

# Video-ecological coefficient of real estate objects

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**Abstract.** The paper presents the data obtained within the analysis of video-ecological factors formed in the territory of the typical building estate "Druzhba" in the city of Komsomolsk-on-Amur, Russia. The present work considers the issues of interrelations between the visual environment and the state of human work efficiency. Taking into account the influence of video-ecological factors, the authors attempted to forecast changes in the value of real estate objects and a consequent change in the cadastral value of these objects. Conclusions about the possibility of taking into account video-ecological factors for the cadastral assessment of the object were made. The authors also noted that investing in the development of the external appearance of the territories belonging to the group having a high video-ecological coefficient could increase their value and attractiveness.

## 1 Introduction

Today the degree of influence of visual environment quality on consumer preferences and consequently on the market value of real estate is quite fully determined. Generally, this factor is already taken into account when performing certain operations related to real estate objects and other improvements of settlements. The analysis defines the correspondence between the visual environment quality of building estate "Druzhba" in Komsomolsk-on-Amur and the preferences of city residents (potential buyers of apartments in this estate). The object under the study is located in cadastral unit 27:22:02 0801 and is considered in the present paper as a typical cadastral unit.

The relevance of this direction raises issues of the relationship between the visual environment and the state of human work efficiency, and the presence of increased crime rate in the territory. Considering this thesis, modern society is concerned not only with the functional convenience of the environment, but also with its positive effect on their physical and mental health. This means that the quality of the visual environment cannot be ignored when determining the value of land resources of settlements and ultimately should be taken into account within cadastral valuation of residential areas.

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The territory of the building estate under the study was initially intended for building objects to accommodate the staff of Komsomolskaya cogeneration plant 3. The buildings and structures of the temporary settlement “Stroitel” (“Builder”) were commissioned in the first turn. The first permanent residential building was erected in 1984. A few years later, the following permanent buildings and structures built according to the general development plan were commissioned. Not only industrial facilities and residential buildings were built, but also objects of social infrastructure. Today the population of this building estate comprises approximately 5,000 people. There are buildings of a secondary school, a kindergarten, a library, and a health care institution in the district.

## 2 Materials and methods

In order to determine the degree of optimization of land use of this building estate, its territory was assessed taking into account video-ecological factors. Table 1 shows the general characteristics of the visual environment, taking into account the concept of saccade automatics [1] recommended by V. A. Filin [2].

**Table 1.** General characteristics of the visual environment.

Name of visual field	General characteristics of the visual field	Surface area occupied by the field, m <sup>2</sup> / %	Typical example of filling a visual field
Homogenous	Visual details are almost absent or their number is sharply reduced. Many straight lines and right angles. Simplified shape. One large plane.	12 758 / 24.0	
Aggressive	Uniform concentration of many homogeneous elements on a surface. Uniformity in shapes and colors	36 550 / 69.0	
Comfortable	Variety of elements in the surrounding space. The presence of curved lines, sharp corners, rich color palette, thickening and rarefaction of visible elements	3 900 / 7.0	

To this moment there is no unitary methodology for assessing the video-ecological situation in the cadastral unit, although a number of principles have been deduced that help to create a comfortable visual environment and therefore identify the differences between the

existing environment and the preferable one. The most significant of them are listed below [3,4,5]:

- To avoid aggressive and homogeneous visual fields in the urban environment;
- To make shapes of buildings and structures more complex;
- To use low-rise and cottage construction;
- To limit the number of floors of buildings (buildings should not exceed the height of trees; a person should be inside the nature, not above it);
- To control the increase in the area of the city;
- The coloristic of the city (color saturation of the urban environment);
- Maximum landscaping and improvement of urban space.

In already formed cadastral units, only the last two principles can be actively implemented. Although the rest of principles are possible for implementation, they cannot be implemented comprehensively. If considering the territory of this building estate in terms of the ratio of the video-ecological coefficient and the presence of unfavorable elements of the visual environment in the land plots, then it is reasonable to classify the environment into five artificial categories given in Table 2.

