SUSTAINABLE HOUSES: RRJOLL, SHKODER

A THESIS SUBMITTED TO

THE FACULTY OF ARCHITECTURE AND ENGINEERING

OF

EPOKA UNIVERSITY

BY

ELDORADO CEKAJ

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR

THE DEGREE OF MASTER OF SCIENCE

IN

ARCHITECTURE

OCTOBER, 2024

Approval sheet of the Thesis

This is to certify that we have read this thesis entitled **“Sustainable houses: Rrjoll, Shkoder”** and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

SUSTAINABLE HOUSES: RRJOLL, SHKODER

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The diploma thesis for this task is related to promoting the development of sustainable tourism, attracting more tourists, and improving the quality of life for tourists in the area while preserving the natural values of the region and strengthening the natural features characteristic of this coastal and mountain ecosystem. I chose Rrjoll because the Ministry of Tourism recognizes it as a place with significant potential for tourism, with diverse natural features. This project is based on designing sustainable houses with modern solutions. The villas are designed to be two stories tall, with a garden and family-friendly. The sustainability is based on 10 factors:

1. Physical buildings
2. Energy use
3. Waste, water, and wastewater
4. Sites and Surroundings
5. Human behavior
6. Quality of housing
7. Social culture and values
8. Communication and transportation
9. Safety and comfort
10. Price and availability

This thesis project is based also in the "Development plan for the city of Shkodra 2015 - 2020".

Keywords: *Sustainable houses, Residential, Green houses, Energy efficiency, Baks-Rrjoll, Tourism, 2-storey houses, Mediterranean climate*.

ABSTRAKT

SHTËPITË E QËNDRUESHME: RRJOLL, SHKODËR

Eldorado Cekaj

Master Shkencor, Departamenti i Arkitektures

Udhëheqësi: Prof. Dr. Sokol Dervishi

Tema e diplomës së kësaj detyre lidhet me nxitjen e zhvillimit të turizmit të qëndrueshëm, thithjen e më shumë turistëve dhe përmirësimin e cilësisë së jetës turistike të zonës pranë duke ruajtur vlerat natyrore të zones dhe forcimin e veçorive natyrore karakteristike të zonës. ky ekosistem bregdetar dhe malor. Zgjedh Rrjollin sepse nga Ministria e Turizmit është një vend me shumë potencial për turizëm me shumë diversitete në natyrë. Ky projekt bazohet në projektimin e shtëpive të qëndrueshme me zgjidhje moderne. Vilat janë projektuar të jenë 2 kate me kopsht dhe për shumëfamilje. Qëndrueshmëria bazohet në 10 faktorë:

1. Ndërtesat fizike
2. Përdorimi i energjisë
3. Mbeturinat, uji dhe ujërat e zeza
4. Vendet dhe rrethinat
5. Sjellja njerëzore
6. Cilësia e banimit
7. Kultura dhe vlerat sociale
8. Komunikimi dhe transporti
9. Siguria dhe komoditeti
10. Çmimi dhe disponueshmëria

Ky projekt teze bazohet edhe në “Planin e Zhvillimit të qytetit të Shkodrës 2015-2020”.

Fjalët kyçe: *Shtëpi të qëndrueshme, Rezidencial, Ndërtim sera, Efiçiencë energjetike, Baks-Rrjoll, Turizëm, Shtëpi 2-katëshe, Klimë Mesdhetare*

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CHAPTER 1

1. INTRODUCTION

This thesis is about designing sustainable architecture implementation on a scale of housing, as the smallest scale and also one of the largest energy consumers and contributors to climate change. To review the implementations that could be applied at the housing scale, these journals cover topics ranging from simple solutions to high-technology applications. This project will cover three dimensions of housing sustainability: social, economic, and environmental. The project is located in Rrjoll, Shkoder.

1.1. Problem Statement

Albania is blessed with a coastline of about 476 km. Typically, a coastline of this size promises development in many other areas as well. However, despite the potential impact that developing this area could have had on the whole country, the 21st century finds Albania and its coastline vastly undeveloped. This may be due to various factors, ranging from social to historical and individual.

Stemming from a rich ancient past dulled by many oppressors over countless years, Albania is, nevertheless, fortunate. Fortunate because these oppressors were not interested in fostering prosperity through trade among the population here, inadvertently preserving the virgin beaches and seas from merciless exploitation.

Now, even in a free country with self-governing people, this exploitation has begun in various forms. The principal issue with how nature is being handled is the construction of buildings without adhering to codes and regulations, often on unstable soils. These soils are frequently found near beaches. This is why one of the main challenges here is ensuring that the soil on which these sustainable houses will be built is stable. The other major challenge is maintenance.

1.2. Healthy Development (Thesis Objective)

The main objectives guiding the tourism development of the study area are:

- Preservation and Conservation of the Environment: Adapt tourism development to the natural characteristics of the area, preserve natural values, and strengthen functional natural features from an ecological perspective.
- Tourism Development: The urban development of the area will include a mix of villas and affordable housing designed to support tourism activities. These will be integrated with a series of public recreational spaces and services to meet the specific needs of tourism at any time.
    - Single-family houses
    - Multifamily houses
    - Public spaces and services

1.3. Framework for beachfront development (Scope of works)

This project focuses on designing sustainable buildings using computer analytics and case studies based on similar climate factors. For computer modeling, we will use a specific modeling software. For technical drawings, we will use AutoCAD, for 3D rendering, SketchUp and V-Ray, and for concept diagrams, Photoshop.

1.4. Organization of the thesis

The funnel diagram illustrating the thesis diverging and converging process illustrates the process (***Figure 1***). The thesis framework is first established through extensive preparation. The thesis chosen topic is quickly narrowed down to one component, and extensive research is done to better understand the subject. The study phase is ongoing, however the findings from the preliminary research serve as the impetus for the concept development. The process of developing the project begins once the concept has reached its highest point. The finished project is the process's culmination even despite the service's architecture.

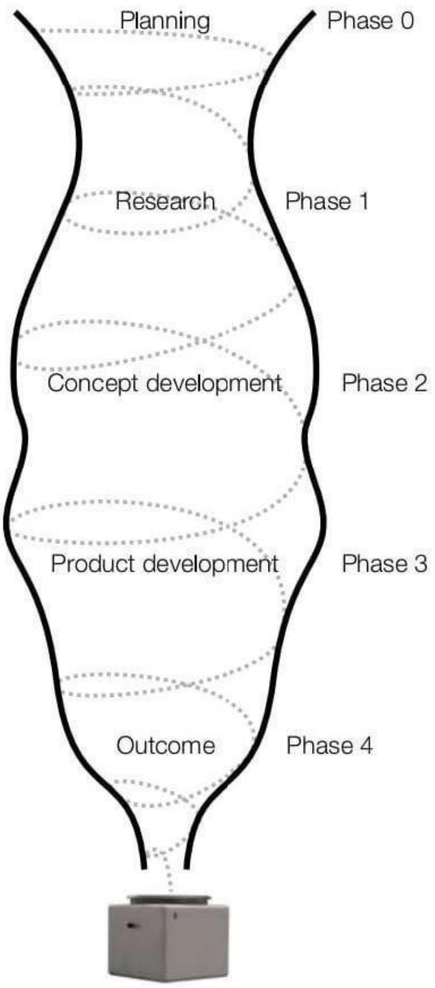

Figure 1: *The funnel diagram illustrating the thesis*

Although it runs nearly parallel with the creation of the product and is an integral component of the process, the service design that supports the product is not depicted in the diagram because it is not covered in this report. The product report contains information about the service's layout.

CHAPTER 2

2. LITERATURE REVIEW

2.1. What is Sustainable Development in architecture?

In the WCED report Our Common Future (1987), the concept of sustainability is defined as development carried out to meet current needs without compromising the ability of future generations to satisfy their own social, economic, and environmental requirements. Sustainable development ensures that activities carried out today remain sustainable in the future and do not negatively impact the environment (Gibson, 2007)

Only a decision-making process that integrates and recognizes economic, environmental, and social challenges can achieve the ultimate aim of sustainable development. In its application, the concept of sustainable development in architecture is often referred to as sustainable architecture, environmentally friendly architecture, or green architecture, all of which broadly aim to create a better quality of life for humanity. Sustainable architecture has begun to incorporate the principles of sustainable development into all types of structures, from the smallest to the largest. It can be implemented through simple methods or high-technology systems, involving the logical use of technology and minimizing the negative environmental impact of buildings (***Figure 2***).

Figure 2: *Sustainable development in architecture diagram*

Sustainable architecture, which encompasses social, economic, and environmental aspects, often demonstrates a stronger focus on environmental concerns while almost entirely neglecting social and economic dimensions in references. This imbalance in applying sustainability aspects hinders true sustainability because maintaining sustainability requires a balanced relationship between all three dimensions. This balance is essential to improve human living standards while preserving ecological systems sustainably.

The implementation of sustainable architecture can begin with small-scale projects, such as individual houses. Achieving the highest level of sustainable architecture across various building types is only possible when the concept of "sustainable development" is fully integrated, resulting in buildings that harmonize with nature rather than conflict with it. A sustainable living environment can only be achieved when environmental issues and development challenges are given equal importance in housing projects. Furthermore, government and industry leaders in construction must guide the housing sector toward energy-efficient solutions (Lourenço, 1996).

