

## UNDERGROUND LIVING CONCEPT IN KOSOVO

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### Abstract:

From the beginning of human existence, housing is considered one of the basic elements for survival and protection from difficult natural conditions. The purpose of this research is to treat underground homes, as a efficient living and nature protected like a new concept of living in Kosovo. In addition, the study will seek to discover the underground houses that were developed in Switzerland, and UK, China, etc. The research is intended to serve as a basic, basis for informing the typologies which can be applied in the territory of Kosovo, advantages, and disadvantages of the underground houses. The work has analyzed the comparison of the built houses, the construction law, the territory of Kosovo and the project proposal which can be applied based on the results of the questionnaire to the citizens of the country. The purpose of the addressed research is to analyze how suitable the changes in terms of housing can be according to the real terrain of Kosovo and based on the results of the research from the questionnaire of the country's residents. The determination of the typology of the construction of underground houses is based on the terrain of the country and the protection of green spaces. The method used for the obtained results of the research is the quantitative method. With the construction of underground houses, nature protection and green areas, it will be helped to preserve the quality of the air and may contribute to the fight against climate change.

### **Introduction**

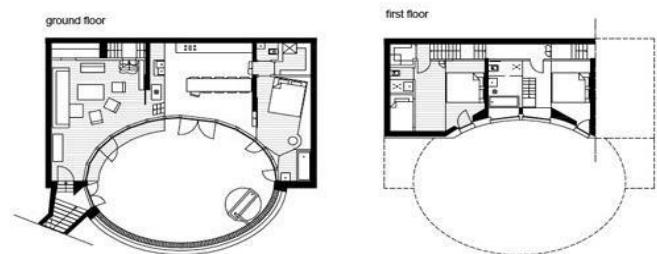
Caves were a temporary shelter where ancient people could live. The caves provided natural protection from bad weather and harsh outdoor conditions. Caves provide natural protection from adverse external conditions, such as extreme temperatures, strong winds, rainfall, heavy snow, and hot sun. The rock structure of caves can provide an effective barrier against the elements of nature. Caves tend to maintain a more stable temperature compared to the outside environment. In some cases, the temperature inside the cave is cooler in summer and warmer in winter, creating a more comfortable environment for the inhabitants. The stone structure of the caves helps to reduce external sounds, creating a quieter and more stable environment for the inhabitants. External sounds are dampened and internal noise is more consistent. In some cases, the deep spaces of the caves are dark or have only limited natural light. This fact can be beneficial for residents, providing a dark environment suitable for sleep and relaxation. Based on global climate change, and buildings and buildings losing greenery and air quality in the place where we live, it was taken as a base point for dealing with the change in the form of the building and the protection of nature by protecting the green mass in the place of construction. . With the

construction of underground houses, the preservation of the green mass will be gained, based on the fact that the houses are placed in the interior of the land, environmental pollution is benefited, using the land as an insulator in the preservation of internal energy in residential areas and not losing comfort of housing in the designed areas. Even underground houses, we can also consider them known as underground houses, which are houses built partially, or completely under the surface of the earth. These types of houses are often located in areas where traditional (aboveground) houses are not suitable, such as cold, dry areas or where upper buildings are exposed to various natural hazards. Underground houses in mountains, also known as mountain retreats or mountain homes, can offer a number of benefits compared to traditional aboveground homes. Here are some of the advantages of building an underground house in a mountainous area.

