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THE IMPORTANCE OF RELIEF IN LAND USE AND CLASSIFICATION BY SITE SUITABILITY

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Annotation:
This study explores the importance of relief and the suitability of land for construction of buildings and structures. The research thoroughly analyzes the impact of the land's slope condition, categorizing the slope into various degrees. The role of slope in construction and its related utilization possibilities have been identified. Additionally, the significance of relief in the taxation process and the relevant parameters are discussed. In this context, geodetic and geographic factors are considered when assessing the impact of relief on construction activities. The research provides essential recommendations for selecting the right relief and determining the location in building construction and infrastructure projects.

Keywords: relief, flat and sloped areas, soil properties, taxation system, utilization coefficient, sustainable construction.

Аннотация:
Это исследование изучает важность рельефа и пригодность земли для строительства зданий и сооружений. Исследование подробно анализирует влияние состояния склона земли, классифицируя его по различным степеням. Определены роль склона в строительстве и связанные с ним возможности использования. Кроме того, рассматривается значение рельефа в процессе налогообложения и соответствующие параметры. В этом контексте учитываются геодезические и географические факторы при оценке воздействия рельефа на строительную деятельность. Исследование предоставляет важные рекомендации по выбору подходящего рельефа и определению местоположения для строительства зданий и инфраструктурных проектов.

Ключевые слова: рельеф, ровные и наклонные участки, свойства почвы, налоговая система, коэффициент использования, устойчивое строительство.

Introduction

The relief of a site and its suitability are important factors in the construction of buildings and structures. Relief, a geological concept representing the natural shape and structure of the earth's surface, encompasses a number of factors affecting construction activities. Factors such as the slope condition of the land, soil properties, geological structure, and climatic conditions are of great importance for the stability, safety, and efficiency of construction. For successful construction, a proper assessment of the site's relief is necessary, as these variations affect different construction technologies, the durability of structures, and their long-term operation.

The degree of slope and soil properties serve as key indicators for identifying potential variations in different construction sectors, such as residential construction, industrial facilities, or infrastructure projects. Slope, indicating the condition of the upper or lower parts of the land, plays an important role in ensuring the safety of the construction site. Additionally, the importance of

relief in the taxation process and how it is taken into account can be a crucial factor in enhancing the economic efficiency of an area.

This work examines the importance of relief in the construction of buildings and structures, the impact of land slope on the construction process, the aspects of taxation related to relief, and the main parameters to consider when selecting a location. Analyzing the role of relief in construction and its variations allows for finding solutions to identified problems and developing sustainable construction strategies.

Methodology

The land relief significantly influences the construction process. Therefore, the methodology for identifying construction methods suitable for the relief and selecting the project is an important step. This methodology includes three main stages: relief analysis, design, and selection of suitable construction technologies.

In the first stage, the land relief is studied, and the degree of slope of the area is determined. The degree of slope is divided into three categories:

Flat areas (0–3% slope, 0°0' – 2°42'): Construction on these areas is carried out with the least cost. No additional work such as site preparation or slope leveling is required.

Slight slope (3–8% slope, 2°42' – 7°12'): In such locations, the construction project is chosen according to the slope of the land. The main approaches include adding soil for leveling or adapting the lower floor of the house to the relief.

Moderate and steep slope (8–20% slope, 7°12' – 18°00'): In such locations, the construction of terraced or cascading houses is more recommended. This method creates platforms at different levels.

Geodetic instruments such as levels and theodolites are used to determine the land relief. This method provides information about the exact degree of slope, changes in elevation, and the general condition of the land. Based on the obtained data, a relief map is created.

The design stage is based on the results of the relief analysis. This stage considers the following important aspects:

Location of the structure: While placing a structure on flat areas is easy, on sloped areas the location is adapted to the relief.

On flat areas, a strip or rectangular foundation is used; on sloped areas, retaining walls, inclined columns, or cascading foundations are used.

