Accounting of the impact of flooding and underflooding zones on the cadastral value of real estate objects

S A Galchenko, R V Zdanova, N P Ruleva, M A Smirnova

Department of Land Use and Cadastre, State University of Land Use Planning, 15, Kazakova St., Moscow, 105064, Russia

E-mail: GalchenkoSA@guz.ru

Abstract. The paper considers the impact of the negative environmental factor of “flooding (underflooding)” on the cadastral value of land plots in Tobolsk municipal district of Tyumen region. A literature review was conducted to define flooding and underflooding. The need to take into account the influence of flood zones (flooding) when determining the cadastral value of real estate was shown. The paper considers the need to enter information on flooding and underflooding zones in the real estate register, justifies why it is important to observe a certain regime and special conditions for their use in these territories, shows how the concepts of the flooding zone differ from the underflooding zone, protective measures are considered that are established for such zones to prevent the negative impact of water on clearly designated territories. The paper justifies the need to take into account the influence of zones with special conditions for the use of territories in determining the cadastral value of land plots. The influence of “flooding (underflooding)” zones as a pricing factor of value on land plots in the Unified State Register of Real Estate and subject to state cadastral assessment was considered. Proposals to improve the cadastral assessment of land plots in order to increase the sustainability of the development of territories are given.

1. Introduction

The concepts of this topic are certainly relevant at present. As before, state cadastral valuation is a set of measures aimed at determining the cadastral value. It is defined in accordance with the methodological guidelines approved by the Order No. 226 of the Ministry of Economic Development of 12.05.2017 on the determination of cadastral value.

The results of determining the cadastral value of valuation objects are used for tax purposes, calculation of rent and other cases stipulated by the legislation of the Russian Federation. The structure and composition of the determined value is influenced by pricing factors, the selection of which is carried out taking into account the type of use and the characteristics of the region [1].

The new law gives the authority to determine the cadastral value to budget institutions created by the executive branch of the constituent entity of the Federation [2].

Real estate owners may provide such an institution with a declaration on the characteristics of their objects. The law provides for mandatory notification of the receipt of declarations [3].

The section concerning the state cadastral assessment of the Rosreestr website presents information on regions where the determination of the cadastral value is already being implemented according to the new procedure. A clear presentation of regional plans will be useful not only for understanding what is happening, but also for successful legal practice [4].
Underflooding is a vivid example of the response of the geological environment to the effects of man-made factors.

In modern conditions, there are problems in accounting for flooding (underflooding) zones when determining the cadastral value of real estate due to insufficient information on the estimated objects provided for the performance of work. One of the most important unresolved tasks is the lack of information on such zones with a negative impact. The problems of reducing the level of land fertility, reducing the capacity of fodder lands, increasing the area of negative impact are closely related to this issue [5].

To solve these problems, it is necessary to take into account the factor of flooding (underflooding) when conducting a state cadastral assessment of real estate objects taking into account the influence of the factor discussed above, which will improve the quality of the work performed. It is important to note that this factor is caused by the specifics and peculiarities of the region in which the land is located.

2 Materials and methods
The types of zones with special conditions for the use of territories are defined in Article 105 of the Land Code of the Russian Federation (hereinafter – LC RF). Let us consider what makes it necessary to enter information on flooding and underflooding zones in the real estate register. Flooding and underflooding are one of the forms of negative impact of water on territories and facilities [5].

In these territories it is important to observe a certain regime and special conditions for their use. The zones with special territory conditions are established for the objectives shown in Figure 1.

![Figure 1. Objectives of establishing zones with special conditions of territories](image-url)
In accordance with the first part of Article 106 of the LC RF, the Government of the Russian Federation approved a provision for each type of zone with special conditions for the use of territories (hereinafter – ZSCUT) [6].

