS spatial analyses and the "attribute selection" tool in the QGIS software, the number of cadastral plots with the land use Wp was determined. Thus, the number of cadastral parcels which could not be traded until their legal status of the land occupied by the watercourse, preceded by demarcation activities, was determined. In the next stage of the work, in order to determine the scale of the problem, the QGIS software calculated the area of the cadastral parcels excluded from the real estate turnover. Then, using Formula (1), the percentage share of the cadastral parcels excluded from the real estate turnover was determined for each of the analysed cadastral districts in relation to the total number of plots in a given cadastral district:

$$\%_{N_{ALL}} = \frac{N_W}{N_A} \cdot 100\% \quad (1)$$

where:

- $\%_{N_{ALL}}$ – percentage share of the number of cadastral parcels excluded from real estate turnover,
- N_W – number of cadastral parcels with land use Wp,
- N_A – number of all cadastral parcels in a given cadastral district.

During the next stage of the work, using Formula (2), the percentage share of the number of cadastral parcels excluded from the real estate turnover for each of the analysed cadastral districts was determined in relation to the number of plots directly adjacent to the watercourse in a given cadastral district which may also require the determination of their shoreline in the near future:

$$\%_{N_{ADJ}} = \frac{N_W}{N_T} \cdot 100\% \quad (2)$$

where:

- $\%_{N_{ADJ}}$ – percentage share of the number of cadastral parcels excluded from real estate turnover,
- N_W – number of cadastral parcels with land use Wp,
- N_T – number of plots directly adjacent to the watercourse in a given cadastral district.

In the next step, the study concerned the area of the analysed land. Using Formula (3), the percentage share of the area of the land excluded from the real estate turnover was calculated in relation to the total area of the land in a given cadastral district:

$$\%_{A_{ALL}} = \frac{A_W}{A_A} \cdot 100\% \quad (3)$$

where:

$\%_{A_{ALL}}$ – percentage share of the area of land excluded from real estate turnover,

A_W – area of cadastral parcels with land use Wp,

A_A – area of all cadastral parcels in a given cadastral district.

Based on Formula (4), the percentage share of the area of land excluded from the real estate turnover was calculated in relation to the area of land directly adjacent to the watercourse in a given cadastral district:

$$\%_{A_{ADJ}} = \frac{A_W}{A_T} \cdot 100\% \quad (4)$$

where:

$\%_{A_{ADJ}}$ – percentage share of the area of land excluded from real estate turnover,

A_W – area of cadastral parcels with land use Wp,

A_A – area of cadastral parcels directly adjacent to the watercourse in a given cadastral district.

3. Results and Discussion

This section presents the results of the analysis carried out in the Końskie and Bielsko counties. The analyses were based on the number of parcels excluded from real estate market turnover and the area of land excluded from real estate market turnover.

3.1. The Analysis in Końskie County

Based on the analyses performed, it was found that there was a problem with the undetermined legal status of cadastral parcels in all four cadastral districts in Końskie county. Figure 5 illustrates cadastral parcels excluded from the real estate turnover in individual districts. The cadastral parcels with the land use Wp are marked in yellow. The courses of the rivers in the analysed cadastral districts are marked in blue. As it is demonstrated in Figure 5, the plots that are excluded from turnover are located along the watercourses.