In areas with moderate and steep slopes, the construction process is facilitated by dividing the construction site into several horizontal levels. This method is used in conjunction with drainage systems.

A drainage system is installed to manage rainwater runoff. This process is important for preventing soil erosion and strengthening the foundation of the structure.

Additionally, geological and hydrological analyses are conducted on the construction site. This process involves studying the soil's composition, density, and moisture level. The condition of the soil is crucial for choosing the foundation and ensuring the stability of the land.

Construction technologies are selected according to the relief. The recommended technologies for each type of relief are as follows:

For flat relief: Simple excavation works and strip foundation construction are applied. The main focus is on the moisture level of the ground.

For slight slope relief: Adding soil for leveling and constructing retaining walls are required. This process may require additional time and resources.

For moderate and steep slopes: Special platforms and layered foundations are constructed for the construction of cascading and terraced houses. Retaining walls and drainage systems are installed.

When choosing construction technologies, the following are taken into account:

Materials suitable for the soil type are used for different types of relief. For example, in very steep areas, more robust concrete foundations and retaining walls are used.

Excavators, bulldozers, and soil compaction techniques are used in construction.

While the duration of construction is short on flat relief, it requires more time on moderate and steep slopes.

Control and monitoring are carried out at all stages of the project. This includes:

Quality control: The quality of materials, stability of drainage systems, and foundations are regularly checked.

Financial control: Financial costs are controlled at each stage, as additional costs may be required for adaptation to the relief.

Safety control: Attention is paid to safety when working on slopes. Safety guidelines and special equipment are provided for workers.

The methodology includes all stages from relief analysis to design and selection of suitable construction technologies. The specific characteristics of the relief are taken into account at each stage. While construction on flat relief is easy and cheap, sloped areas require additional costs through terracing, drainage, and retaining walls. This methodology aims to ensure that construction is of high quality, efficient, and economically acceptable.

This study employs a systematic and comprehensive approach to investigate the importance of relief and site suitability in the construction of buildings and structures. The methodology section primarily envisions the following main methods and research approaches:

Geographic and geodetic analysis: Geographic and geodetic analysis methods are used to determine the state of the relief on the earth's surface. In this process, the degree of land slope and natural forms of relief (e.g., mountainous, flat, and lowland areas) are identified. Changes in relief and their impact on construction are studied using geodetic measurements and cartographic data.

Soil analysis: The soil properties of the site, its density, moisture, weight, and mechanical characteristics are analyzed. The physical and chemical properties of the soil are important for assessing its suitability for construction. Laboratory analyses are conducted to determine soil variability and the stability of lower layers.