2.2. Sustainable housing criteria

Sustainable housing is essential for supporting human health, sustainability, and safety, and sustainable housing practices must integrate the three aspects: environmental, social, and economic. There are many ways individuals can begin living in sustainable housing, even starting with small, affordable implementations. For example, a previous study highlighted the need for affordable housing materials that require improvement, particularly for low-income households in need of affordable sustainable housing (Carter, 2007).

These practices also rely on the government, architects, developers, community residents, and construction leaders to create sustainable housing that meets the criteria and implementations mentioned earlier, integrating land use, social, economic, and environmental considerations (***Figure 3***). To ensure the continued success of sustainable housing programs, these programs must continually assess economic viability, socio-cultural acceptability, technical feasibility, and environmental compatibility (Chung, 2011).

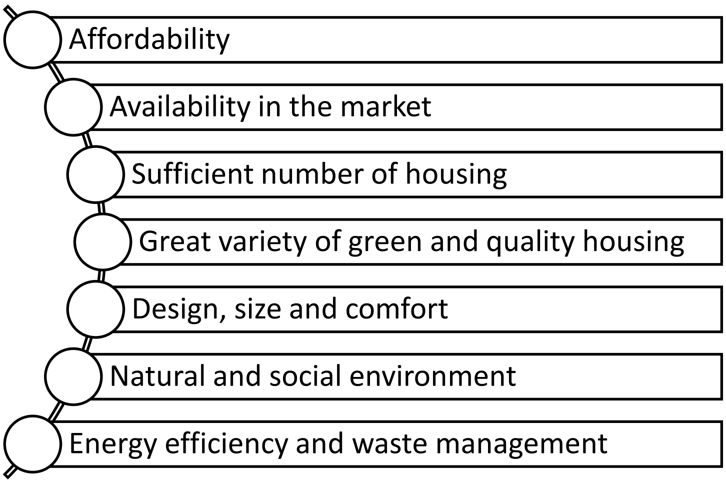

Figure 3: *Sustainable housing requirements diagram*

With the aim of increasing the sustainability potential in residential research, this project will focus on the implementation of sustainability at the housing or residential scale (***Figure 3***). The sustainability criteria will categorize all implementations into 10 sustainable housing criteria: (Lourenço, 1996)

1. Physical buildings: The goal of sustainable housing is to minimize the negative effects of buildings and their operations, which impact human well-being and environmental conditions. This is achieved through better design in terms of location, construction, function, maintenance, and the entire building life cycle.

2. Energy use: The implementation of energy-saving measures in housing needs improvement, as housing consumes significant amounts of energy and contributes greatly to pollution (Chung, 2011).

3. Waste, water, and wastewater (WWW): Managing water features and waste is a key principle of green architecture. Effective waste management at the housing scale reduces illegal dumping and increases the volume of recovered materials, lowering costs for city and county councils (Miller, 2012).

4. Sites and surroundings: A green environment is a critical factor in housing, contributing to both physical and mental health. It also supports the quality of life and promotes sustainable happiness (Conway, 2015).

5. Human behavior: These aspects are important because most development occurs due to human actions. The lack of knowledge about human behaviors,

attitudes, and values is a significant issue for architects and planners, affecting the successful implementation of sustainable housing.

6. Quality of housing: This criterion relates to the user's standard of living. A sustainable house should meet the residents' needs, support financial self-sufficiency, integrate building management systems, promote a circular economy, and provide good opportunities for employment.
7. Social culture and values: Sustainable housing practices must consider the influence of culture and context, as these factors play a crucial role in improving the implementation of sustainability criteria.
8. Communication and transportation: Sustainable houses should support long-distance communication and facilitate the movement of people using environmentally friendly transportation (Sahlin, 1971).
9. Safety and comfort: Achieving safety and comfort in sustainable housing requires the provision of necessary social infrastructure. This includes adequate staffing for community services, effective management and maintenance of housing, and the establishment of a supportive community, all contributing to sustainable development.
10. Price and availability: Sustainable housing must be accessible to individuals across all economic levels, including low-income households. These methods help the author categorize the various implementations discussed in the previous 10 journals.

2.3. Sustainable buildings in hot climate

The Mediterranean climate, especially in the western part of Albania, is characterized by sunny days and very warm temperatures (which can exceed 40°C). The Mediterranean coast is becoming increasingly popular among visitors from the northern part of the globe, particularly during the summer months. Given the harsh climate in certain areas, the adoption of environmentally friendly architecture is more than necessary.

As Mediterranean temperatures can reach 40 degrees Celsius or higher, solar cooling is commonly used in these buildings. They typically have thick walls, which act as a barrier during the day by preventing external heat from entering. At night, when temperatures drop, the walls release the stored heat into the house. These buildings are usually designed with a shape where the thickness of the walls is smaller than their length. Structures with this design often have one main wall that is protected from direct sunlight (***Figure 4***).

When it comes to the Mediterranean climate, one common challenge is the scarcity of water. Efficient water management in these houses is essential. Rainwater must be carefully collected, stored, and protected from evaporation. Additionally, gray water systems should be recycled and reused for various functions within the building (Miller, 2012). This approach to utilizing natural, renewable sources of energy in the overall functioning of the building is known as passive design, which can be better illustrated in the following diagram:

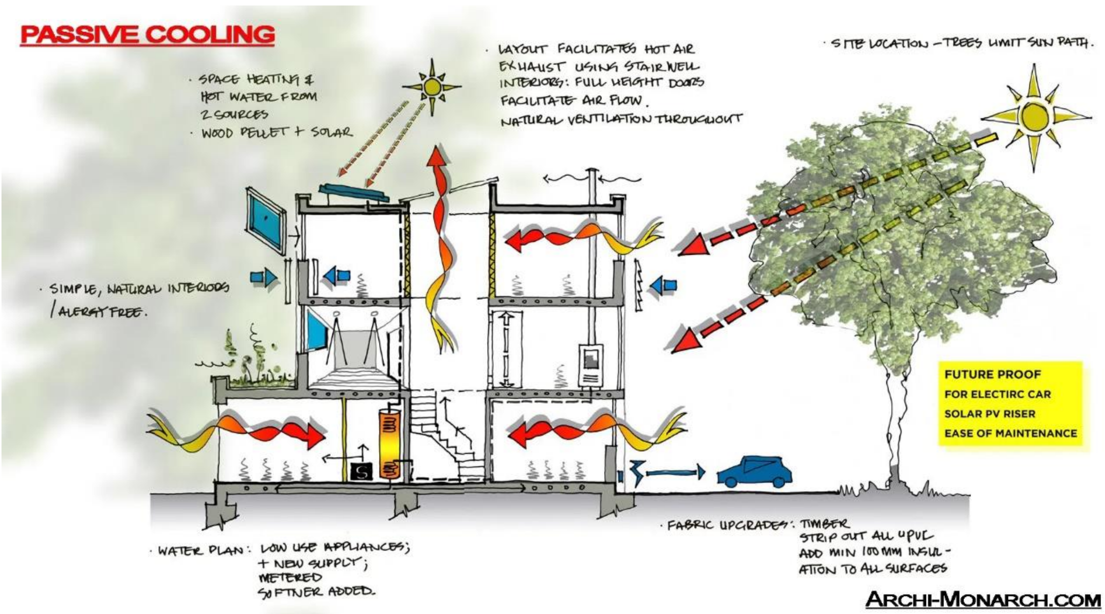

Figure 4: *Passive housing system in hot and dry climates*

2.4. Sustainable buildings in hot climate

In regions with Mediterranean climates, architects face another challenge in creating energy-efficient constructions. The climate in these areas typically features two seasons: high temperatures and significant humidity. The Mediterranean region, which shares a coastline of 46,000 km, is also home to around 480 million people spread across three continents: Africa, Asia, and Europe. Recognizing this, we must focus more on sustainable architecture, as it can make a significant difference. Buildings in these areas must be highly durable to withstand storms, cyclones, and other extreme weather conditions. Shading systems must be carefully designed, and the number and size of windows must be optimized without compromising the stability of the structure. Given the frequent rainfall, water management is also critical in these regions.

Additionally, due to the soil's tendency to corrode, extra attention is required when constructing the building’s foundation. Because of the global issue of mass deforestation, it is crucial that the timber used in construction be sustainably harvested. One of the main goals of green architecture in these regions should be to minimize the use of toxic materials for treating steel and timber against rust, mold, and insect infestation (Miller, 2012).

Regarding materials, several factors should be considered before making a final choice. To stabilize indoor temperatures, adobe or stone can be used for walls, and reflective roof materials can be applied. To minimize transportation energy, the use of locally sourced materials is encouraged. To allow natural light while reducing heat gain, low-emissivity (Low-E) windows should be installed (***Table 1***).