## 1. Underground house in Vals, Switzerland

In a location like Vals place with a beautiful view, in Switzerland, it is difficult to imagine any new construction that would hurt the landscape, of SeArch (Architecture office) and Christian Müller. Built in the Swiss Vals village, the house is located in the mountain, with an open view from the mountain side the house is almost invisible, located on a mountain such as a terrain invisible. In the introduction, part there is a central courtyard which is surrounded by a large facade formed by large window openings that offer bright reflections of the Alpine view on the opposite side of the narrow valley. (Pham, 2014)

**Figure 1,2:** *Underground House in Vals, Switzerland*



*Source: Pham, 2014*

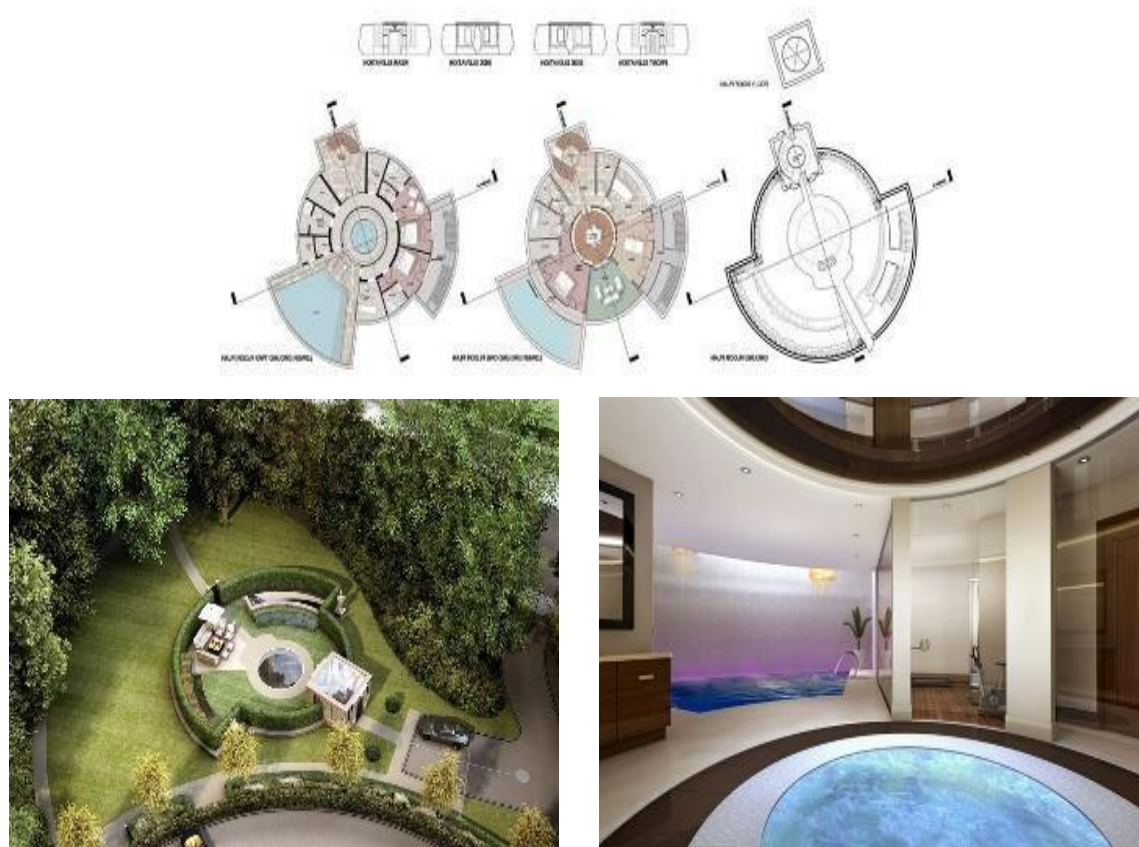
### 1.1. Perdu, Cheshire, UK

Intriguing new dwelling formed almost entirely subterranean and designed to make a minimal visual impact above ground, comprising only a car lift and access entrance within a modern sleek structure. (BDi, n.d.)

The sub-structure was formed of permanent sheet piled walls set almost circular on plan, with a capping beam designed to ensure the stability of the retaining walls in both the temporary and permanent conditions. (BDi, n.d.)

A series of temporary structural props were designed in the temporary condition to allow the embedded basement walls to be designed as economical as possible whilst ensuring the capping beam could be formed safely. A complex analysis was undertaken to verify the temporary and permanent conditions were stable. (BDi, n.d.)