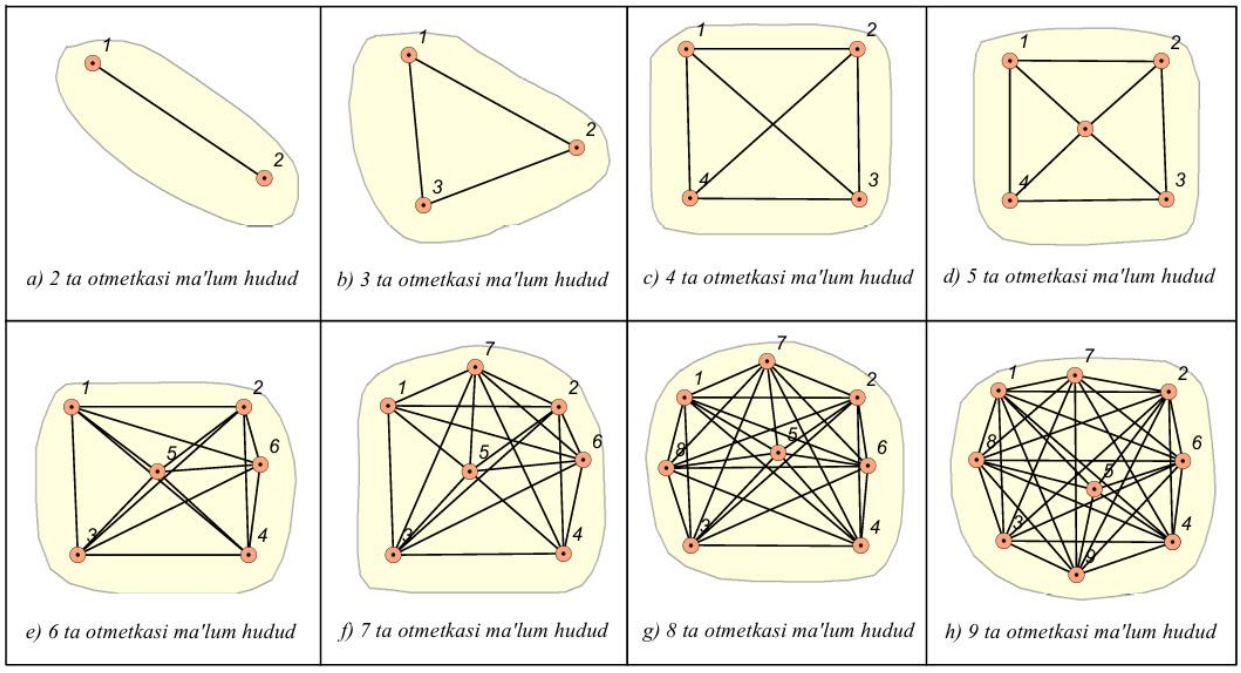
Slope classification and analysis: The degrees of slope of the relief are studied, and how these slopes affect the construction process is determined. The types of slopes (low, moderate, high) and their roles in different types of construction are examined. This allows for the analysis of the relationship between the degree of slope and whether the site is flat or sloped.

Mathematical models and computer simulation: The use of mathematical models is envisaged to assess changes in relief at the construction site and their impact. Using this method, the impact of relief on construction is simulated, and statistical analyses are conducted under various conditions. This method allows for identifying risks for different types of slopes.

Determining taxation parameters: The importance of relief in taxation is studied, aiming to determine how relevant parameters (e.g., degree of slope and soil type) affect the tax system. This process includes analyzing how economic and geological factors interrelate and influence tax policy.

Research

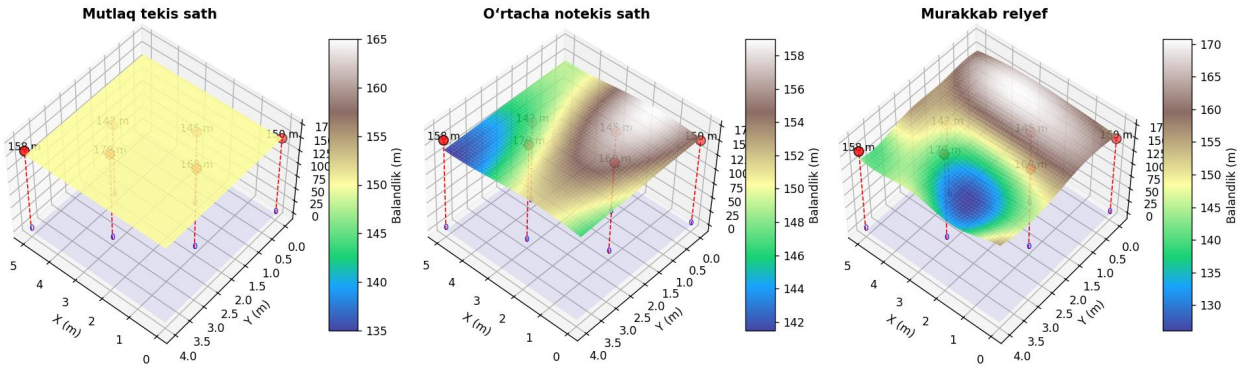
Analysis of the impact of relief on construction: The research examines the impact of relief on the construction process. This includes how the degree of slope, geological structure, and soil properties affect construction quality. It is important to identify the differences in flat, sloped, or mountainous areas and how these differences influence construction technologies. This analysis demonstrates the importance of relief when choosing suitable sites for construction.