Table 1: *The most suitable design technologies and materials for hot and dry climates*

Design Technologies	Materials
Sustainable architecture	Special timber
Durable construction	Concrete
Shading systems	Brick
Water management	Thick Plaster

2.5. Passive Design Strategies.

2.5.1. Windows and shadings

Windows in a house play an important role in energy gain and loss. In warmer areas, the east, west, and north facade walls are the best locations for windows. The glass area on the south facade should not exceed 7%. Of course, attention must also be paid to the size of windows on the other facades, as oversized windows can lead to significant energy losses during colder months and at night (***Figure 5***). Skylights are not recommended for use in hot areas, as they are difficult to shade and allow too much light into the home. If additional natural light is needed on the roof and no other options are available, tubular skylights can be installed.

In tropical climates, it is essential for the house to have adequate shading. The shading systems in these areas should be designed to cover the south facade during the summer, preventing direct sunlight from heating the walls and entering the windows. Additionally, it is always a good idea, when possible, to have vegetation around the east and west facade walls. This is because these sides are particularly difficult to shade, and vegetation can provide an effective alternative.

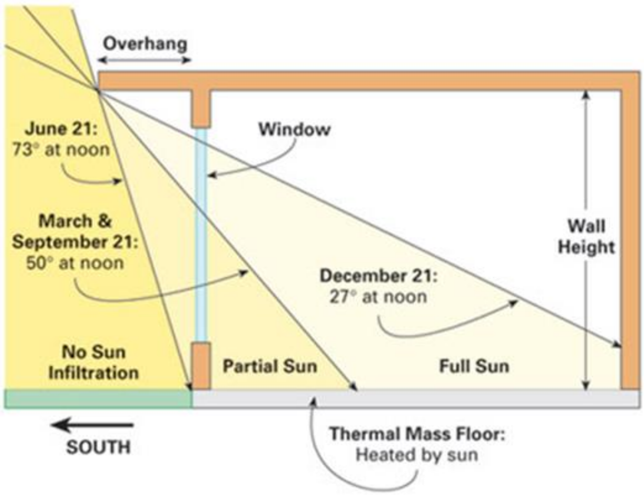

Figure 5: *The natural shading elements*

2.5.2. Construction type and walls

It is important to understand that there are two types of hot climates: the humid tropics and the dry deserts. Depending on the location of a sustainable house, a different type of construction is required. In hot and dry climates, the walls should be solid and heavy, made primarily from concrete, stone, or other mass materials. With this design, the solar heat entering the house is minimized and absorbed by the walls.

The situation in humid climates is different. Due to the high amount of water vapor in the air, thick walls can lead to mold formation inside the walls due to condensation. This not only causes material degradation but also contributes to pollution. In these areas, construction should be lightweight, and if timber is used, it must be sustainably harvested (H. B. Kaushik, 2007). It is also important for the roof to remain cool and ventilated (***Figure 6***). A double roof is recommended. Light-colored materials are always a good choice for hot climates.

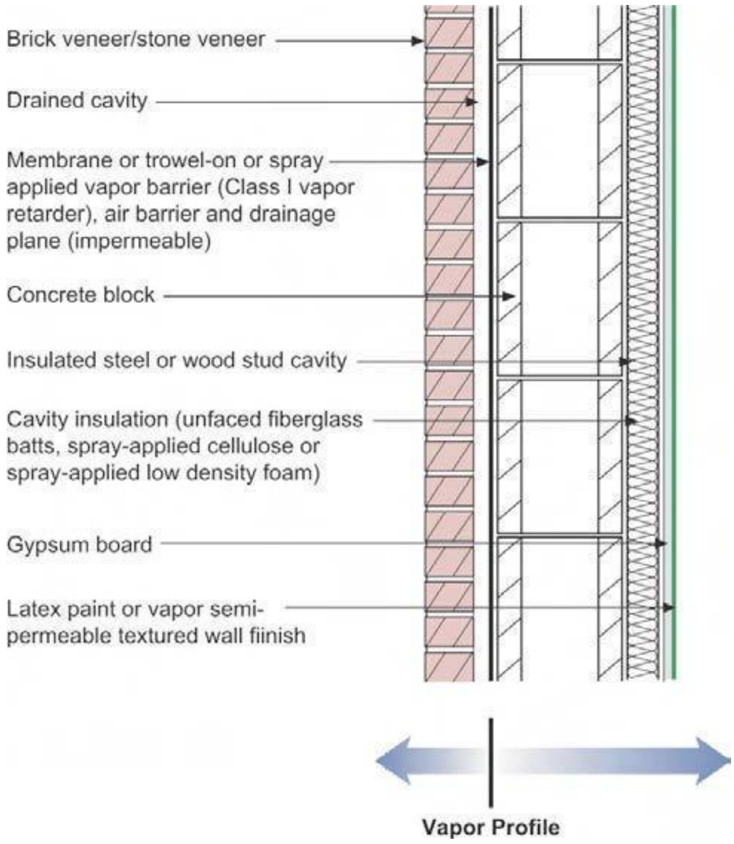

Figure 6: *Type of wall for dry and hot climates*

2.5.3. Double skin façade

Most office buildings in hot climate countries are made of glass, which increases the need for air conditioning due to the preheating of the building. Obviously, when designing buildings in these areas, it is crucial to consider the comfort of the people who will use them. There is a way to use glass facades while still meeting sustainable requirements. Double skin facades are a possible solution, especially for large office buildings. These facades have complex structures and must be carefully designed and calculated (***Figure 7***). The design and materials used depend heavily on the building's location. However, when properly calculated, double skin facades can improve the building's performance (Gibson, 2007). They can enhance indoor air quality and save energy.

Another benefit of double skin facade is their soundproofing qualities. This component, which is sometimes overlooked, is critical for the physical and mental well-being of the building's occupants. Double skin facades typically consist of two or more layers of glass. In most cases, they cover the entire facade or at least 3-4 stores. One of the layers often has insulating properties. An air corridor is created within the construction, allowing for ventilation (when desired) and insulation. The movement of air can be controlled by automatic systems. To prevent overheating, shading devices are integrated into the double skin facade system. These shades are often mechanically operated and are typically located between the layers of glass. The thickness of the entire double skin facade system can range from 20 cm to several meters.

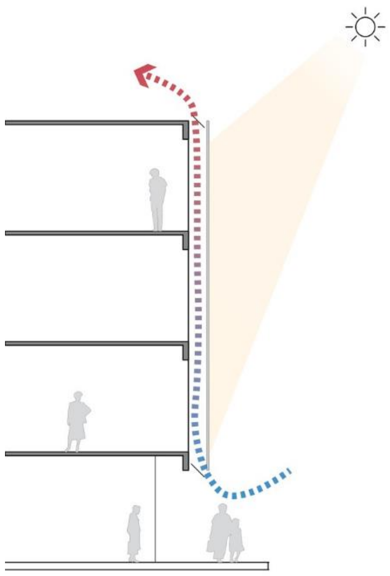

Figure 7: Double skin façade

Double skin facades can also perform the functions of the building's HVAC system, significantly lowering electricity costs. Unfortunately, achieving this in hot climates can be challenging. A more suitable function for facades in these regions would be a system that acts like exhaust ducts. In this way, double skin facades can reduce the solar radiation absorbed by the building (Miller, 2012).

2.6. Technologies

2.6.1. Solar Chimney

The problem of limited resources on planet Earth is growing every day. The greatest paradox is that the countries providing 20% of the world's resources are the ones with the highest levels of starvation and the lowest levels of technological advancement. These are the countries primarily in Africa and other impoverished regions. The climate in these areas is typically hot, and they are often located near deserts. There is an urgent need to find new ways of collecting energy that require fewer resources and are less harmful to the environment. The solution may lie in the sun. The solar chimney technology combines solar energy, wind, and water in one efficient system. Typically constructed in desert areas, this technology requires a relatively large area for its construction (Sopinka, 2014). However, because the materials used are mainly concrete and glass, shipping costs are reduced, as these components are widely available.

The solar chimney system consists of a large glass roof collector, a tall chimney, and wind turbines (***Figure 8***). Beneath the solar-collection roof are water-filled cylinders that are heated by the sun and the soil during the day. There is a gap between the cylinders and the roof, allowing cold air to enter, which is then heated. The hot air is naturally drawn upwards into the chimney due to the temperature difference. The connection between the roof and the chimney is airtight, and wind turbines are installed at the point where they meet. The air movement inside the chimney rotates the turbines, generating kinetic energy (Bhandari, 2017). This energy is then converted into electricity via a generator.

The main advantage of the solar chimney system is that it can use both direct and reflected solar radiation. This means that even in cloudy weather (common in tropical regions), the efficiency of the system is not reduced. Another benefit is that the system can generate electricity even at night, as the heated water releases its stored heat.

Solar chimney technology is extremely environmentally friendly and requires minimal maintenance. The cylinders are filled with water only once, and there is no need for additional water, which is beneficial for desert countries. The technology is not difficult to implement, and it can be used in developing countries. By using solar chimneys to produce energy, we can reduce carbon emissions and potentially replace dangerous nuclear plants entirely.