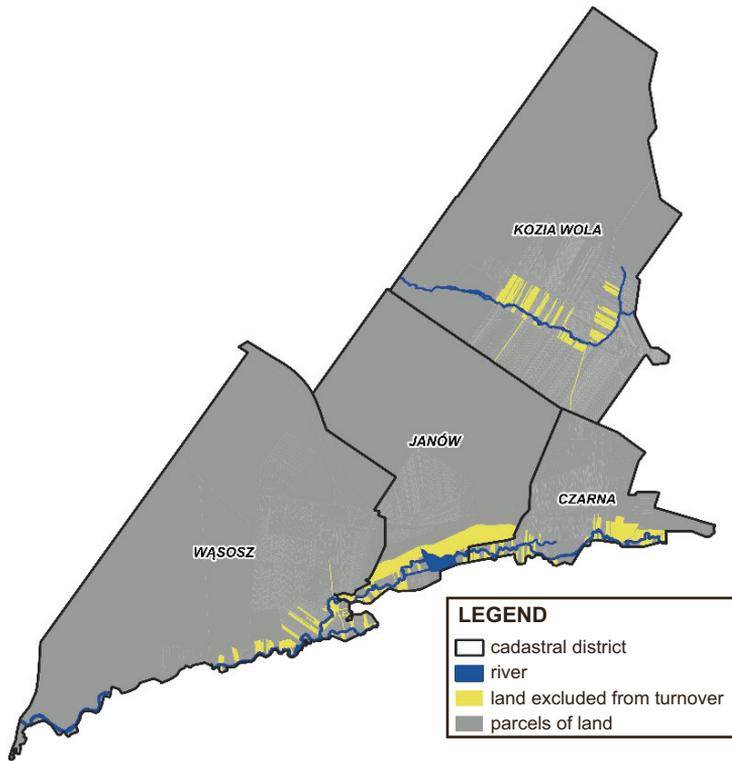


Fig. 5. Comparison of boundaries of cadastral parcels with area actually occupied by the watercourse (Wp)

Based on the GIS analyses, it was found that in the four analysed cadastral districts in Końskie county, 575 plots with an area of over 153 ha were excluded from real estate turnover due to the undetermined legal status of the land occupied by flowing water (Tab. 1). These plots constitute on average about 11% of all cadastral parcels entered into the land register. The largest number of such parcels (210) is in Kozia Wola cadastral district and the smallest in the Janów cadastral district – 56. However, these parcels occupy the largest area – 55.7 ha (Tab. 1).

Table 1. Land excluded from real estate turnover

Cadastral district	Number of cadastral parcels	Area of cadastral parcels [ha]
Kozia Wola	210	38.5
Czarna	168	33.4
Janów	56	55.7
Wąsosz	141	25.7
TOTAL	575	153.3

After the calculations carried out according to Formula (1) using the data presented in Table 1, it was found that the percentage of the number of cadastral parcels excluded from the real estate turnover in relation to the number of all parcels in individual cadastral districts ranged from 7% in the Janów cadastral district to as much as 16% in the Czarna cadastral district, accounting for an average of 11% (Fig. 6), which was a significant percentage (Tab. 2).

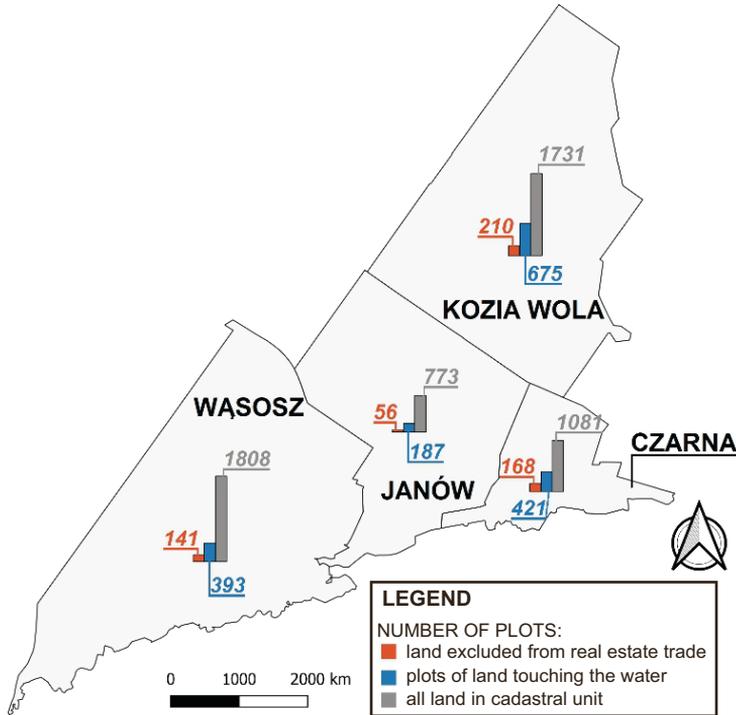


Fig. 6. Number of cadastral parcels excluded from real estate turnover and at risk of such exclusion in individual cadastral districts

Table 2. Percentage share of the number of cadastral parcels excluded from real estate turnover

Cadastral district	% _{N_{ALL}} [%]	% _{N_{ADJ}} [%]
Kozia Wola	12	31
Czarna	16	40
Janów	7	30
Wąsosz	8	36
ARITHMETIC MEAN	11	34

After the calculations carried out according to Formula (2) using the data presented in Table 1, it was found that the percentage of the number of cadastral parcels excluded from the real estate turnover in relation to the number of parcels directly adjacent to the waters in individual cadastral districts ranged from 30% in the Janów cadastral district to 40% in the Czarna cadastral district, accounting for an average of as high as 34% (Tab. 2).

