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RATIONAL USE AND MANAGEMENT OF PROTECTION ZONES OF HIGH-VOLTAGE POWER LINES: THE EXPERIENCE OF THE FERGANA VALLEY

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Abstract
The article deals with the issues of rational use of protection zones of high-voltage power lines (PTL) on the example of the Fergana region. Special attention is paid to the analysis of legal, environmental and economic aspects of land use in such zones. The data on the length and area of protected zones, their impact on agricultural and residential areas are presented. The use of satellite image illustrates the distribution of protective zones in the region, emphasizing the need for strict consideration of their boundaries in order to prevent legal and environmental conflicts. In conclusion, recommendations are proposed for optimizing the management of protected zones using GIS technologies and strengthening cadastral registration.

Keywords: protection zones, high-voltage power lines, land use, legal status, Fergana region, agriculture.

Introduction

Protected zones of engineering communications play a key role in rational land use. Their availability determines the possible types of use of land plots, including construction, agricultural needs and other types of activity. In the Fergana Valley, where a significant part of the territory is occupied by high-voltage power lines, compliance with the requirements of protective zones is especially relevant. However, the lack of accurate information in the Unified State Register of Real Estate Property about such zones often leads to legal, environmental and financial problems. The purpose of the study is to study the features of the protection zones of high-voltage power lines in the Fergana region, to analyze their impact on land use and to offer recommendations for improving the management of these zones.

Methodology

The following methods were used in the course of the study:
Analysis of legislation: regulatory documents, including resolutions of the Cabinet of Ministers of the Republic of Uzbekistan, regulating the protective zones of power lines are studied [1].
Cartographic analysis: data from the Unified State Register of Real Estate and cadastral authorities were used to assess the length and location of protected zones.
Comparative analysis: restrictions on land use depending on the type and voltage of power lines are considered.
The main attention is paid to the protection zones of power lines with a voltage of 110–500 kV,

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which are most widespread in the Fergana region.

Outcomes. Types of protected zones.

In the Fergana region, the length of protection zones of high-voltage power lines is more than 100 km, covering 1500 hectares of land. These zones include [1,2,3]:

- Overhead lines with a voltage of up to 20 kV – a protective zone of 10 m;
- 110 kV overhead lines – 20 m security zone;
- 550 kW power transmission line – protected zone up to 60 m.

Impact on land use. Restrictions on the use of land in protected zones of power lines include a ban on:

- Construction of residential buildings.
- Carrying out earthworks without approval.
- Planting perennial trees near wires.

Agricultural lands with a fertility of 56 points are often under protected zones, which reduces their productivity.

Problems of registration in the Unified State Register of Real Estate. It was revealed that in most cases, the protective zones of power lines are not registered in the Unified State Register of Real Estate, which leads to:

Legal disputes during construction.

Damage from non-compliance with restrictions.

Length and area of protected zones

In the Fergana region, the protection zones of high-voltage power lines occupy significant areas, which affects the availability of land for various types of use. For example, only the transit corridor of high-voltage power lines with a width of 150 m, a length of more than 100 km, occupies about 1500 hectares of agricultural land with a yield of 56 points [4,5].

A comparative analysis of protection zones for different types of power lines in the Fergana region is presented in Table 1:

№	Type of power line	Length, km	Standard width of the protected zone, m	Total area of the buffer zone, ha
1	Low-voltage cable line (0.4 kV)	81,253	2	16,25
2	Low-voltage overhead line (0.4 kV)	574,988	2	115,0
3	High Voltage Cable Line (10/6 kV)	202,197	20	404,39
4	High voltage overhead line (10/6 kV)	116,25	20	232,5
Total		**974,688**	**-**	**768,14**

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Legal and economic restrictions

In protected zones, there are strict restrictions on the use of land, including a ban on construction, construction and blasting operations, and the placement of buildings and structures without the consent of the owners of power lines [5,6].

For example:

- **High-voltage overhead lines**: a ban on planting perennial plantations, which reduces the possibility of their use in agriculture.
- **Cable lines**: restrictions on the depth of earthworks and the need for written approval from the owners of power lines.

Problems of accounting in the Unified State Register of Real Estate. Often, protective zones of power lines are not in the cadastral records, which leads to legal disputes and losses for landowners. The main reasons are:

1. Violation of the law by owners of industrial facilities who do not transfer data on protected zones to the Unified State Register of Real Estate Property.
2. Lack of technical means to accurately determine the boundaries of protected zones.