**Figure 3,4,5: Perdu, Cheshire, UK**



Source: <https://ncarchitecture.com/works/perdu/>

The research used the method of comparing the two types of underground houses, those on flat ground with an atrium and underground houses on sloping ground. Both forms can be applied in Kosovo, based on the extent of the territory of Kosovo.

## 2. The Typology's of underground houses

There are various typologies or styles of underground houses, each with its own design characteristics. These typologies are applied based on the extent of the land, flat land, basement, high slope land as well as the type of land. All typologies contain the characteristics of fulfilling the living conditions.

### 2.1.Total Ground floor

A total ground-floor underground house, also known as a fully submerged underground house, is a type of dwelling where the entire living space is located beneath the ground level. In this design, the house is entirely submerged in the earth, providing a unique and unconventional living environment. This type of typology can be applied to any stretch of terrain.

**Figure 6:** Ground floor



*Source: Create from author*

## 2.2. Underground house with atrium

An underground house with an atrium combines the benefits of subterranean living with the addition of an open, central space that allows for natural light, ventilation, and a connection to the outside environment. The type of underground house, based on the extent of the terrain and the possibilities of opening the atrium, can be used in flat areas.

**Figure 7:** Underground house with atrium



*Source: Create from author*

## 2.3. Underground house with a free façade

An underground house with a free façade refers to a design where one or more sides of the underground dwelling are exposed or left uncovered, allowing for open views and interaction with the surrounding environment. Based on the extent of the terrain of Kosovo to start a new application of this concept would be more suitable underground houses in one or two free façades.

**Figure 8:** Underground house with a free facade



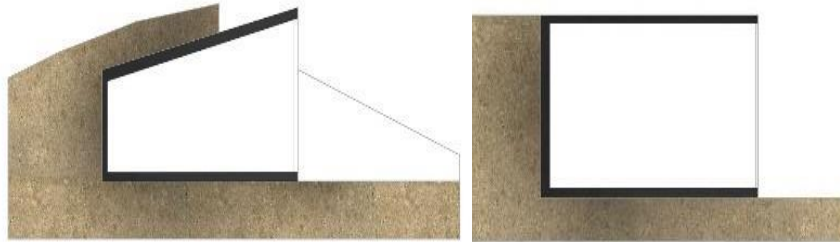
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## 2.4. Combined House

A combined house underground refers to a subterranean dwelling that incorporates a combination of architectural styles, design elements, or features from various building types. While underground houses often have unique characteristics of their own, combining different architectural styles or design influences can further enhance their aesthetic appeal and functionality.

**Figure 9:** *Combined House*



*Source: Create from author*

## 3. Advantages of underground houses

The advantages of underground houses help us understand how many underground houses offer the same quality of living than houses above ground. It is very important that during the use of the building for housing, the comfort of life is offered, with all the necessary conditions for housing. In every process of changes in the aspect of housing and in the aspect of construction, we may also encounter difficulties in implementation. Researching the advantages and disadvantages helps us to have a clearer understanding of the processes in which we may have difficulties in implementation.

1. Underground houses are naturally insulated by the surrounding soil, which can help to reduce heating and cooling costs. In a mountainous area, where temperatures can be extreme, this can be particularly beneficial.
2. Mountainous areas are often subject to harsh weather conditions, such as heavy snow, high winds, and extreme temperatures. Underground houses can offer greater durability and resistance to these conditions, helping to protect the home and its occupants.
3. Building an underground home in a mountainous area can help to integrate the home into the natural environment. The home can be designed to blend in with the surrounding landscape, using natural materials and landscaping to create a seamless transition between the home and the outdoors (Sharma, 2022)
4. Mountainous areas can offer greater privacy and seclusion than urban or suburban areas. An underground home can provide even greater privacy, as the home is hidden from view and protected by the surrounding soil.
5. Mountainous areas can be subject to natural disasters such as landslides, floods, and wildfires. An underground home can offer greater protection from these hazards, as well as from human threats such as vandalism and theft (Alicja Krzemińska, 2017).