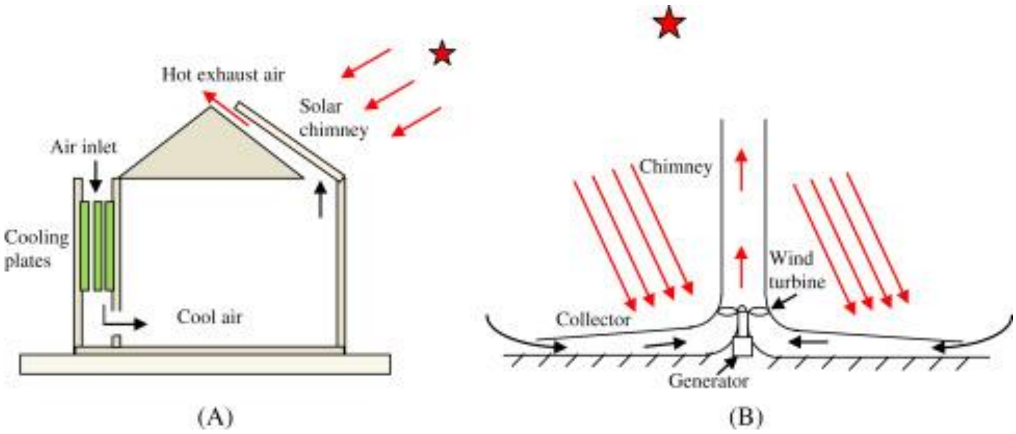

Figure 8: Solar chimney

2.6.2. Geothermal heat pump

We must never underestimate the power of the earth's energy. The heat released from the sun is stored in the soil. In fact, the temperature of the earth, especially at deeper levels, remains mostly constant. Today, technology has created a way to use the earth's constant temperature for eco-friendly purposes. Cooling and heating with geothermal pumps are completely environmentally friendly and highly effective (***Figure 9***).

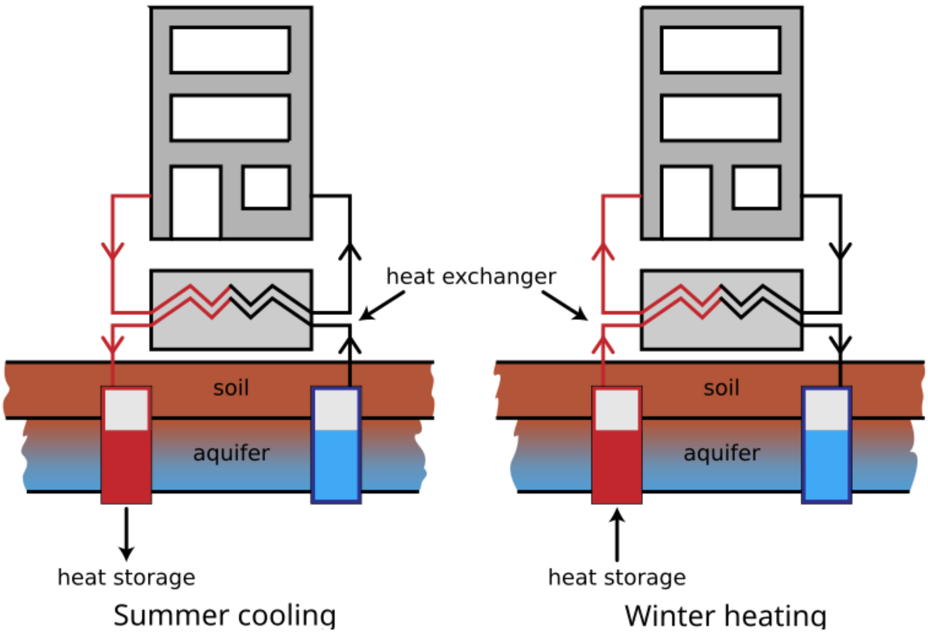

Figure 9: *Geothermal heating and cooling pump*

The system consists of two main units: one installed inside the building, called the evaporator coil, and another unit located underground, known as the condenser. These units are connected through a system of pipes that carry a fluid. When compressed, the fluid (referred to as refrigerant) is under high temperature and pressure. As it expands, the refrigerant turns into gas, which absorbs the earth's temperature and transfers heat from one unit to the other. During hot summer months, the geothermal pump extracts heat from inside the building and transfers it into the ground. In the winter, the process is reversed (***Figure 9***).

Geothermal systems have a long lifespan and require minimal maintenance. The greatest advantage is that they do not release harmful substances into the environment.

2.6.3. Cooling with seawater

Many large cities are located near vast bodies of water, such as the sea. These areas, particularly when situated in hot climate zones, often become crowded during the summer months. Large hotel buildings accommodating numerous tourists and office buildings housing many workers all contribute to significant electricity consumption. Fortunately, coastal cities have the potential to reduce their electrical consumption by up to 90 percent.

Cooling with seawater is a simple and environmentally friendly technology that works effectively in hot climates (***Figure 10***). It operates using two water loops. The first loop circulates through the building, lowering the temperature, before returning to the cooling station (Mitchell, 2012). The second loop involves seawater drawn from the ocean, which enters the cooling station and absorbs heat from the fresh water. Importantly, the two types of water never mix. The energy exchange takes place through a titanium plate at the cooling station. Once the seawater has absorbed the heat, it is returned to the ocean.

When discussing cooling methods for coastal hot cities, this type of cooling system is practically unavoidable. By taking advantage of natural resources, we reduce greenhouse gas emissions and minimize reliance on fossil fuels.

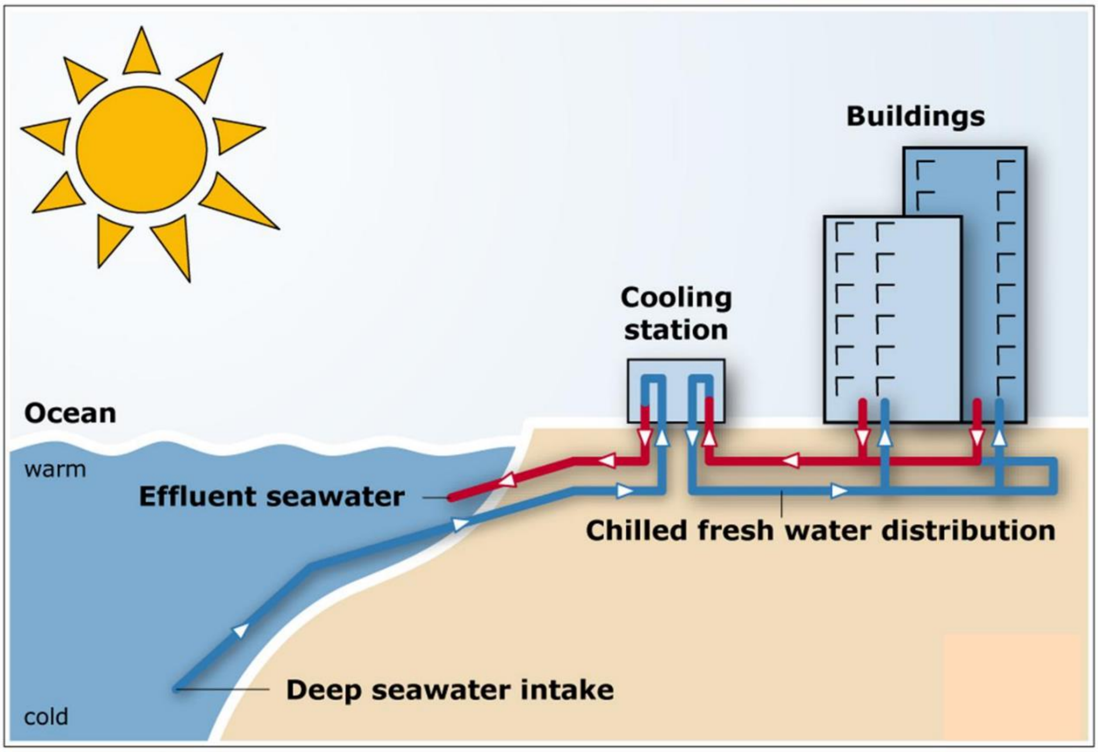

***Figure 10**: Cooling with seawater*

2.7. Materials

2.7.1. Green Roofs

Hot climates occupy much more space on the planet than cold climates. Due to the favorable temperatures, these regions tend to have larger populations, and as a result, big cities are crowded with people who consume enormous amounts of energy while wasting natural resources. Constructions in these large cities are among the greatest challenges to sustainability today. To address this issue, we need to consider how to use the space and resources we already have. A typical example of this is the green roof technology.

In busy cities, particularly in hot climates, there are often many unused roof spaces. People in these areas, especially in urban environments, are frequently confined to concrete buildings, relying heavily on air-conditioning and breathing polluted air. Green roofs offer an effective solution to at least part of these problems (Cohen, 2013). The concept is to transform empty concrete surfaces—often left unused—into pleasant green spaces where people can go, for example, at the start of the day to relieve stress, relax, and breathe fresh air.

Green roof constructions consist of several layers. At the base is an insulation layer, followed by a waterproof membrane to protect the structure from water damage. Above that is a growing medium layer, and finally, a layer of vegetation (***Figure 11***). The benefits of installing green roofs are numerous. While they are currently most popular in Scandinavia, Austria, and Germany, they can significantly improve the environment in hot climates as well. Plants absorb CO2 and release O2, so the more vegetation we have, the better the air quality. Additionally, increasing plant coverage reduces carbon dioxide levels in the atmosphere.