**Table 2.** Classification of visual environment components.

Artificial visual group	Classification features
I	Unfavorable territory, built-up with well-type buildings. The most aggressive visual environment
II	The territory built up with high-rise buildings having windows facing neighboring buildings or elements of engineering infrastructure. Predominance of aggressive fields
III	It is represented by a territory with quite favorable buildings and positive adjacent areas, although the number of floors of residential buildings does not allow them to be considered as comfortable for people
IV	The territory which is the closest to comfortable, with multi-storey residential buildings, the windows of which face natural visual environment
V	The most comfortable territory with buildings and their surroundings that are favorable in terms of video-ecology, which positively influences people

For the numerical solution of problems of comparing land plots with the presence of various visual environments, a video-ecological coefficient can be used:

$$Q_v = S_{exp} \times q, \text{ where}$$

$Q_v$  – video-ecological coefficient,

$S_{exp}$  – percentage of the area of the visual environment fields,

$q$  – complete correction.

$Q_v$  takes into account the percentage of aggressive and homogeneous fields, while taking the full value of the percentage of aggressive fields, as this factor is more significant for owners:

$$S_{exp} = S_{agg} + \frac{S_{hom}}{2} - S_{com}, \text{ where}$$

$S_{exp}$  – percentage of the area of visual environment fields,

$S_{agg}$  – area of aggressive fields, %,

Shom – area of homogeneous fields, %,

Scom – area of comfortable environment, %.

The full correction takes into account the indicator for the height of the building (from 0.5 for low-rise buildings to 1.5 for high-rise buildings), for the shape of the building (from 0.5 for multi-storey buildings to 1.5 for buildings made in the shape of a well), on the environment (from 0.5 for natural plantations to 1.5 for technical buildings that disfigure the landscape), for landscaping (from 0.5 to 1.0; the decrease in the coefficient depends on the creation of public gardens, park zones, play and sports grounds):

$$q = qbh * qbs * qe * ql, \text{ where}$$

qbh - correction for building height,

qbs - correction for the building shape,

qe - correction for the surrounding visual environment,

ql - correction for the improvement.

The higher the  $Q_v$  coefficient, the less favorable this territory is, when:

$Q_v < 50$  - the video-ecological situation of the territory is favourable;

$50 \leq Q_v < 100$  - the video-ecological situation of the territory is acceptable;

$Q_v \geq 100$  - the territory is unfavorable, it needs improvement.

Restrictions are chosen based on data processing by the attractiveness of existing objects with similar properties. Table 3 shows the ratio of the parameters of the area of land and visual fields.

**Table 3.** The ratio of the parameters of the area of land and visual fields.

Cadastral numbers of land plots	Total area of land plots, m <sup>2</sup>	Area of aggressive fields, m <sup>2</sup>	Area of homogeneous fields, m <sup>2</sup>
Visual group II			
:40; :41; :52; :53; :56; :57; :58; :59; :60; :61; :62; :63; :64; :65; :66; :67	56,101	16,482	4,148
Visual group III			
:2; :42; :86	11,422	7,410	1,710
Visual group IV			
:44; :45; :50; :51; :54; :55	51,886	11,561	1,740

Based on the foregoing and the data given in Table 3, the density of aggressive and homogeneous fields is calculated for the residential area of a building estate:

- for group II, the density of aggressive fields is 0.3; of homogeneous - 0.1;

- for group III, the density of aggressive fields is 0.6; of homogeneous - 0.1;

- For group IV, the density of aggressive fields is 0.2; homogeneous are completely absent.

### 3 Conclusion

Graphic visualization of the results is shown in Figure 1, where the ratio of visual groups can be seen.



**Fig. 1.** Zoning of a typical cadastral unit taking into account the video-ecological factor.

From the data above, it is clear that the IV visual group is the most favorable. At the same time, the density indicator of visual group III exceeds indicator II, but taking into account significant differences in the relief it can be concluded that the zoning was carried out correctly. The visual group III is located on a smooth relief, which is more favorable. The second visual group is located in areas with a feral relief, which causes the predominance of negative elements of the visual environment.

Positive trends are also observed in assessing the value of residential real estate. According to the data taken from the website [komsomolsk.irr.ru](http://komsomolsk.irr.ru), the cost of one square meter of residential real estate of the second group is lower than of the fourth group approximately by 20%. This fact confirms the change in consumer preferences of the population for real estate, adjacent to a comfortable visual environment, which proves a certain influence of factors of the video-ecological state of the environment on the market value, therefore it should be taken into account when conducting a professional assessment of the property (including cadastral). It will be possible only if the regulatory framework of documents that are at least non-regulatory is changed. Alternatively, they should be recommended for use when specifying the cadastral value of individual real estate items.

Investing in the development of the visual appearance of the territories belonging to the group with a high video-ecological coefficient can increase their value and attractiveness. The presence of play and sports grounds, park areas will create conditions for attracting young population, as well as improve the external perception of the living population.

## References

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