

## CADASTRAL VALUATION BASED UPON THE ENVIRONMENTAL FACTORS USING THE CITY OF KURSK AS AN EXAMPLE

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*Economic appraisal of urban lands requires cartographic documents and point assessment. The purpose of the present studies is the creation of thematic cadastral maps and accompanying material. There were used the methods of mathematical statistics, comparative analysis, map modeling. The result of these studies can be used while making a comprehensive economic assessment of a city based on the existing regulatory framework. This article focuses on the environmental impact as one of the factors of integrated cadastral valuation.*

*Key words: Urban cadastre, Cadastral valuation, Environmental characteristic of area*

### INTRODUCTION

The regulation of land matters by paying for land is one of the main tasks of the State Land Cadastre of the Russian Federation, the development of which will help to implement land reform in the Russian Federation.

Economic appraisal of lands is a constituent part of cadastre. While forming the database of urban lands cadastre, it is necessary to define qualitative indicators for each area of land use.

The basis of our research is the principle that is the most suitable for the process of introducing market relations in the urban environment. The principle is as follows: the amount of land fee from land users (landowners) which forms the part of their rental income depends on aggregate factors, one of which is an environmental one.

### LAND EVALUATION METHODS

There are various methods of urban lands assessment (the method of expert valuation of land, the method of analogue procedure, the method of integrated economic land valuation on the basis of major factors, the method of land valuation on the basis of one dominant factor). For the first time the principles of land valuation were established by the Russian Federation government decree No. 112 of February 25, 1992. There was singled out a group of factors that together or separately influence the formation of values for all categories of land use: industrial, retail (commercial) residential [01].

The main ones of them:

1. Historical and architectural significance of the area
2. Site location on the city plan
3. The level of social infrastructure development
4. The level of utility systems and services development
5. Area's transport accessibility
6. The ecological state of the area
7. The possibility of natural hazards' existence

### THE RESULTS OF THE EVALUATION OF URBAN LAND

Successful outcome of any area assessment is a division of a city into zones depending on the degree of influencing factors of city-planning value. There was used a ten-point scale in our methodology. In the beginning, the territory of the city of Kursk was estimated on a ten-point scale on the basis of each of the major factors and before this it had been divided into areas on the basis of each factor of city-planning value. The result of our research will be integral score, which is calculated by formula [02]:

$$S = \frac{\sum_{i=1}^n F_i \times K_i}{\sum_{i=1}^n K_i} \quad 1)$$

S- area value in points,

Fi- value in points for each factor,

Ki – the contribution of factor i to area value in %,

i - number of factor; by value we mean a notional price in points

Contribution is the "weight" of each factor influence of city-planning value on the total score.

The degree of influence of each factor is determined by expertise, in total, the influence of factors equals to 100% (the value of contribution on the basis of factors of city-planning value is determined by expertise).

This article focuses upon the impact of area's ecological state on cadastral value. The most important component of a particular set of environmental problems of any territory is the pollution of soil, water and air basin. For cities and settlements this is of particularly importance as it negatively affects human health [04].

In urban areas the main sources of atmospheric pollution are industrial enterprises; industrial, transport, scientific research facilities; vehicles.

The air of large cities accumulates up to 1200 kinds of dangerous substances from plants, boilers and thermal plants. About 100 types of dangerous contaminants get into the atmosphere together with exhaust gases. The most active air pollutants - thermal power plants, the enterprises of chemical and construction industry, vehicles.

In the capacity of cartographic basis we used a map of the city of Kursk at the scale of 1:20000. The facilities that affect the environmental component of the area were laid down upon the map chart of the city of Kursk in the corresponding scale and coordinates. There are several methods of determining the areas of urban atmospheric pollution. The most effective one is taking into account the influence of weather conditions; it allows us to determine more precisely the concentration of pollutants in different parts of the city. In order to record the meteorological factors, there was used wind rose. It is a graph on which the cardinal directions of the earth show the number of winds blowing in a certain time of year, month in %. There were usually considered the winds with speed of 2 m/sec.- 6 m/sec. Table 1 presents an example of the calculation of radii of the city areas polluted by various pollutant components of a certain enterprise (in centimeters, JSC "Pribor").