After the calculations carried out according to Formula (3) using the data presented in Table 1, it was found that the percentage of the area of cadastral parcels excluded from the real estate turnover in relation to the total area of all parcels in individual cadastral districts ranged from 2% in the Wąsosz cadastral district to 11% in the Czarna cadastral district, accounting for an average of 4% (Tab. 3). After the calculations carried out according to Formula (4) using the data presented in Table 1, it was found that the percentage of the area of cadastral parcels excluded from the real estate turnover in relation to the area of the parcels directly adjacent to the waters in the analysed cadastral districts ranged from 4% in the Wąsosz cadastral district to as much as 69% in the Janów cadastral district (Tab. 3).

Table 3. Percentage share of the area of land excluded from real estate turnover

Cadastral district	$\%_{A_{ALL}}$ [%]	$\%_{A_{ADJ}}$ [%]
Kozia Wola	3	5
Czarna	11	51
Janów	7	69
Wąsosz	2	4
ARITHMETIC MEAN	4	10

As the analyses show in Końskie county, the problem with the cadastral parcels excluded from real estate turnover and at risk of such exclusion is significant. Their total area is not as disturbing as their number. In the four cadastral districts in Końskie county that were analysed, as many as 575 cadastral parcels with a total area of 153.3 ha were excluded from the real estate turnover due to the undetermined legal status of the land occupied by flowing water.

3.2. The Analysis in Bielsko County

Based on the analyses performed, it was found that a problem of the undetermined legal status of cadastral parcels did not exist in any of the three cadastral districts in Bielsko county. It was made possible thanks to the division of the land under water and its severance from the adjacent land. Separate cadastral parcels were established for the land covered with water and the remaining part of the land which was not under water became a different cadastral parcel.

Figure 7 illustrates the cadastral parcels in the Czaniec cadastral district. The cadastral parcels occupied by water and thus separated are marked in orange. The cadastral parcels that would have been excluded from the market turnover if the division had not been performed are marked in yellow. The courses of the rivers in the analysed cadastral districts are marked in blue. All cadastral parcels in this cadastral district are marked in gray.