Green roofs not only improve air quality but also help reduce urban temperatures. It has been shown that concrete-heavy cities, with few plants, can raise air temperatures by as much as 8 degrees Celsius. Research in Japan suggests that if 50% of a city's rooftops were converted to green roofs, temperatures could be reduced by 2 degrees Celsius, reducing the need for air conditioning. Another benefit of green roofs is their role in energy efficiency. They are excellent insulators, significantly reducing heat loss through the roof. Furthermore, the vegetation provides natural shading, keeping the roof cooler and reducing solar heat absorption, which protects the structure and extends its lifespan. Studies show that green roofs can reduce up to 50% of heat losses per year in buildings.

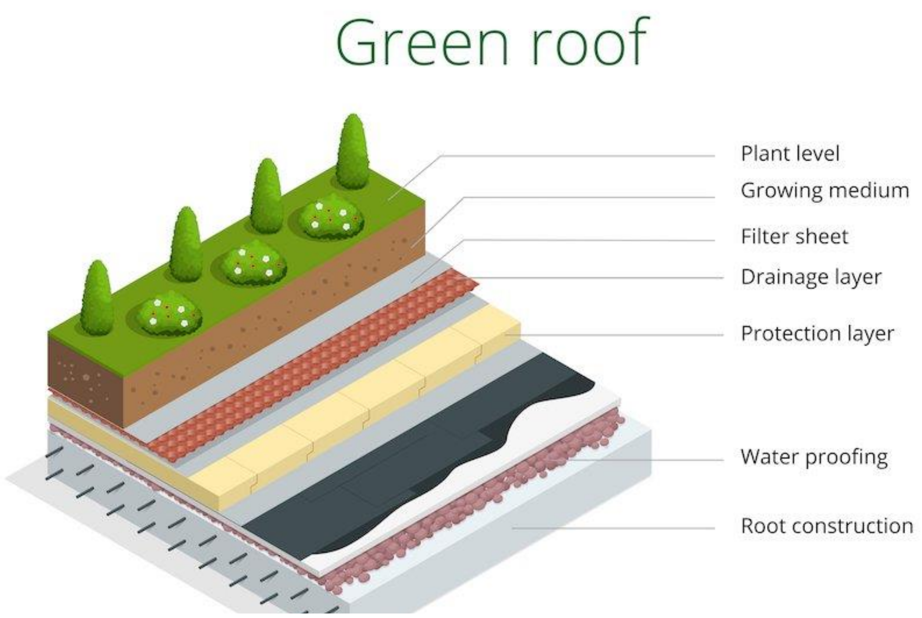

Figure 11: *The layers of the green roof*

Green roofs also help manage stormwater, which is especially important in hot, humid climates. Plants and soil absorb between 25% and 100% of rainwater, releasing it slowly, which reduces the amount of water entering the sewage system and prevents flooding.

Looking ahead, I believe green roofs could be used for growing vegetables as well. With the increasing food consumption in cities and limited space for agriculture, green roofs could provide a viable solution to help meet urban food demands.

2.7.2. Green façades

Green facades serve a similar function to green roofs. They improve the insulation qualities of walls, absorb solar radiation, and restrict wind currents. Additionally, they positively impact air quality and create a more comfortable urban atmosphere. Green facades act as filters, reducing dust pollution caused by traffic, construction, and other activities.

There are several types of green facades, but the most suitable for hot climates are structural media types (***Figure 12***). These are favored because, unlike other types, they offer sufficient stability while remaining well-suited for the environmental conditions of hot regions. However, in areas with high humidity and seismic activity, some other options may not be as durable. Structural media systems have an expected lifespan of about 15 years, and they are produced in blocks of varying sizes depending on the client's needs. The humidity levels in these blocks can be controlled, and maintenance is relatively easy.

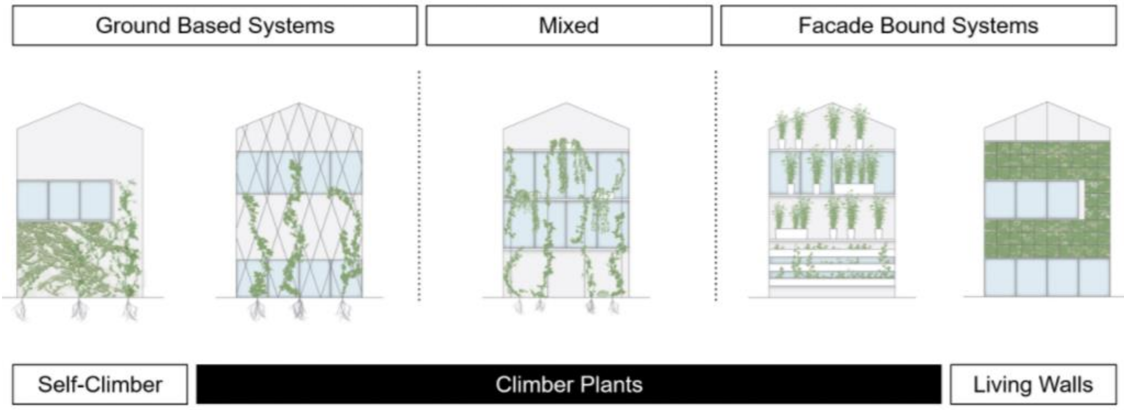

***Figure 12**: Types of Green façade*

In conclusion, the integration of green systems in buildings for both hot and cold climates is essential. These systems not only enhance indoor air quality and comfort but also contribute to improving the environmental diversity of the surrounding areas (Miller, 2014). Furthermore, the plants used in these systems can provide new habitats for local wildlife, fostering biodiversity. By implementing such sustainable practices, we can address social, economic, and environmental factors, creating a more balanced and eco-friendly approach to urban development.

CHAPTER 3

3. METHODOLOGY

3.1. Study Area

3.1.1. Access to the zone

One of the recently proposed projects is the construction of the Shengjin-Velipoje road, which will pass through the Rrjoll area. This new route will become the primary access to the area, serving as the main tourist entrance (Deodhar, 2000). The existing access axis will shift to secondary importance, mainly used by locals and for service deliveries to the area. The construction of this road, along with the improvement of the existing access route, will create a triangle of tourist and economic interaction:

- Tourist Interaction: Shengjin-Baks-Rrjoll-Velipoje
- Economic Cooperation: Rrjoll-Shkodër

In addition to these primary mobility corridors, the road network in the area will be reconstructed. A promenade will be built along the lagoon, connecting to Velipoja via a wooden bridge. This promenade will extend 4 km from the Baks-Rrjoll area, enhancing both tourism and local connectivity (***Figure 13***).

In terms of environmental considerations, the Baks-Rrjoll area will prioritize the preservation of its natural habitats. This will be accomplished by halting development in environmentally sensitive areas and focusing growth in regions that are already developed and do not hold significant natural value. Additionally, the proposal includes the introduction of autonomous vegetation to further support ecological sustainability.

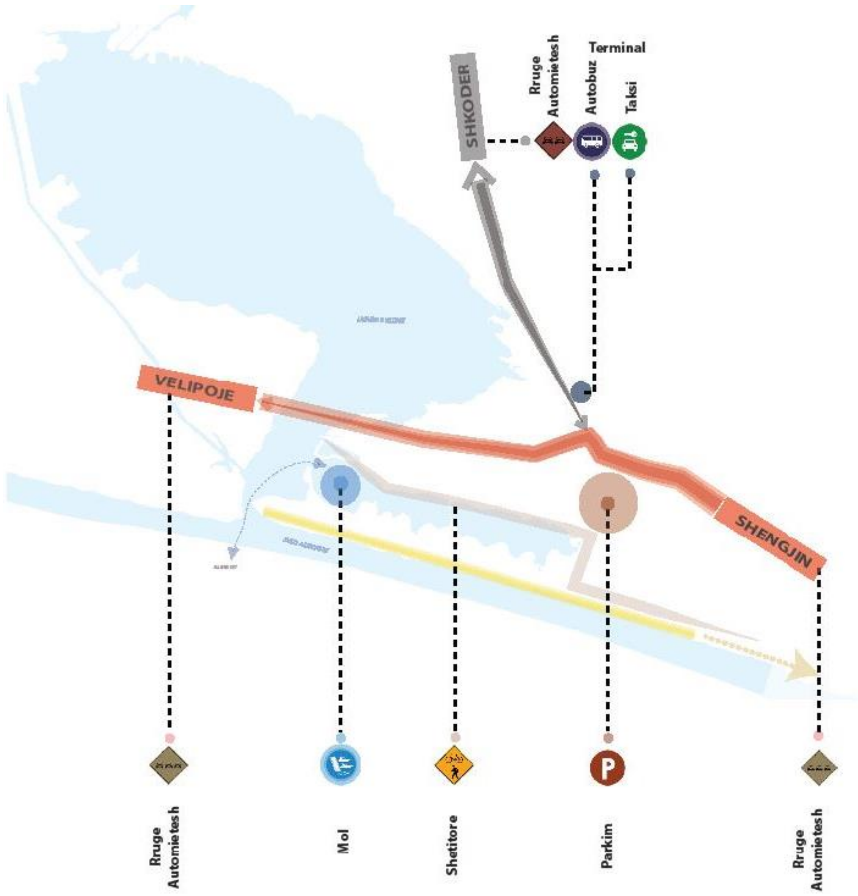

Figure 13: Existing situation map of Baks-Rrjoll

3.1.2. Infrastructure services

In addition to the construction of the road network, other essential infrastructure and services will be developed in the area. An underground electricity supply network will be installed, ensuring the necessary capacity and stability. The water supply system will be enhanced by upgrading the existing depot and rebuilding the entire network to meet current demands.