The approach to recording contamination of air environment of city areas is determined by the number of sources and the degree of components concentration emitted by these sources. In the case when there are several enterprises that are the sources of air pollution and they are emitting two or more components with different degree of concentration, then the concept of total estimated figures is introduced. The total estimated figures allow us to summarize various components with different degrees of concentration that are emitted by different sources. The summation takes into account the categories of hazardous substances, there are of them - 1,2,3,4. Our research also introduces the concept of contrast ratios of ingredients. They are also 4(a=1, b = 2, c = 3, d = 4).

It is necessary to use the map of polluted areas to calculate the total estimated figures. The contours that have been formed by the boundaries intersection of the areas polluted by all the components in various concentrations should be numbered. The total estimated figures are calculated for each contour. Then, on the basis of total estimated figures, score is calculated for each contour, results are entered in the register.

Table 1: Radii calculation of the areas polluted by enterprises

| Component | Maximum concentration limit mg/cubic metre | Emissions (tons per year) | Radii (km) | Radii (km) | Wind rose, % |               |         |               |          |                |          |                |
|-----------|--|---------------------------|------------|------------|--------------|---------------|---------|---------------|----------|----------------|----------|----------------|
|           |  |                           |            |            | North 12%    | North East 8% | East 8% | Sout East 14% | South 9% | South-West 14% | West 19% | North-west 12% |
| Zn        | 0,2  | 0,8145                    | 1,01       | 5,05       | 0,97         | 0,67          | 0,97    | 1,13          | 0,73     | 1,13           | 1,54     | 0,97           |
|           |  |                           | 0,59       | 2,95       | 0,47         | 0,38          | 0,57    | 0,66          | 0,42     | 0,66           | 0,90     | 0,57           |
|           |  |                           | 0,47       | 2,35       | 0,45         | 0,29          | 0,45    | 0,53          | 0,34     | 0,45           | 0,71     | 0,45           |
| Cd        | 0,6  | 0,0005                    | 1,01       | 5,05       | 0,97         | 0,67          | 0,97    | 1,13          | 0,73     | 1,13           | 1,54     | 0,97           |
|           |  |                           | 0,59       | 2,95       | 0,47         | 0,38          | 0,57    | 0,66          | 0,42     | 0,66           | 0,90     | 0,57           |
|           |  |                           | 0,47       | 2,35       | 0,45         | 0,29          | 0,45    | 0,53          | 0,34     | 0,45           | 0,71     | 0,45           |
| Cr        | 0,01                                       | 1,5                       | 1,01       | 5,05       | 0,97         | 0,67          | 0,97    | 1,13          | 0,73     | 1,13           | 1,54     | 0,97           |
|           |  |                           | 0,59       | 2,95       | 0,47         | 0,38          | 0,57    | 0,66          | 0,42     | 0,66           | 0,90     | 0,57           |
|           |  |                           | 0,47       | 2,35       | 0,45         | 0,29          | 0,45    | 0,53          | 0,34     | 0,45           | 0,71     | 0,45           |
| Cu        | 0,1  | 0,0505                    | 1,01       | 5,05       | 0,97         | 0,67          | 0,97    | 1,13          | 0,73     | 1,13           | 1,54     | 0,97           |
|           |  |                           | 0,59       | 2,95       | 0,47         | 0,38          | 0,57    | 0,66          | 0,42     | 0,66           | 0,90     | 0,57           |
|           |  |                           | 0,47       | 2,35       | 0,45         | 0,29          | 0,45    | 0,53          | 0,34     | 0,45           | 0,71     | 0,45           |
| Pb        | 0,3  | 1,5535                    | 1,01       | 5,05       | 0,97         | 0,67          | 0,97    | 1,13          | 0,73     | 1,13           | 1,54     | 0,97           |
|           |  |                           | 0,59       | 2,95       | 0,47         | 0,38          | 0,57    | 0,66          | 0,42     | 0,66           | 0,90     | 0,57           |
|           |  |                           | 0,47       | 2,35       | 0,45         | 0,29          | 0,45    | 0,53          | 0,34     | 0,45           | 0,71     | 0,45           |