- procedure for preparing and making decisions on establishment, changes, termination of these ZSCUT,
- exhaustive list of objects, territories in connection with the placement of which or for the purpose of protection and preservation, which are established by ZSCUT, or the criteria for such objects. Types of territories,
- period on which the specified ZSCUT are established,
- requirements to the limit dimensions of the specified ZSCUT and (or) the rules for determining the dimensions of ZSCUT,
- procedure for designation of ZSCUT boundary and (or) location of the object, in connection with placement of which ZSCUT is established on the ground,
- list of restrictions on the use of land plots that may be established within the boundaries of these zones.
- rules for determining the size of territories in case two or more territories can be allocated within the boundaries of a zone with special conditions of the territory, for which different restrictions on the use of land are established;
- information on the possibility or impossibility of establishing separate restrictions on the use of land plots, water bodies, their parts during ZSCUT establishment;
- federal executive bodies authorized to make decisions on the establishment, amendment, termination of ZSCUT existence;
- exhaustive list of documents for making decisions on establishment, change, termination of ZSCUT existence;
- justifications for the termination of ZSCUT existence.

What is the regime of land use within the boundaries of flooding and underflooding zones? Within the boundaries of flooding and underflooding zones assigned in accordance with the legislation on urban planning activities to zones with special conditions for the use of territories, a ban is imposed on the placement of new settlements and the construction of construction projects without providing engineering protection of such settlements and objects from flooding and underflooding [7].

The establishment of flooding and underflooding zones is a special protective measure designed to prevent the negative impact of water on clearly designated territories. Next, let us consider the concepts and their differences.

Flooding zones – the formation of a free surface of water on a section of the territory as a result of an increase in the level of watercourse, reservoir or groundwater.
Underflooding zones – an area subject to flooding as a result of overflow from reservoirs, rivers, other water bodies or the influence of any other economic activity and natural factors.

The Article 67.1 of the Water Code of the Russian Federation contains measures to prevent the negative impact of waters and to eliminate its consequences. Next, let us show what kind of activities they include [7].

Let us consider which territories should be protected. Flooding zones are established in relation to the following territories (Figure 3).

The resolution of the Russian Federation No. 360 “On flooding and underflooding zones” of 18.04.2014 approved the situation which establishes an order of establishment, change and termination of the zones of flooding, underflooding and also the requirement to the territories entering the borders of such zones [8]. Within the boundaries of flooding and underflooding zones, the following measures are prohibited (Figure 4).

Let us consider what measures should be taken to establish the mentioned zones and add them to the Unified State Register of Real Estate (hereinafter – USRRE).

Flooding or underflooding zones are established or changed on the basis of the decision of the Federal Water Resources Agency (its territorial bodies) together with proposals by the authorities of the constituent entity of the Russian Federation and local governments.

Such proposals include information on the boundaries of these zones, which should contain a graphical description of the location of the boundaries of these zones, a list of coordinates of the characteristic boundaries of such zones in the coordinate system established for the inclusion into the Unified State Register of Real Estate [9].

At the expense of the local budget, funds in the amount of 549.3 million rubles are provided for construction, reconstruction, improvement and design work; as of 31.12.2020, 506.9 million rubles (92%) were used.

At the expense of these funds in 2020 the work was carried out at the following facilities:
- engineering protection of Tobolsk against flooding, deepening of river channels;
- coastal dam in the area of Tobolsk oil depot;
- engineering protection of the piedmont part of Tobolsk against flooding and underflooding; flood-breaking dam.

Different cost factors are used to determine the cadastral value of land plots. We propose to apply the factors “Characteristics of the environment”. This factor ambiguously affects the value of land. For some settlements, proximity to the river is a positive factor (recreational), for others, on the contrary, a negative (underflooding).
To date, 135 flooded territories were determined in Tyumen. The decree No. 100 of the Nizhne-Ob Basin Water Administration of the Federal Water Resources Agency dated 20.06.2019 approved the boundaries of flooding and underflooding zones of the territory of Tyumen, Tyumen and Yarkovsky districts of Tyumen region adjacent to the Tura River with tributaries.