Investments will also be made in the installation of optical fiber and telecommunication networks to improve connectivity. Public lighting throughout the area will be another key investment. These developments are in line with the "Development Plan for the City of Shkodra 2015-2020" (CEN, 2005).

3.1.3. Tourism

Tourism today is one of the largest industries in the world, generating significant revenue and closely linked to other sectors of development. Employment within the tourism sector holds considerable potential for poverty alleviation, especially for women. Moreover, tourism directly impacts various industries such as manufacturing, agriculture, and services. These interconnections create multiplier effects that stimulate the local economy, providing diverse sources of income for both the local population and beyond. Beyond its economic benefits, tourism can also contribute to the conservation of biodiversity. The growth in the number of visitors to national parks and protected areas can generate financial benefits, which can be reinvested in preserving these areas.

The Coastal Zone, with its vast tourism potential, requires clear and concrete development guidelines. These should be aligned with national sector development policies, the global vision for tourism, and focus on nature conservation and landscape protection — the essential raw materials for the sector. These guidelines must address the various functions of the sector, the territorial distribution of activities, and the unique characteristics of the land, alongside the architectural communication necessary for tourism developments (Gëdeshi, 2020). Extending tourism activity, however, remains a challenge, which can be effectively addressed through well-planned spatial development and the integration of environmental protection measures.

The study area is located within the "Protected Landscape of the River Buna Velipoja," which includes the village of Baks-Rrjoll. While this area is somewhat residential, it also contains many untouched areas with high tourism potential due to its unique value. Most of this region is preserved for its distinctive landscape and the ecological features of its lagoons and wetlands. Despite its great potential, this area has remained undeveloped due to a lack of infrastructure and its protected environmental status.

As an area rich in landscape and environmental values, with significant potential for coastal, rural, and natural tourism, the Baks-Rrjoll region is positioned as one of the most attractive areas for future tourism development. The potential of this area is closely tied to its strategic geographical location. Its proximity to Montenegro, the Shkodra-Lezha economic zone, the port of Shengjin, and the beach of Velipoja gives it a competitive edge for future tourism growth in the region.

The primary entry points to the area will be Mother Teresa Airport, Shengjin Port, and the Muriqan customs. The area will be developed by leveraging its natural and human resources, which include notable attractions such as the Viluni Lagoon, the beach, Renc Mountain, natural habitats including sand dunes and wetlands, the Rana e Hedhun Monument, and the existing built-up area of the village of Baks-Rrjoll (***Figure 14***).

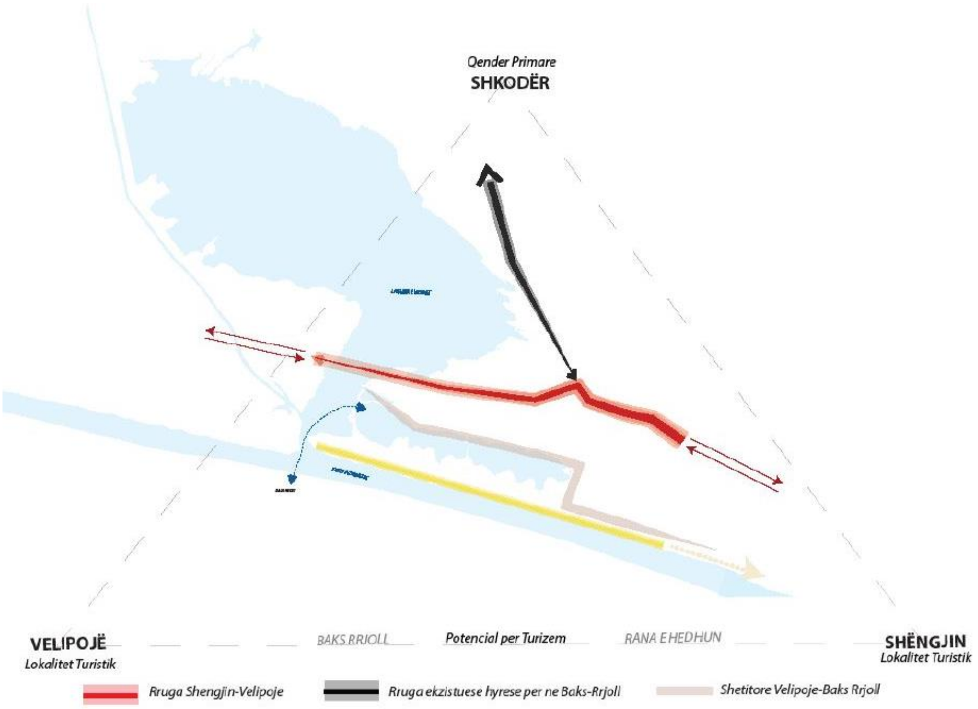

Figure 14: *The map that illustrates touristic possibilities of the zone*

3.2. Tourist Typologies

The tourist development of the area dictates the need to increase and structure the accommodation offered in the region. Today, structures oriented toward family tourism will be included in future development, becoming part of the urban and architectural structuring and regeneration. The range of tourist offerings in the area will be enriched with new hotel structures, which will be integrated into the territory with structures for tourist and gastronomic services, thereby increasing economic activity in the area. The area will be divided into several sub-zones, each with its own spatial typology and offering different activities (***Figure 15***). In this way, tourists will have a variety of choices, from resorts to guesthouses (Mucaj, 2022).

The area is planned in such a way that future tourist development will attract as many tourists as possible, while also being environmentally friendly and preserving natural habitats. The most environmentally sensitive sub-areas are sub-area number one, where light structures will be developed, and sub-area number two, which is conceived as a natural park and will be connected to the accommodation areas via paths. These three sub-areas will serve as locations for accommodation, public services, recreation, and possible infrastructure development. These areas are considered the noisiest and will serve as an entrance to this newly urbanized area.

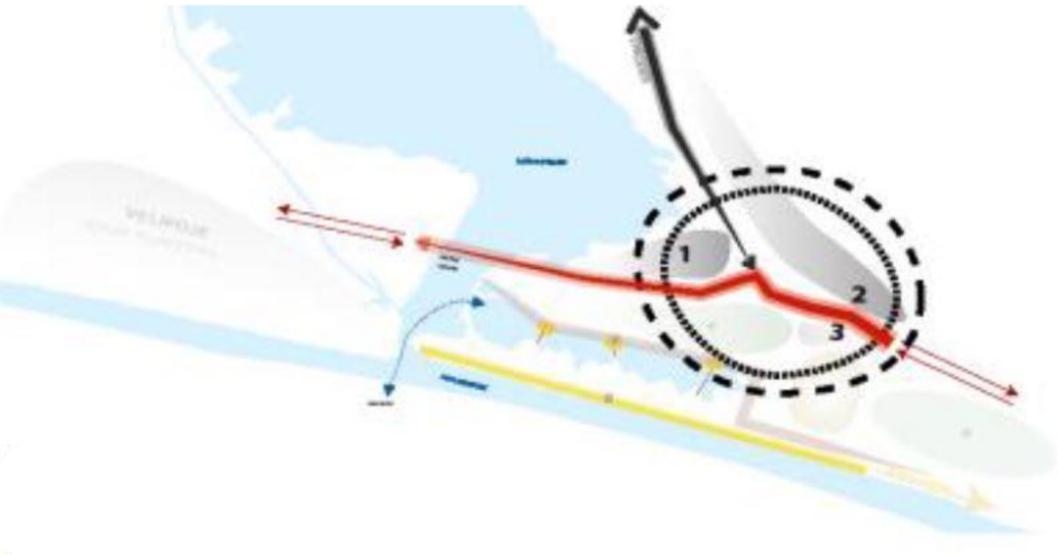

Figure 15: *Sub-areas 1, 2 & 3*

Meanwhile, the 4th sub-area could include tourist accommodation, a promenade, and could also offer organized natural activities for tourists in the lagoon (***Figure 16***). These additional areas are needed to make this destination zone successful, as part of most tourists' vacations includes informative activities that can help pass the time and also contribute to creating lasting memories of the area.