### **3.1 Disadvantages of the underground house**

1. Underground houses have limited access to natural light due to their subterranean nature. Depending on the design, the amount of natural light entering the living spaces may be restricted. This can lead to a darker interior, which may require additional artificial lighting.
2. Proper ventilation can be a challenge in underground houses. Without proper airflow, indoor air quality can be compromised, leading to moisture buildup, stale air, and potential issues with humidity and condensation. Mechanical ventilation systems are typically necessary to ensure adequate airflow and fresh air exchange (Sharma, 2022).
3. Underground houses are more prone to moisture-related problems, such as water infiltration and dampness. Without proper waterproofing and drainage systems, groundwater or rainwater can seep into the structure, causing dampness, mold, and structural damage over time.
4. Constructing an underground house requires specialized engineering and construction techniques to ensure structural integrity and stability. The excavation, reinforcement, and waterproofing processes can be more complex and costly compared to traditional above-ground construction.
5. Underground houses typically have limited outdoor space compared to traditional houses. While outdoor areas such as gardens or terraces can still be incorporated, the options may be more limited due to the subterranean nature of the dwelling.

Based on case studies of underground houses realized in the world, houses based on the use of the residential aspect, are houses that can meet some conditions of sustainable architecture. One of the points is the realism of the temperatures inside the underground houses. The ground itself is the insulation structure of the underground houses, which enables the creation of adequate temperatures within the residential areas. In Kosovo, many individual houses built have kitchens and living rooms in the basement, and during high temperatures, the utilization of these spaces is quite high. Mountainous areas with high altitudes tend to contain atmospheric conditions that are often mobile and often low temperature.

## **4. Construction law in Kosovo**

The aspect of residential forms in Kosovo is quite well explained by the construction law (Spatial, 2018).

Construction Law 04 / L-110, dated 31.05.2012, respectively Article 15 defines the following categories of construction: (Hapësinor, 2018)

- 1.1. Category I – low-risk construction;
- 1.2. Category II - Construction of Medium Risk
- 1.3. Category III - Construction of high risk and construction of national interest. (Hapësinor, 2018)

Kosovo has not yet formed a specific law to deal with underground housing. The construction law concerning constructions in Kosovo does not specify any special

category that deals only with underground construction. Since no such construction has been applied in Kosovo, in the legislative aspect, there is no specification in the construction law for only underground constructions. In comparison, the construction law of Bratislava was taken into consideration, which also does not specify a law only for underground construction.

Slovak Construction Act No 50/1976 Coll. (still in force, 48x supplemented, changed)  
§43 b: The family house is primarily intended for family living with a separate entrance from the public road, which has a maximum of three apartments, two above-ground floors and an attic. According to information, I got, the same is a family house, embedded in the ground. The builder has to ask/apply at the construction office for a construction permission, attach the project of the house and all needed documents based on the legislation.