(Figure 1) Marks taken by contour

When assigning a ratio or evaluation based on slope for a given area, or when assigning a coefficient, attention must be paid to the shape of the area. Therefore, the calculation is based on the number of characteristic points in the area. a) The area has two points, one high and one low. Subsequent points similarly have 3, 4, 5, and so on. When calculating the gradient of these points

relative to each other, the slope of each point relative to the others is calculated, and a result is derived. The result is evaluated according to specific boundaries.



(Figure 2) Classification of complex relief landforms in different situations

Study of slope and soil properties: The degree of slope and the mechanical properties of the soil are studied. Each soil type (e.g., sandy, loamy, clayey) and its interaction with the slope determine which parameters are necessary to ensure the stability and safety of buildings. Additionally, soil variability, moisture level, and free flow on the surface are taken into account.

Geographic and geodetic analysis: Geographic and geodetic methods are used to determine the site's relief. Using geodetic methods, the degree of slope, mountainous or flat areas, irrigation, and erosion conditions of the site are analyzed. This analysis helps determine the impact of the relief and its changes on construction and select the most suitable construction sites.

Taxation process and relief parameters: The significance of relief in taxation is investigated. This section analyzes how factors such as the degree of slope, soil type, and other geological factors influence the tax system. Aspects of taxation related to relief are identified to enhance the economic significance of the site, and the important parameters in this process are shown.

Risk assessment: To identify construction risks related to relief, soil analyses and slope assessments are carried out in different areas. High-risk zones such as steep slopes, upper parts of slopes, or erosion-prone areas are identified, and ways to minimize risks for construction in such areas are developed.

Practical approaches in building and structure construction: During the research, various construction technologies, materials, and methods are studied, particularly construction methods suitable for different types of relief. For example, in areas with steep slopes, stronger structural elements or reinforcement of structures may be required. In this process, practical problems and solutions are analyzed.

Statistical analyses and simulations: Using mathematical modeling and computer simulation, statistical analyses are conducted to assess the impact of relief on construction and to evaluate risks. This method allows for predicting probable outcomes under various conditions and determining which factors need to be considered during the construction process.

Recommendations and decision-making: Based on the assessment of the impact of relief on the construction process, the research develops important recommendations for selecting the right relief in building construction and infrastructure projects. Decisions are made to account for relief when choosing a location, and their practical indicators are presented.

The main goal of the research section is to thoroughly study the importance of relief in construction, develop suitable solutions for construction in different areas based on the degree of slope, and provide practical recommendations. This opens up possibilities for carrying out the construction process safely and efficiently.

Analysis Section

This article provides a detailed analysis of the role of land relief in the construction process, as well as the advantages and disadvantages of building on flat, slightly sloped, and moderately sloped areas. The impact of relief on the construction process and the necessity of applying specific construction methods and techniques on land plots with different slopes are demonstrated.

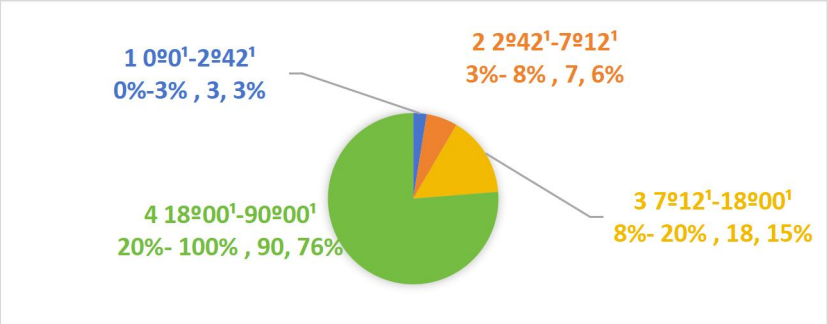
Flat relief is described as the most convenient option for construction because site preparation and the construction process generally do not require additional costs. Many project options are available for building on flat land, and construction is carried out efficiently. However, flat plots are often sold at higher prices. This aspect can sometimes turn the advantages of flat relief into disadvantages.