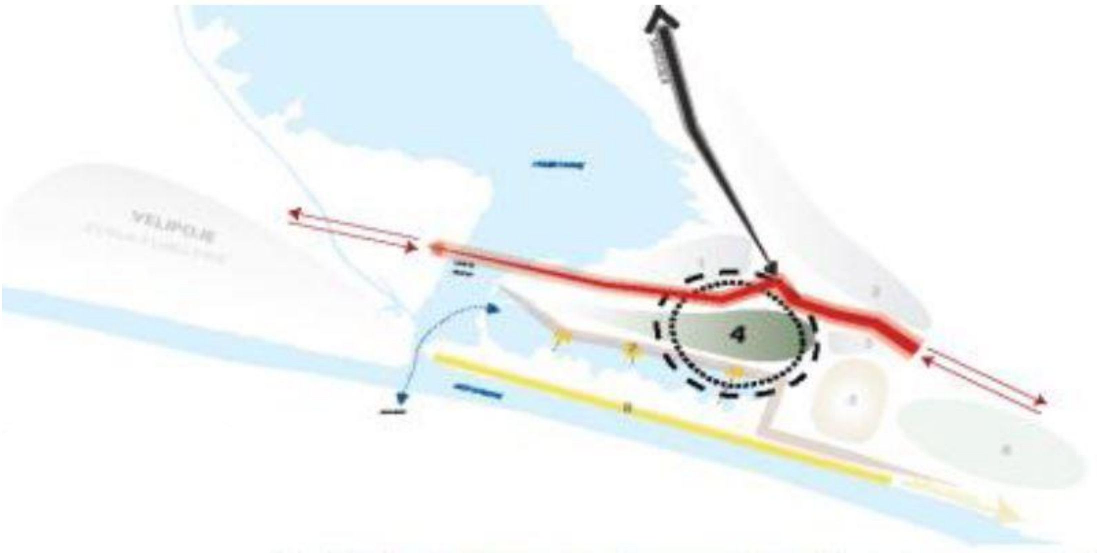

***Figure 16**: Sub-area 4*

Moving on to the 5th sub-area, where our villa complex is planned to be built, we can see that the development plan designates this area solely for tourist accommodation (***Figure 17***). This ensures that the strategic plans are strictly followed and further makes it a more suitable choice in every aspect of the area's development.

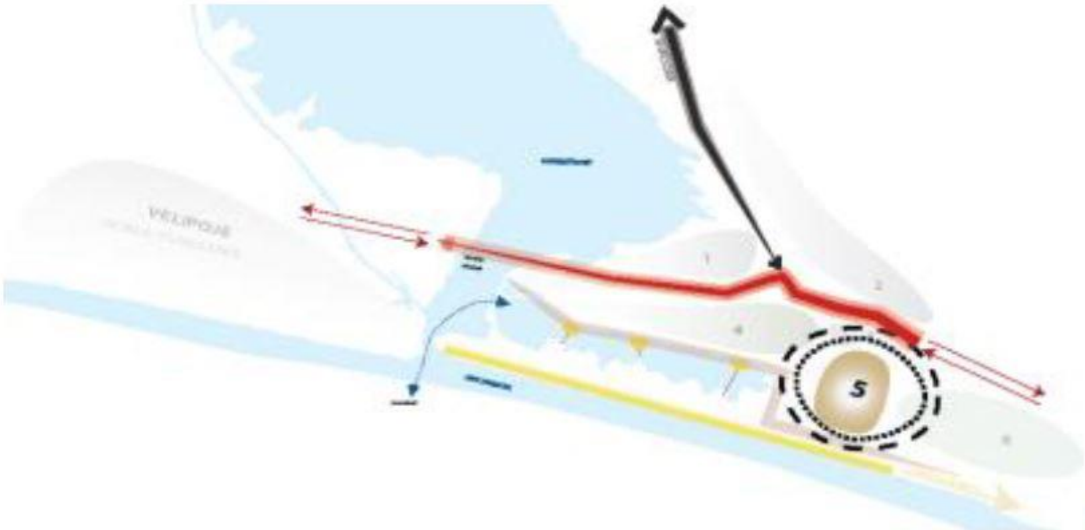

***Figure 17**: Sub-area 5 – Building area in which the villa complex is proposed*

The sixth and the last sub-area has only the destination of entertainment, in which are planned to be held activities that will attract tourists and raise the bar for touristic areas (***Figure 18***).

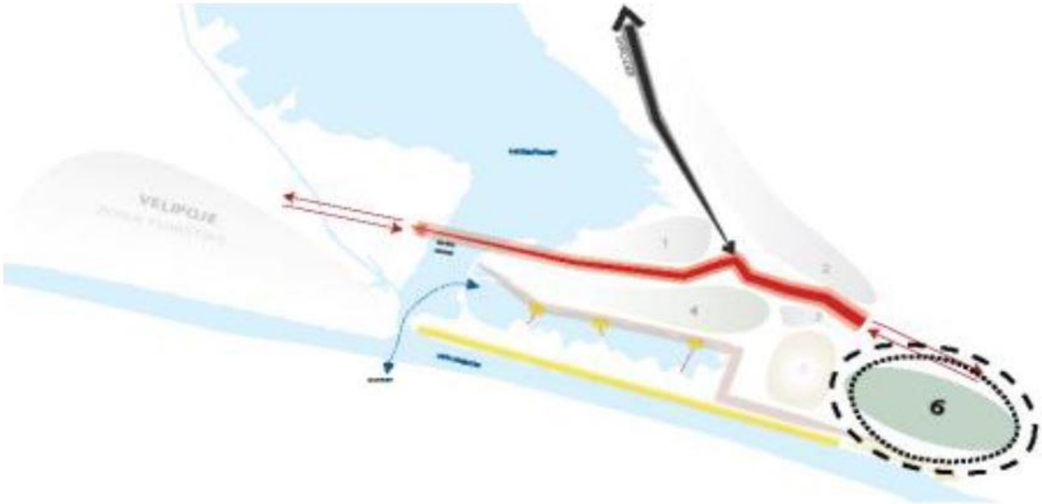

Figure 18: Sub-area no. 6

3.2.1. Geographical Position (Main Landmarks)

The study area is in the village of Baks-Rrjoll, located in the administrative unit of Velipoja in the municipality of Shkodra. Velipoja lies south of Shkodra, at a distance of 25 km from the city. The village of Baks-Rrjoll is bordered by the villages of Velipoja, Bajramaj, and Kel Marashi. The two most developed tourist poles closest to the study area are Velipoja, 16.2 km away by road, and Shengjini, 60.8 km away by road. This village is located 39.2 km from the Muriqan customs, 98.3 km from Rinas Airport, and 124 km from the port of Durrës. The geographical position and proximity to the border points give this area priority for the development of tourism (CEN, 2005).

From the existing road network, we can mention the access roads that connect to the national axes. The most important entry point is from the Tirana-Shkoder highway, at a place called "Harku Bërdicës." This road is used by cars, buses, motorcycles, bicycles, vans, etc. It crosses the villages of Bërdicë, Trush, passes through Ura e Gjolulit, crosses the villages of Mountain Kolaj and New Baks, and then turns left and crosses an 8 km long asphalt road leading to the tourist area of the village of Rrjoll.

The favorable geographical position, where the sea, lagoon, fertile plains, and mountains intersect, gives this area a great opportunity for the development of maritime and mountain tourism, fishing, and the cultivation of various agricultural and livestock crops. The area is bordered by four important elements: the Adriatic Sea, Viluni Lagoon, Renci Mountain, and the natural monument Rana e Hedhun.

3.2.2. Climate

Climatic features are also expressed in the spatial distribution and time regime of indicators of climatic elements. The area of Velipoja and Baks-Rrjoll is characterized by a Mediterranean climate, with hot and dry summers, and mild and wet winters. The Murrlan wind is characteristic of Velipoja, making the winter somewhat bitter, while in summer, the Shirok wind brings moisture (CEN, 2005). Velipoja and its surroundings, as a large field near the influence of the sea, have an average annual temperature of 15.3°C. The coldest month is January, with an average temperature of 6.6°C, and the hottest month is July, with an average temperature of 24°C.

3.2.3. Topography

Baks-Rrjolli offers a unique combination of habitats along the coast, karstic mountain landscapes, steep slopes, dunes, alluvial forests, and temporary swamps, all in combination with a clean and abundant sandy beach. The area in question has a harmonious blend of rural and natural environments, while maintaining a strong natural character. The wind has shaped a landscape with dunes up to 50 meters high on the southern slopes of Mount Renc.

The Baks-Rrjoll Area of National Importance is characterized by flat terrain starting at sea level and extending several meters up the southern slope of Mount Renc. The area covers approximately 150 hectares and lies within the village of Baks-Rrjoll along the coastline south of Vilun Lagoon (***Figure 19***). Although relatively small, this area features a variety of landscapes, including sandy surfaces (beach), sand dunes with pioneer vegetation, wetlands, small lagoon-shaped hills, areas covered with herbaceous plants and shrubs, and the steep part of the slope of Mount Renc (CEN, 2005).

Figure 19: Green areas protection and development

3.3. Soil Quality

The soils in the study area are considered to be highly saline. In the area of Velipoja, these lands cover over 400 hectares and are classified as having very high salinity, making them poorly suited for the cultivation of agricultural crops. The salinity originates from marine infiltration, where chlorine salts dominate. To determine the future use of these lands, it is necessary to conduct a financial analysis of the costs required for land rehabilitation or to assess the feasibility of changing their purpose. The lack of drainage and continued cultivation further deteriorates the structure, quality, and productivity of these lands (CEN, 2005).