In accordance with the Decree of the Government of the Russian Federation No. 360 dated 18.04.2014, flooding and underflooding zones are considered established from the day of entering information on flooding and underflooding zones in the Unified State Register of Real Estate [4].

Information on the boundaries of flooding and underflooding zones is included in the Unified State Register of Real Estate and is contained in the online service “Public Cadastral Map” posted on the official website of Rosreestr (www.roseestr.ru) in the Internet [10].

3. Results

In Tyumen municipal district, 18 out of 20 municipalities currently fall into the boundaries of these zones in different percentages.

According to the Department of Subsoil Use and Ecology of Tyumen Region, work is currently underway to change the boundaries of flooding and underflooding zones, flooding of the Tura river with tributaries within the borders of Tyumen, Tyumen region, which are planned to be completed in 2021.

Let us consider the example of land plots falling into the flooding zone (underflooding) (Figure 5). Table 1 details the characteristics of the zone with special conditions for using the territory with register number 72:16-6.463 located in Tyumen region of Tobolsk district.
Figure 5. Fragment from the Rosreestr public cadastral map of zones with special conditions for the use of territories (flooding/underflooding) with registry number 72:16-6.463 in Tobolsk district of Tyumen region [10]

Table 1. Characteristics of the zone with special conditions of use of the territory with register number 72:16-6.463

| Indicator         | Characteristic                                                                 |
|-------------------|--------------------------------------------------------------------------------|
| Type              | Zone with special use conditions                                               |
| Kind              | Zones with special use conditions                                              |
| Register number   | 72:16-6.463                                                                     |
| Cadastral region  | 72:16                                                                          |
| Name              | Flooding zone                                                                  |
| Description       | Flooding zone (territory flooded at a maximum water level of 5% of the Tobol river with tributaries) of Tobolsk district of Tyumen region |
| Restrictions      | Within the boundaries of flooding zones, underflooding is prohibited: 1) use of wastewater to regulate soil fertility; 2) placement of production and consumption waste disposal sites, chemical, explosive, toxic, poisoning and toxic agents, points of storage and burial of radioactive waste; 3) implementation of aviation measures to combat harmful organisms. 4) placement of new settlements and construction facilities without special protective measures to prevent the negative impact of water. |

Let us consider a zone with special conditions for the use of territories (flooding/underflooding) located on the Irtysh River with tributaries) in Tobolsk district of Tyumen region shown on the public cadastral map of Rosreestr in Figure 6.
Figure 6. Fragment from the Rosreestr public cadastral map of the zone with special conditions for the use of territores (flooding/underflooding) with registry number 72:16-6.428 [10]

Table 2 shows the characteristics of the zone with special conditions for the use of territories with register number 72:16-6.428 located in Tobolsk district of Tyumen region.

| Indicator       | Characteristic                                                                 |
|-----------------|-------------------------------------------------------------------------------|
| Type            | Zone with special use conditions                                             |
| Kind            | Zones with special use conditions                                             |
| Register number | 72:16-6.428                                                                  |
| Cadastral region| 72:16                                                                         |
| Name            | Flooding zone                                                                 |
| Description     | Flooding zone (territory flooded at a maximum water level of 50% of the Irtysh River with tributaries) of Tobolsk district of Tyumen region |
| Restrictions    | Within the boundaries of flooding zones, underflooding is prohibited: 1) use of wastewater to regulate soil fertility; 2) placement of production and consumption waste disposal sites, chemical, explosive, toxic, poisoning and toxic agents, points of storage and burial of radioactive waste; 3) implementation of aviation measures to combat harmful organisms. 4) placement of new settlements and construction facilities without special protective measures to prevent the negative impact of water. |