Slightly sloped areas (3% to 8% slope): Construction on these plots requires specific methods. Leveling the area by adding soil or choosing other construction methods is required. These methods may require additional costs and time, as special materials and machinery are necessary. At the same time, an individual project is required, considering the land's characteristics.

Moderately sloped areas (8% to 20% slope): Construction on these areas is more complex and requires more resources. The construction of terraced or cascading houses consumes more materials and time. Such construction processes allow for incorporating the natural landscape into the design, but these types of houses are associated with higher costs and resources. Thus, optimization of construction and additional expenditures may be required here.

Steeply sloped areas: Construction on steeply sloped plots requires special engineering solutions and materials. Construction work here also requires considering the hydrological and geological conditions of the land. Drainage systems and land stability become critically important. At the same time, unexpected problems may arise during construction on steep slopes, necessitating consultation with highly qualified specialists.

Tax payments: The relief of the land and its location play a significant role in the tax system. Taxes should be higher in areas with a high utilization coefficient, which is an important factor in construction costs and project selection. Therefore, before construction, a thorough analysis of the land plot's characteristics and calculations dependent on the amount and location of tax payments are necessary.



(Figure 3) Distribution of construction sites by slope

The research results showed that considering the land relief has a direct impact on the construction process. The choice of construction methods and resources corresponding to each slope type is a decisive factor in the successful implementation of the project. Also, considering the geological and hydrological characteristics of the land helps ensure the long-term stability of the construction. The tax system should consider the land relief, and appropriate tax payments should be calculated for the area.

Discussion

This research analyzed in detail the land relief and its impact on the construction process. As highlighted in the article, different slopes and reliefs shape the construction process in unique ways. Each type of relief requires specific construction methods, materials, and technologies, and the natural characteristics of the land are decisive factors in ensuring the efficiency and stability of construction. The research results particularly demonstrated the importance of adapted construction methods for slightly and moderately sloped areas.

While flat relief is convenient for construction, the process is usually easier and cheaper. However, the high cost of flat plots can sometimes diminish this advantage. While additional costs generally do not arise during construction on flat land, the high price of flat areas, a common situation in cities, can increase construction costs. This can be a negative factor for builders expecting low land costs.

Construction on slightly sloped areas may reduce efficiency and cost-effectiveness due to the need for additional technical equipment and materials. However, the construction process can be optimized on these areas through modifications such as adding soil and leveling the site. These lands can be suitable for construction with average costs but require more planning and additional expenses.

Construction on moderately sloped areas is more complex and demanding. Building terraced or cascading houses requires more resources and time. This, in turn, increases the cost of construction, but the opportunity to incorporate the natural landscape into the design enriches the process aesthetically. Thus, moderately sloped areas are expensive for construction but offer good opportunities for creating attractive and special designs.

The complexity of construction increases further on steeply sloped areas. Special engineering solutions, materials, and technologies are required. Ensuring drainage systems and land stability is crucial in such areas, as the geological and hydrological conditions can cause many unforeseen problems. The construction process on steep slopes can be lengthy and expensive, necessitating consultation with highly qualified specialists.

Land relief and location directly affect the tax system. Taxes should be higher in areas with a high utilization coefficient, which plays an important role in site selection and project choice during the construction process. Tax payments, depending on the land characteristics, can increase construction costs. Therefore, analyzing the impact of the land plot on the tax system before purchase aids in making construction plans and budgets.