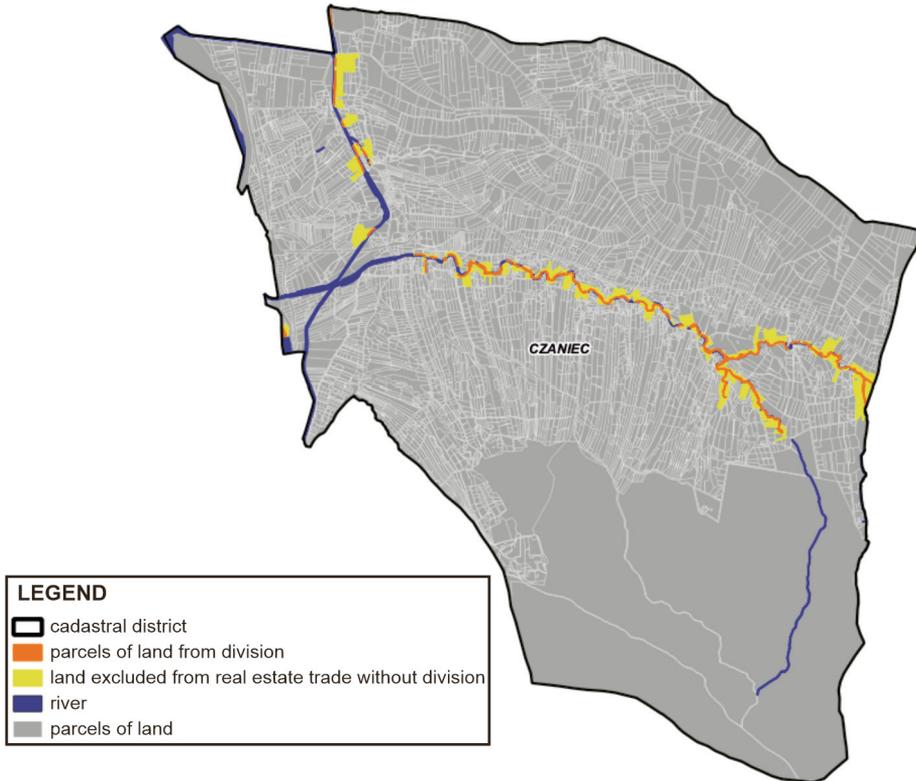


Fig. 7. Cadastral parcels in the Czaniec cadastral district

Figure 8 illustrates cadastral parcels in the Heczmarowice cadastral district. The cadastral parcels occupied by water and thus severed are marked in orange. All cadastral parcels in this cadastral district are marked in grey. The cadastral parcels that would have been excluded from the market turnover if the division had not been performed are marked in yellow. The courses of the rivers are marked in blue.

Figure 9 illustrates cadastral parcels in the Jaworze cadastral district. The cadastral parcels occupied by water and thus severed are marked in orange. The cadastral parcels that would have been excluded from the market turnover if the division had not been performed are marked in yellow. All cadastral parcels in this cadastral district are marked in gray. The courses of the rivers are marked in blue.