A differentiation factor is proposed depending on the percentage of coverage at the maximum flooded water level of the territory.
Table 3. Cadastral value adjustment factors within zones with special flooding (underflooding) conditions

| Item                                           | Coverage, % | Differentiation factor of cadastral value |
|------------------------------------------------|-------------|------------------------------------------|
| Flooding zone (territory flooded at a maximum water level of 3%) | 3           | 0.9                                      |
| Flooding zone (area flooded at a maximum water level of 5%)    | 5           | 0.86                                     |
| Flooding zone (area flooded at a maximum water level of 10%)  | 10          | 0.83                                     |
| Flooding zone (area flooded at a maximum water level of 25%)  | 25          | 0.76                                     |
| Flooding zone (territory flooded at a maximum water level of 50%) | 50          | 0.69                                     |

Let us consider an example of calculating land plots designed to accommodate houses of medium-rise and multi-story residential buildings taking into account the factor of flooding (underflooding).

Specific indicator of land cadastral value (SILCV) = 1.41938838300531* e ^ (0.00170329336187686*(Distance from the settlement to the center of the subject) + 5.9262E-05*(Distance to the administrative center of the settlement, km) + 1.44743-05*(Population in settlements) + 0.725828396478232*(Presence of flooding zones).

The change in the specific indicator of the land cadastral value for all groups within 5% is caused by the composition of land plots in the previous and current assessment rounds, as well as the inclusion of such a pricing factor as the “presence of flooding zones” in the calculation.

4. Conclusion

The conclusions obviously state that the flooding and underflooding zone influence not only the structure of different types of land use, but also is in dependence with the cost of the real estate objects located in these zones.

Therefore, as part of the calculation of the cadastral value of land plots, in the process of determining the composition of pricing factors in the calculation, in addition to the most significant factors identified, it is proposed to take into account factors that have a special impact on the cadastral value of land plots – the presence of wetlands and underflooding.

Such factors more significantly take into account the differentiation of the cadastral value of land plots, which plays a particularly important role in constructing statistically significant models and obtaining correct and reliable results.

References

[1] Shapovalov D A, Galchenko S A, Antropov D V, Zhdanova R V 2017 Assessment of the impact of water protection zones by the cadastral value of land plots International Agricultural Journal 6 22-25. DOI: 10.24411/2587-6740-2017-16005.
[2] Federal Law “On State Cadastral Valuation”: Federal Law237-FZ: adopted by the State Duma on 03.07.2016: as of 31.07.2020. Retrieved from: the legal system “Consultant Plus”.
[3] Galchenko S, Varlamov A, Bogdanova O 2018 Theoretical and methodological foundations for formation of sustainable land management system IOP Conference Series: Materials Science and Engineering 012141
[4] Murasheva A A, Vdovenko A V 2013 Cadastral value of land in the coastal zone Scientific notes TOSU 4 1709-1714
[5] Papaskiri T V, Kasyanov A E, Alekseenko N N, Semochkin V N, Ananicheva E P, Shevchuk A A 2019 Digital land management IOP conference series: earth and environmental science 350 012065
[6] Anthropov D V, Zhdanova R V, Gvozdeva O V 2016 Accounting of the influence of zones with special conditions for the use of territories in the formation of an effective agricultural land use system International Agricultural Journal 4 15-17

[7] Russian Federation. Water Code of the Russian Federation: Federal Law No. 74-FZ of 03.06.2006 (current version, 2021). Retrieved from: Legal System “Consultant Plus”

[8] Decree of the Government of the Russian Federation No. 360 dated 18.04.2014 “On flooding, underflooding zones.” Retrieved from: Official Internet portal of legal information: http://www.pravo.gov.ru.

[9] Rasskazova A, Sinits Yu 2019 Prediction of agricultural land use IOP conference series: earth and environmental science 350 012068

[10] Public cadastral map. Federal Service for State Registration, Cadastre and Cartography ROSREESTR. Retrieved from: https://rosreestr.ru, (date of access: 23.0.2021).