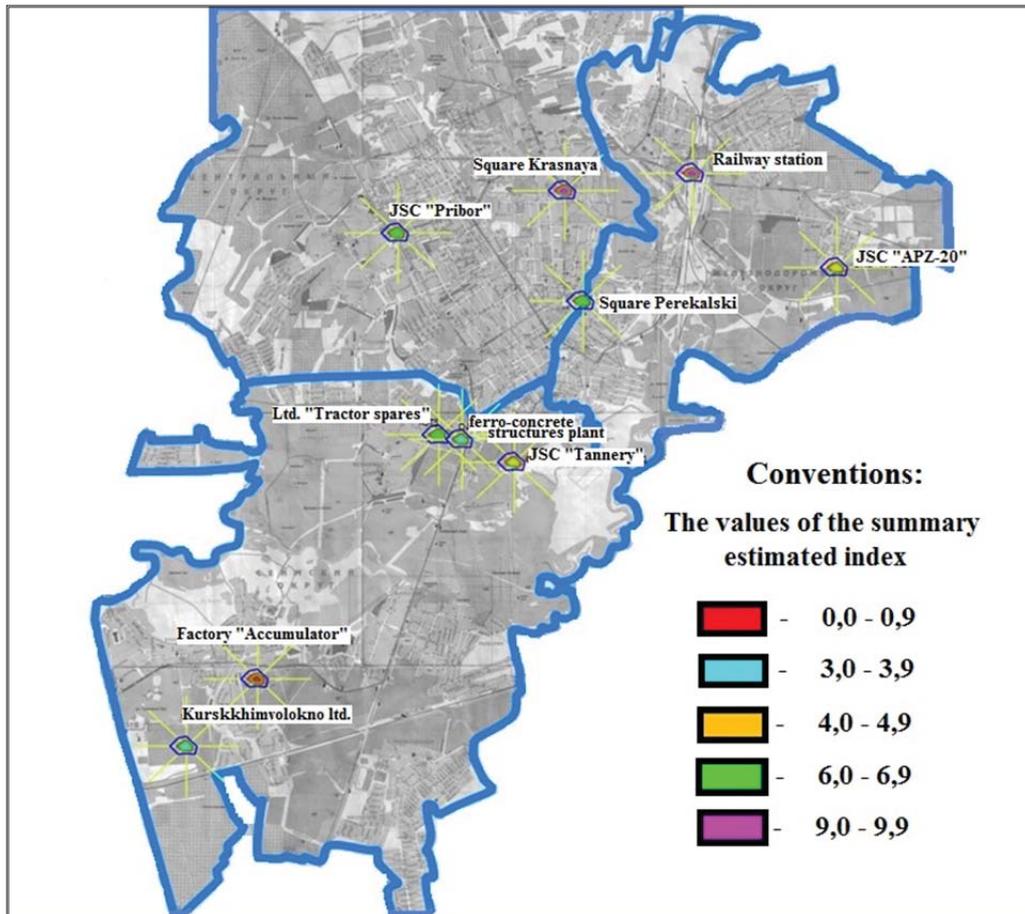


Figure 1: Map chart of the city of Kursk based on the level of environmental load from the main enterprises

## CONCLUSIONS

According to the results of scoring the level of air pollution in urban areas, territorial zoning is undertaken which is represented on the map chart.

On the basis of performed graphic and analytical work in the territory of the city of Kursk, there can be singled out several areas with optimally high score (10) of the environmental situation. The amount of the score in this cadastral quarter negatively affects the overall aggregate rating, lowering the level.

Taking into account the existing regulatory framework, the research performed can be used in the integrated economic valuation of urban lands based on the general principles of territories assessment.

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Paper submitted: 07.02.2018.

Paper accepted: 08.03.2018.

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