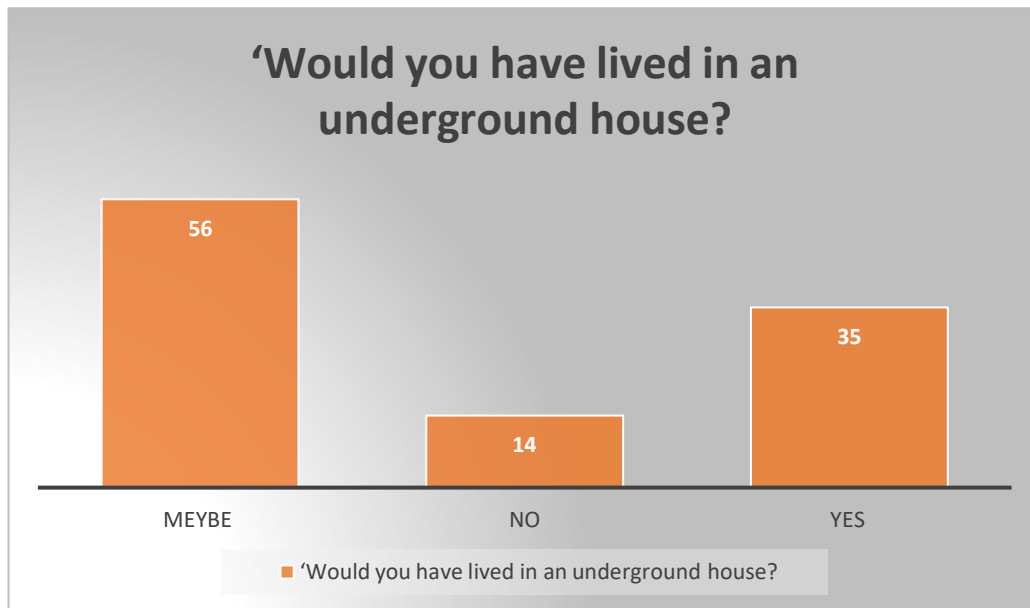
§11: In Slovakia, currently, the building authority is the municipality. The competence of the construction office is a transferred performance of the state administration (Prof. JUDr. Eleonóra Marišová, 2023).

Slovakia adopted a new construction act No. 201/2022 Coll. - valid from 1st. 4.2024, according to which the existing powers of municipalities as building authorities will be transferred to a newly established central state administration body with defined territorial competence, the so-called Office for Spatial Planning and Construction of the Slovak Republic. This authority will establish offices within its competence, whose main task will be to carry out the competences of the existing building offices. The list of workplaces of the Authority will be the building offices for the territorial districts of the districts in the seats of the regional towns and will be determined by a decree to the new Building Act (Prof. JUDr. Eleonóra Marišová, 2023).

## **5. Results of the questionnaire**

Since there are no such type of underground houses built in Kosovo, in order to achieve the result that how the residents would see the change of the residential buildings, it was investigated with a questionnaire and the results were obtained that in Kosovo it is accepted by the residents that a format I can be built new housing. In the questionnaire addressed to the residents of Kosovo, about 300 residents, aged 18-45, were interviewed in rural and urban residential areas. The new concept of housing as underground houses is not known in Kosovo. In the development of the research, was presented the question "Would you have lived in an underground house". From our expectations, based on the knowledge that the public may have in Kosovo, 35% answered positively, that they would have lived in an underground house, and they said that it would be an interesting living experience. Some of the locals support the protection of the environment that surrounds them and would be satisfied if a new housing concept was applied in our country. From the aspect that many of the residents do not know this concept of housing, they have resulted in 14% of refusal to live in underground houses. Many of the residents have emphasized that these houses may not offer the aspect of sufficient lighting and ventilation. Fortunately, about 55% of the residents have neither refused nor accepted living in underground houses. Based on the research, we can say that the construction of underground houses would also increase the additional interest to try or live in the long term in areas with steep terrains.

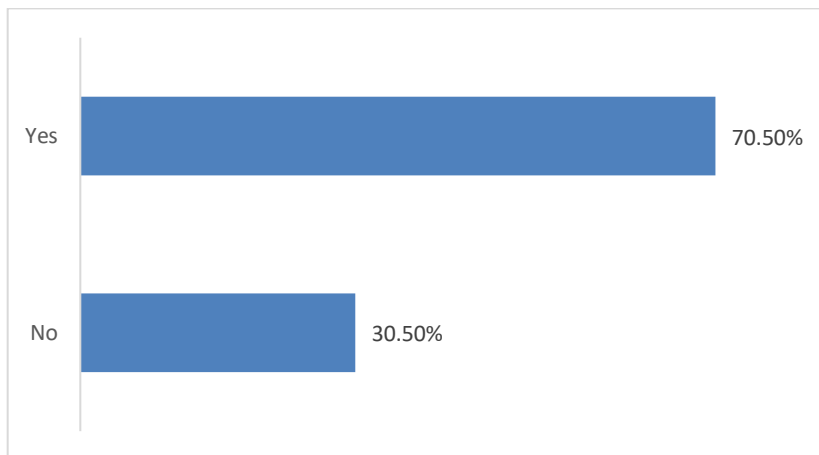
**Figure 10:** *The results of the analysis: Would you have lived in an underground house?*