Land relief significantly impacts the construction process. Flat lands are the most convenient for construction but can be expensive; slightly and moderately sloped areas require specific methods; while construction on steeply sloped areas is more complex and resource-intensive. Tax payments can vary depending on the relief and location, affecting the economic aspects of construction. The research results indicate that considering each type of land relief and choosing appropriate construction methods are crucial for the successful implementation of construction.

Conclusion

This research deeply analyzed the land relief and its impact on the construction process. Different slopes and natural characteristics of the land play a crucial role in selecting construction methods, materials, and technologies. Although flat lands are the most convenient for construction, their high cost can increase construction expenses. While slightly and moderately sloped areas require special technical methods, construction on steeply sloped areas is more complex and resource-intensive. These variations directly affect the efficiency and economic aspects of construction.

Furthermore, land relief and location affect the tax system, which is of great importance for construction costs and budget. Taxes should be higher in areas with a high utilization coefficient, which creates additional financial obligations for builders.

The research results demonstrated the importance of considering land relief in the construction process. The choice of construction methods and resources suitable for each type of relief is the foundation of project success. Thus, considering the geological and hydrological characteristics of the land helps ensure the long-term stability of the construction. Also, the tax system and land characteristics should be important factors in planning the economic aspects of construction. Taking these factors into account allows for carrying out the construction process efficiently and economically.

References

1. Artikov, G. A., Samankulov, Sh. R., Xudayqulov, Sh. Sh., & Nomozov, A. A. (2023). Procedure for Registering and Formalizing Relevant Objects in the Creation of State Cadastral Maps of Highways. Miasto Przyszłości, 36, 196-201.
2. Askarovich, K.Z., Mardonovich, P. I., Samankulov, S. R., & Ogli, B. A. Z. (2021). Theme: Development of a Methodology for the Creation of Digital Topographic Plans of Terrain Inclination. ResearchJet Journal of Analysis and Inventions, 2(05), 202-207.
3. Djavatov, S., Samankulov, Sh., & Xushnud, T. (2023). The Concept of Optimal Experiment in Geodesy. Wire Insights: Journal of Innovation Insights, 1(1), 1-6.
4. Husanov, B., & Samankulov, S. R. (2023). Presentation of Geographical Coordinates (Longitudes and Latitudes) of Cities in the Works of Beruni. Miasto Przyszłości, 35, 423-426.
5. Safarov, T. U., Samankulov, Sh. R., Xudaykulov, Sh. Sh., & Berdikulov, U. A. (2023). Adjustment Method for Multi-Faceted Heliostats. Open Academia: Journal of Scholarly Research, 1(1), 69-73.
6. Safarov, T., Urokov, O., & Samankulov, S. R. (2020). Studies of Axes of Heliostat Rotary Turning Devices. International Journal of Innovations in Engineering Research and Technology, 7(05), 144-145.
7. Samankulov, S. R., & Nomozov, A. (2019). The role of modern laser scanners in the geodetic detection and planning of underground utilities. In Bridge to science: research works (pp. 201-205).
8. Suyunov, A., Tukhtamishev, S., Suyunov, S., Manoev, S., & Samankulov, S. (2023). Innovative solutions in creating noise maps in cities. In E3S Web of Conferences (Vol. 463, p. 02007). EDP Sciences.
9. Usmanovich, S. T., Rashitovich, S. S., & Adkhamovich, B. U. (2022). Currently Modern Levels Applied in the Field of Geodesy. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 2(4), 193-197.
10. Usmanovich, S. T., Rashitovich, S. S., & Adkhamovich, B. U. (2022). Surface Control of Heliostats. Gospodarka i Innowacje, 22, 355-357.
11. Usmonovich, S. T., & Rashidovich, S. S. (2023). Geodetic Methods of Studying and Determining Landslides. JOURNAL OF ENGINEERING, MECHANICS AND MODERN ARCHITECTURE, 245-251.