Impact on land use

Restrictions in protected zones prevent the full use of land plots, which negatively affects the development of the regional economy [6]. For example:

- More than 40% of plots in protected zones are not in active use, which leads to losses of income from land lease.
- In the agricultural sector, restrictions lead to lower yields, as protected areas often overlap with fertile land.

Additional aspects

To improve the management of protected zones, it is recommended:

1. Conducting a large-scale inventory of power transmission line protection zones using GIS technologies.
2. Creation of digital maps of protected zones for public access, which will simplify the processes of coordinating land use.

Discussion

The lack of accurate data on the boundaries of protected zones in cadastral documentation creates risks for developers and landowners. It is recommended to strengthen supervision over compliance with legislation, ensure the accuracy of cadastral data, and introduce geoinformation technologies for the management of protected zones [10-15].

Comparative analysis has shown that the introduction of modern mapping methods and automated management systems can significantly increase the efficiency of land use in protected zones. Figure 1 shows the satellite status of power lines emanating from agricultural lands along residential areas.

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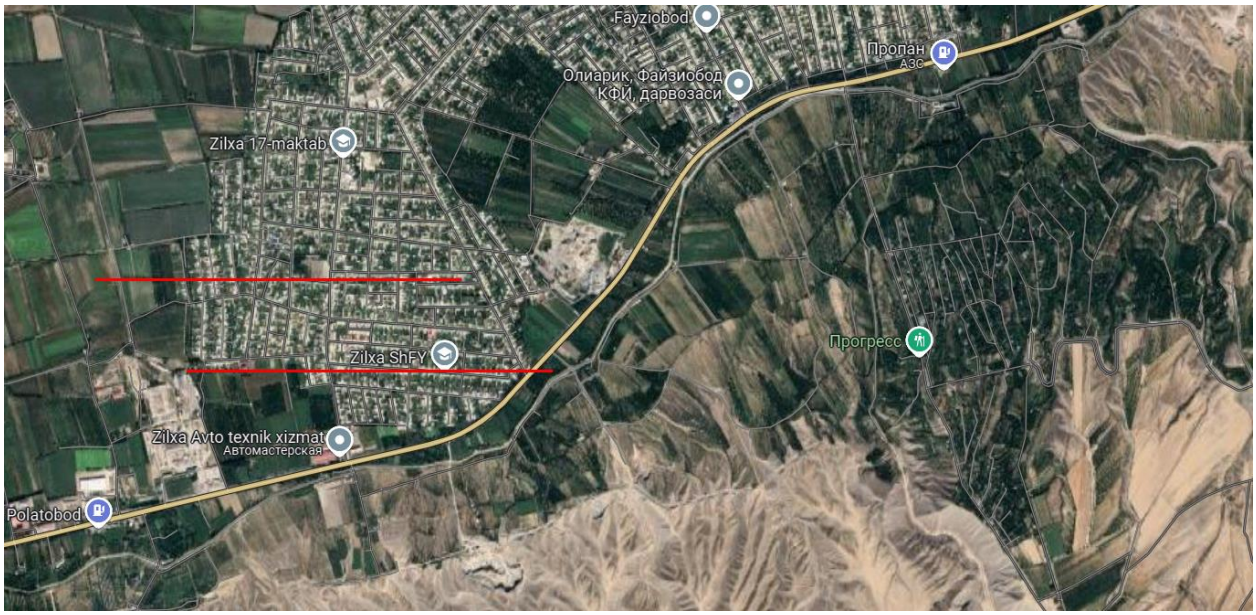

Figure – 1. Location of the power line in the south of the Fergana region.

Conclusion

Protection zones of high-voltage power lines in the Fergana region play an important role in land use, but require more careful accounting and regulation. To minimize risks, it is proposed:
Ensure full registration of protected zones in the Unified State Register of Real Estate.
- Implement GIS technologies for monitoring and managing land use.
- To increase the awareness of landowners about legal restrictions.

These measures will increase the rationality of land use and reduce the risks of conflicts and environmental problems.

The cultivation of protective zones of power lines in the Fergana region requires an integrated approach, including compliance with regulatory requirements, informing land users about existing restrictions and rational use of land resources. This will ensure the safety of the operation of power lines and the effective use of land in the region.

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