*Source: Create from author*

Based on the development of information systems and the results obtained, about 70% of the residents have heard what underground houses are and what they can offer, distinguishing them from convection houses.

**Figure 11:** *Statistics from the questionnaire 'How much have the inhabitants of the country heard about the houses'*



*Source: Create from author*

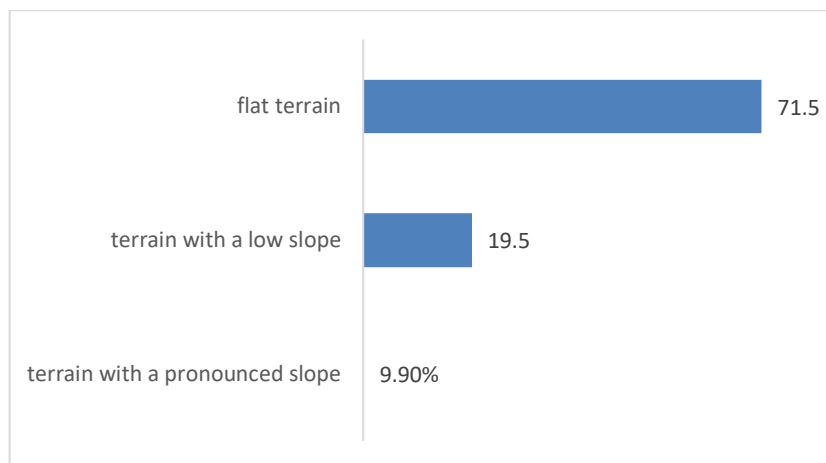
The results obtained by the residents of the results and what were the sources of the information about the underground houses and their types. Many of them architecture is on social networks have more information about this for housing, some others emphasize their interest in history and history, from which they are informed enough also about the views of which it offers at home, and a number. Small points out that underground houses are popularized by various architecture studies, lectures, books and magazines.

An important role is also played by the type of terrain on which our country lies. By distinguishing the construction typologies of underground houses, the terrain plays the



main role in determining the typology. In the questionnaire distributed to the residents of the country, the question of what land they live in and where they think underground houses can be built, even if they have basic knowledge about this type of residential building, is addressed. The result of the research shows that 34.1% of the residents live in collective buildings in urban areas and 67.5% live in individual houses and about 1.3% emphasize that they live in other types of buildings.

**Figure 12:** Residence in the territory of Kosovo (questioner results)



*Source: Create from author*

Living in underground houses would provide comfort in indoor spaces by providing freshness in high temperatures and warm in low temperatures during the meteorological changes of nature. Based on the knowledge that the residents have about the benefits of underground houses, the results of what benefits the underground house can offer were also examined in the questionnaire. It is important to be able to gain results and knowledge about what the underground house can be called as a residential object that offers all the conditions for a comfortable life. If we talk about energy conservation (heating and cooling) in living spaces in underground houses, about 52% of the residents considered that the soil contains good insulating properties and energy losses would be smaller. Energy conservation in underground houses is among the basic advantages which offer comfort in changing temperatures. Among the other advantages offered by the underground house is the protection of nature. Rough constructions degrade large parts of tourist areas or help destroy nature, cut trees, disappear greenery, help pollute water, increase carbon dioxide in the air, etc. In the distributed questionnaire, about 67% of the residents of Kosovo agree that the underground house protects green areas that help preserve natural resources. Fire protection is another element that is constantly fighting in terms of construction, another advantage that the underground house offers. Based on the type and structure of the building materials, about 28% of the residents agree that these houses are sufficiently protected even from fire. One of the main problems that are considered in convection houses is the constant maintenance of the house. About 24.8% of the residents agreed that the underground house would reduce the maintenance cost.