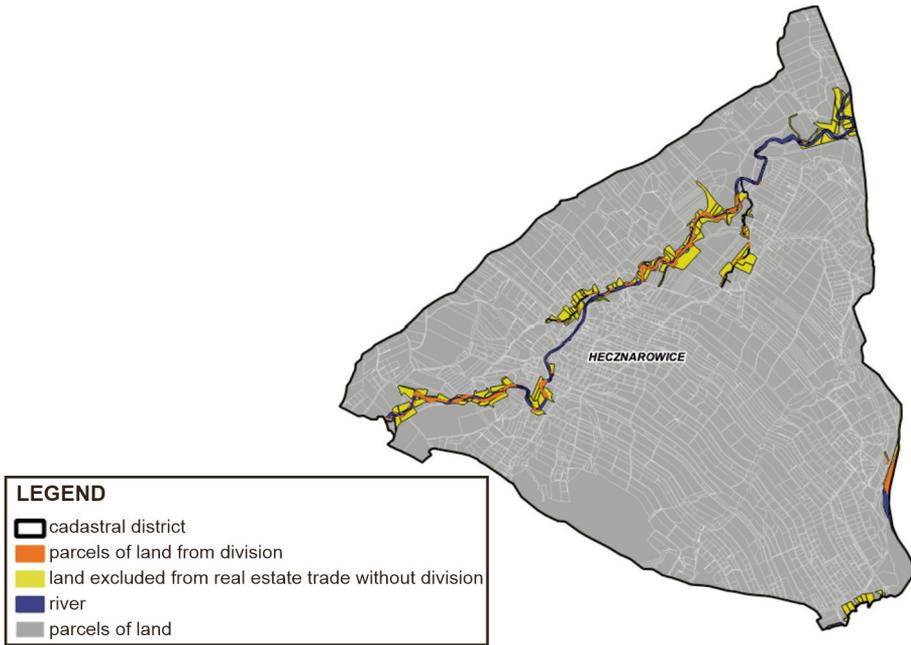


Fig. 8. Cadastral parcels in the Hecznarowice cadastral district

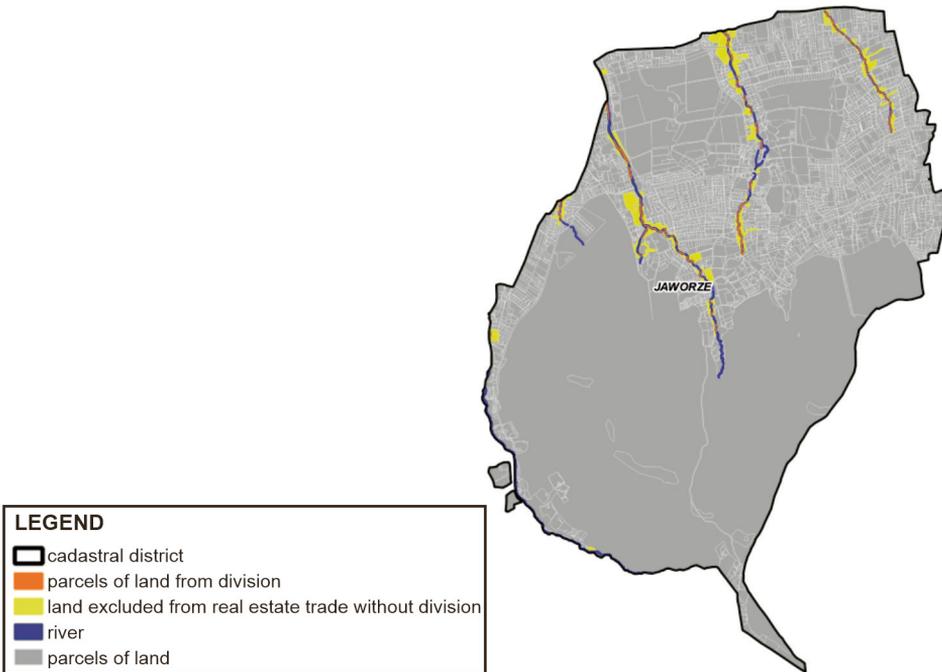


Fig. 9. Cadastral parcels in the Jaworze cadastral district

Based on the GIS analyses, it was found that in the three analysed cadastral districts in Bielsko county, 485 parcels of land with an area of over 23 ha taken by water were divided (Fig. 10, Tab. 4). The largest number of such parcels (343) is in Jaworze cadastral district and the smallest in Hecznarowice cadastral district – 236.

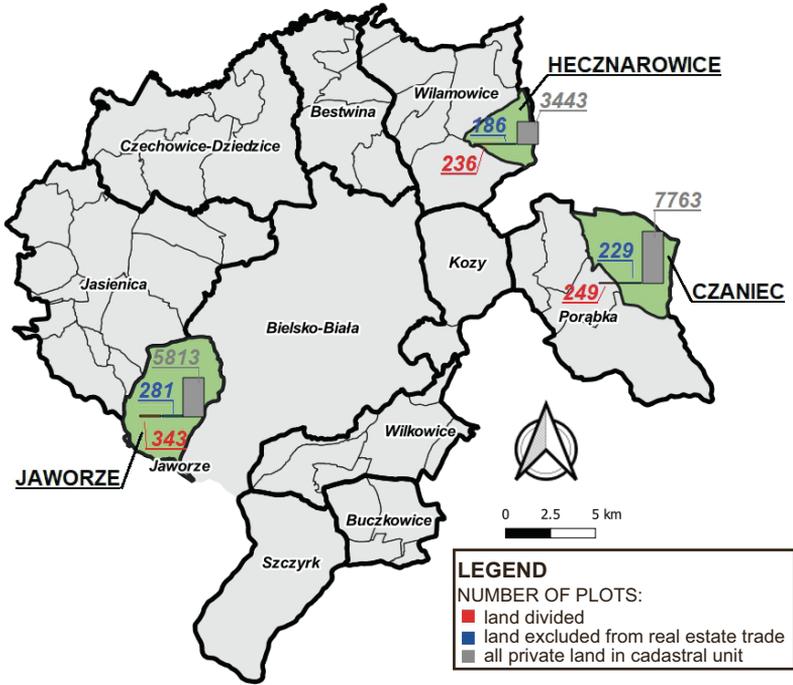


Fig. 10. Number of cadastral parcels excluded from real estate turnover and at risk of such exclusion in individual cadastral districts

Without the division, 415 cadastral parcels with an area of over 107 ha would be excluded from real estate turnover (Fig. 10, Tab. 4). The largest number of such parcels (281) is in the Jaworze cadastral district and the smallest in the Hecznarowice cadastral district – 181.