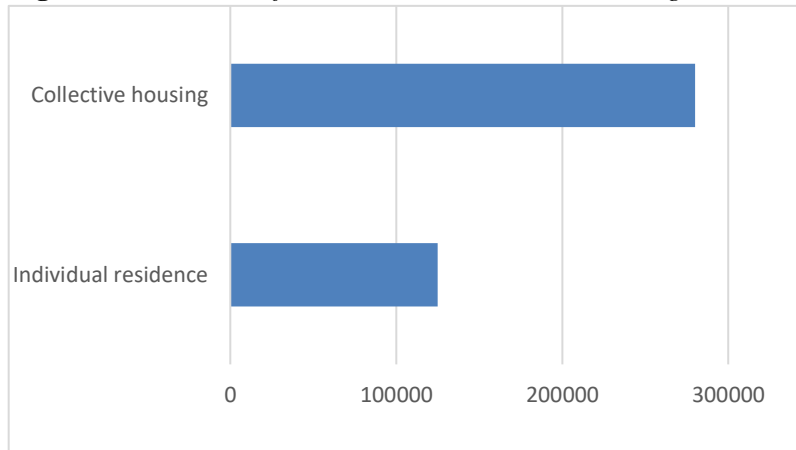
## **6. Underground living in Kosova, project idea**

Yes, underground houses can be used as tourist homes or vacation rentals. Some people find the unique and unusual design of underground homes to be an attractive feature for vacation stays. However, there are some factors should be considered when using an underground home as a tourist rental. Underground houses can provide a distinctive and memorable experience for tourists. They offer a departure from conventional accommodations, attracting visitors seeking something out of the ordinary. Underground houses can blend harmoniously with the natural surroundings, preserving scenic views and minimizing visual impact. In tourist destinations known for their natural beauty, such as national parks or coastal areas, underground houses can offer an environmentally friendly and sustainable accommodation option. Kosovo mainly consists of mountainous terrain, and beautiful natural views, in this case the application of underground houses to protect the terrain structure would be appropriate. A new architecture which would contribute to the protection of the environment and the development of tourism in Kosovo.

Kosovo (historically Dardania, officially the Republic of Kosovo) is an independent state in Southeastern Europe. It lies in the center of the Balkan Peninsula and is bordered to the north and east by Serbia, to the southeast by the Republic of Macedonia, to the southwest of Albania and to the west of Montenegro. It has an area of about 10,908 km<sup>2</sup>. With relief mainly in the form of a river basin, Kosovo is geographically divided into two primary plains, that of Kosovo in the east and that of Dukagjin in the west. The height above sea level in the plain varies from 400 to 700 meters, while the lowest point of 297 meters is located in Vërmica on the border with Albania. The two plains are separated and surrounded by pronounced ranges at a height of 2,000 to 2,500 meters; the highest point, Gjeravica, reaches 2,656 meters. The average height above sea level is 811 meters. (agency 2017) The subsoil of Kosovo is known for its reserves of important minerals such as coal, lignite, nickel, lead, zinc, magnesium, kaolin, chromium, aluminum, gold, silver, copper, etc. The climate of Kosovo, influenced by air currents continental, is defined by cold winters with heavy snowfalls, as well as hot and dry autumns and summers.

According to the report prepared by the Ministry of spatial planning in the field of housing and the statistics agency in Kosovo, it results that individual housing occupies a large percentage of the horizontal extension in urban areas and a small percentage of the space is occupied by the extension of collective housing in urban areas. which in recent years their construction resulted in a rapid development. (Hapësinor, 2018)

**Figure 13:** *The ratio of individual and collective housing in Kosovo*



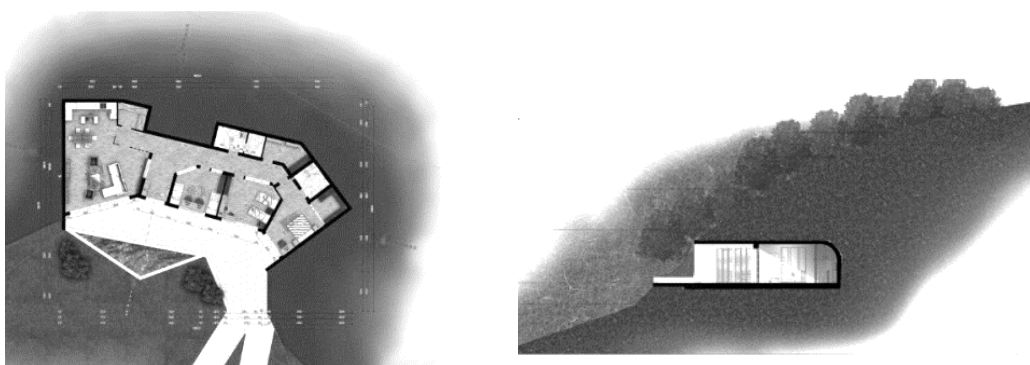
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**Figure 14:** *Design of underground House*



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**Figure 15:** *Design of underground House, Planimetric view*



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Based on the results obtained from the research developed in our country, as a result we obtained that the underground house selected based on the form of the extension of the land of Kosovo and the culture with which our country is characterized, for the application of the form of for residential purposes, the third typology of the underground house, which is characterized by a free facade, would be suitable. With the research applied, according to the citizens, the underground house as a form of residence in most cases has been heard in various documentaries and articles published in various social networks, but with all the information obtained, the citizens were asked if they would have lived in an underground house a large percentage of the citizens did not reject stating that they would like to try it as they would accept it as a residential house. The terrain and climate of Kosovo would enable the construction of all types of underground houses in rural areas as well as in urban areas. As a proposal, we initially selected a basement house for five members. The reason why the type with a free facade was chosen is the possibility of developing rural areas, the terrain suitable for the realization of underground houses, the growth of the country's economy, etc.

## **Conclusion**

An underground house in a mountainous area also requires careful consideration of the local environment, terrain, and building codes and regulations. It's important to work with an experienced architect and builder to ensure that your underground home is designed and constructed to meet your specific needs and preferences, while also ensuring safety, durability, and sustainability. Local regulations and zoning laws may impose restrictions on underground construction, especially in touristic areas. Obtaining necessary permits and approvals may be more complex, requiring thorough planning and compliance with building codes and environmental regulations.

Underground houses may present challenges related to accessibility for guests with mobility issues. Adequate infrastructure, such as well-designed entryways, walkways, and parking areas, needs to be considered to ensure ease of access and comfort for all guests. It helps to protect the natural environment by aligning the building with nature, it also helps the economy of the country in the field of tourism in Kosovo.

Because houses are unknown in our country, the application of these underground houses will help citizens to understand the importance and comfort that they can offer for permanent housing. The rapid development of urban areas in our country makes it impossible to build underground houses in urban areas by placing them in the area of sewerage, electricity and water installations.

The adequate typology for the application of underground houses according to the extent of the terrain in our country would be the underground house with a free façade based on the territorial extent of Kosovo with sloping terrain. The project proposal is a demonstration of how the type of underground house can be applied in the tourist areas of Kosovo. Which would help in the preservation of the environment from rough constructions, the extension and preservation of green spaces, and economic development in tourist areas. The application of sustainable architecture can be an answer to the problems of exposed buildings and social crises.

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