Table 4. Area [ha] of cadastral parcels

Cadastral district	Divided cadastral parcels	Cadastral parcels excluded from real estate turnover without division	All private parcels in cadastral district
Czaniec	3.42	27.26	1 095.38
Hecznarowice	10.23	33.08	608.52
Jaworze	10.10	46.73	695.34
TOTAL	23.75	107.07	2 399.24

After the calculations were carried out according to Formula (1) using the data presented in Figure 10, it was found that if the division had not been made, the percentage of the number of cadastral parcels excluded from the real estate turnover in relation to the number of all parcels in individual cadastral districts would range from 3% in the Czaniec cadastral district to as much as 5% in the Hecznarowice cadastral district (Tab. 5).

After the calculations were carried out according to Formula (3) using the data presented in Table 4, it was found that if the division had not been made, the percentage of the area of cadastral parcels excluded from the real estate turnover in relation to the total area of all parcels in individual cadastral districts would range from 2% in the Czaniec cadastral district to 7% in the Jaworze cadastral district (Tab. 5).

Table 5. Percentage share of the land excluded from real estate turnover without division

Cadastral district	$\%_{N_{ALL}}$ [%]	$\%_{A_{ALL}}$ [%]
Czaniec	3	2
Hecznarowice	5	5
Jaworze	3	7
ARITHMETIC MEAN	4	4

As the analyses show in Bielsko county, there is no problem with the cadastral parcels excluded from real estate turnover. It was made possible thanks to the division of the land under water and its severance from the adjacent land. If the division had not been made, the problem with the cadastral parcels excluded from real estate turnover would have been of the same size as in Końskie county.

4. Conclusion

The Water Law Act of 2017 introduced changes in the management of land covered with water. Unfortunately, not all of these changes are an advantage. The lack of the obligation to determine the course of the shoreline of natural watercourses during the modernisation of the land register survey results in the failure to update the cadastral data regarding boundaries of cadastral parcels permanently occupied by flowing water.

The study concentrated on two areas in Poland, i.e. Końskie county and Bielsko county. In these areas, different methods of determining water in the cadastre were presented.

As the analyses show, the problem with the cadastral parcels excluded from real estate turnover only occurs in Końskie county. The current course of the shoreline

only as a contour of the land use (Wp) into the land register survey blocks the turnover of the land adjacent to the watercourse only in the first area (Końskie county). As demonstrated by the conducted study, this problem occurs in all four surveyed cadastral districts modernised after 1 January 2018.

In the second area analysed (Bielsko county), the problem with the cadastral parcels excluded from real estate turnover was eliminated. It was made possible thanks to the division of the land under water and its severance from the adjacent land. The land covered by water has been marked as a separate cadastral parcel. However, the owner of this new cadastral parcel remained the same. Such a solution allowed the problem of cadastral parcels excluded from real estate turnover to be temporarily avoided. The shoreline has not been legally established in Bielsko county, as is the case in Końskie county. In Bielsko county, the shoreline was vectorised on the orthophotomap, as in Końskie county. The problem of establishing the shoreline and regulating the legal status of the land under water was left to the owners of the real estate taken by the water.

In both of the analysed areas, due to the considerable size of the problem, the most favourable way to determine the legal status of the land occupied by watercourses would be to prepare a demarcation project for all plots within a given cadastral district. The demarcation project should be made during the modernization of the land register survey. If the modernisation of the land register survey had been performed before the change of the Water Law Act, the problem in the studied area would not exist. The change of the Water Law Act has resulted in the lack of obligation to establish the shoreline. The authors believe that this change was unfavourable. The fact that the provision imposing the obligation to determine the shoreline during the modernisation activities has been repealed from the new Water Law Act may also involve a change in the authority responsible for issuing the administrative decision approving the shoreline – from January 1, 2018 it is the minister responsible for water management, i.e. central administration, not the district governor (the authority keeping the register of land and buildings) as it was before.

Considering the complicated procedure, high costs of demarcation activities and a large extent of the works, they should be coordinated and co-financed by public administration bodies responsible for the timeliness of cadastral data and using these data for various purposes. However, this requires a change to be made to the legal regulations in Poland. A public administration may only perform such tasks from public funds if it is obliged to do so by law.

Author Contribution

Author 1: writing – review and editing, supervision, project administration, funding acquisition, conceptualization.

Author 2: conceptualization, methodology, software, visualization, data, writing – original draft preparation.

Author 3: data, writing – review and editing.

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