3.3.1. Flora and Fauna

A total of 10 target plant species were identified, each with special conservation interest. According to the Red List data for Albania, four of these species are classified as endangered, while the other six are classified as vulnerable. The latter group includes Salvia officinalis, a shrub cultivated for commercial purposes that is threatened by overexploitation. Nine of these 10 species are included in the European Red Data List (three as "almost threatened" and six as "slightly problematic"), while six are included in the global Red List (all classified as "slightly problematic").

The Buna Velipoja River Protected Landscape Area supports a wide variety of animal species, with particular richness in aquatic species. The fauna includes a large number of species that are of conservation interest globally, regionally, or nationally.

- Mammals: The most common mammal species include the wild rabbit, red fox, jackal, European vulture, weasel, and wild boar. A total of 22 mammal species have been recorded, including the brown bear. The presence of dolphins is also being studied.
- Birds: (Euronatur, 2009) recorded 238 bird species, including 114 nesting species and 16 species that nest in the area. In addition, 52 species are classified as regular migrants, while 51 are occasional migratory birds or winter visitors. Data collected from winter counts show fluctuations in the total number of wintering waterfowl. On average, the area accommodates about 4,240 individuals.
- Reptiles: (Euronatur, 2009) recorded 19 reptile species, several of which are included in the Red Data List. Four of them are classified as "almost threatened," 10 as "slightly problematic," and five as "unassessed."
- Amphibians: (Euronatur, 2009) recorded 11 species of amphibians, all of which are included in the Red Data List. One species is classified as "endangered," and 10 as "slightly problematic." Gathering frogs for restaurant supplies has been reported as a common practice.
- Freshwater Fish: (Euronatur, 2009) recorded 143 species of freshwater fish (in Shkodra Lake, the Buna River, and Viluni Lagoon). This includes the Adriatic blunder, which is nearly extinct. The Buna River is essential for the migration of 13 species of fish from inland waters to the Adriatic Sea. Of these migratory species, six are globally threatened: the European sea urchin, the Adriatic urchin, the European oyster herring, the river lamprey, and the stream lamprey.

3.3.2. Waste Management

The urban waste management situation in the project area is inadequate. Scattered urban solid waste is visible along almost the entire coastline. In the village area, the situation is relatively better, though problems remain with the management of organic waste, such as fertilizers (Paper, 2019). Currently, the village of Baks-Rrjoll generates small amounts of urban solid waste, which are managed by the Administrative Unit (AU) Velipoja, under the Municipality of Shkodra. However, the tourist season remains problematic, as the population in the area and surrounding areas increases, causing the amount of waste to increase significantly, reaching 20 tons per day.

3.3.3. Water Supply

The water supply for the Baks-Rrjoll area faces significant challenges due to infrastructure limitations and over-reliance on private wells. The village is currently supplied by a pumping station, with two 2x2000m3 depots in the Kolshi neck. However, this water supply system does not meet the demand of the population, especially during the summer tourist season. Consequently, there are consistent issues with both the quality and quantity of water provided (Parker, 2015).

In addition, private wells in the area are being used in an uncontrolled manner, leading to significant pressure on the local groundwater aquifer. This over-extraction is contributing to the phenomenon of sea intrusion, where saltwater is contaminating the fresh groundwater supply. To address these challenges, it is necessary to implement a new water system that connects to the existing depots, with an increased storage capacity to ensure a more reliable and sustainable water supply for both residents and tourists.

3.3.4. Population and Socioeconomic conditions

Despite significant socio-economic development in the past three decades, Albania continues to face persistent socio-economic challenges, including migration, unemployment, low income, and poor integration into the labor market. These issues are especially pronounced in rural areas, where the agricultural sector has struggled to provide sufficient income and employment opportunities for local populations.

In the Velipoja Administrative Unit, data from the 2011 Census reveals troubling trends:

- A 28% decrease in population between 1989 and 2011.
- An alarmingly high unemployment rate, nearing 49%, with youth unemployment reaching as high as 70.6% among individuals aged 18 to 25statistics highlight the pressing need for comprehensive socio-economic interventions to address the challenges faced by rural areas in Albania (CEN, 2005).

3.3.5. Environmental requirements for energy efficiency

The energy efficiency of a building refers to the extent to which its energy consumption per square meter is lower than the defined energy consumption values for that type of building, considering its specific climatic conditions. For the study area, located in a particular climatic zone, the target is an energy consumption coefficient of approximately <100 kWh/m² per year (Miller, 2012). To achieve this, the development plan will incorporate a range of materials, technologies, and practices aimed at energy conservation and reducing carbon emissions. Specifically, in the planned accommodation and service buildings, the following principles and technologies will be applied:

- Orientation of Buildings: The main facades, which will include large glass areas, will be oriented towards the south. This positioning allows the buildings to absorb solar radiation during the colder months. In summer, when the sun's rays are more direct, radiation on these glass surfaces will be reduced through shading. This will reduce heating energy consumption during winter, while sunscreens and deciduous greenery will help in shading the buildings during the warmer months.
- Natural Ventilation: All proposed buildings will integrate natural ventilation principles, featuring both horizontal and vertical cracks to allow airflow. Openable windows will be incorporated, and ventilation will be enhanced in

main halls through vertical openings, allowing air to enter from the bottom and exit through a space at the top, such as a terrace.

- Thermal Insulation: The buildings will be constructed to meet international energy-saving standards, focusing on using materials with the lowest possible heat transfer coefficient for walls, floors, and roofs. Windows and doors will be fitted with two or three layers of glass, filled with gas to enhance insulation, and will be made from plastic with thermal insulation material inside. Thermal bridges, especially around windows and doors, will be minimized by inserting parts of the window frame into the wall, reducing heat loss. Specific construction measures will include:
- Walls: Fentile facade with grafiato and mortar, brick, polystyrene, and mortar.
- Roof/Terrace: Mortar, concrete, thermal insulation material, membrane, drainage, and vegetation.
- Windows and Doors: Plastic casing with thermal insulation (ceramics), double-glazed windows with a thermally insulated frame.

By implementing these strategies, the buildings will be designed to ensure high energy efficiency, reduced environmental impact, and optimized comfort for the inhabitants and visitors. These strategies align with contemporary best practices in energy-efficient building design, focusing on both passive and active measures to achieve sustainable performance (Cohen, 2013).

3.3.6. Central heating and cooling systems

All buildings proposed in the area will operate with a central heating and cooling system. This system will be equipped with smart sensors to maintain the required temperature with maximum energy efficiency (***Figure 20***).

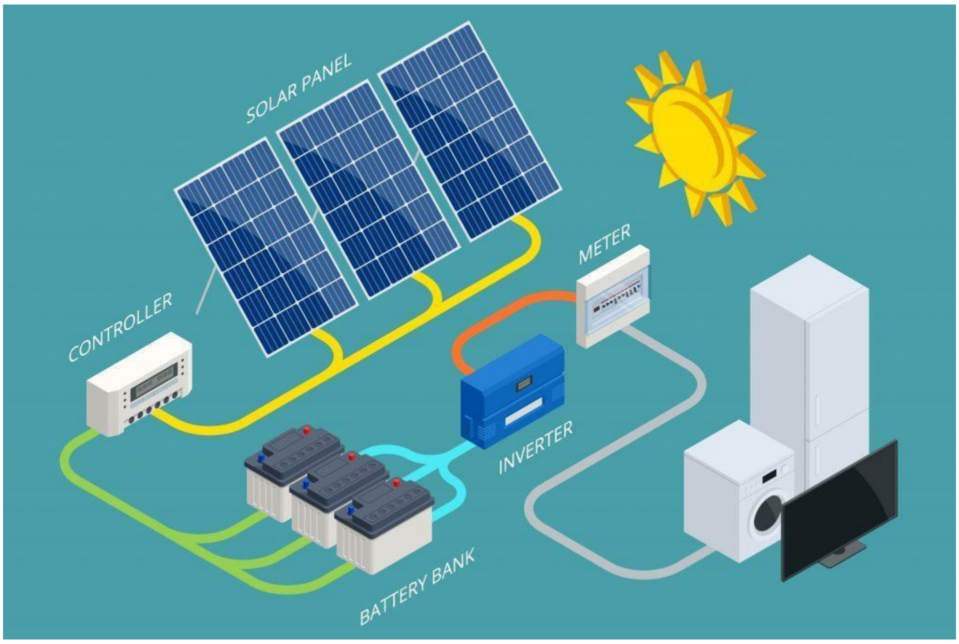

Figure 20: Central Heating with renewable sources of energy

3.3.7. Environmental requirements for solar energy production

To maximize energy production from solar energy, it will be used in three main ways: solar panels for water heating, solar panels on terraces for power generation, and panels for lighting or specific processes. The following sections address each of these technologies separately for use in the area.

Solar Water Heating Panels: These will use passive solar water heating systems, which mainly rely on natural convection to create pressure to store water in a tank. These systems have no electrical components, are easier to maintain, and tend to last longer than active systems. In the study area, given that it is intended for the development of elite tourism, the design element is very important. Therefore, it is proposed to use an active water heating system, as boilers and tanks can be hidden while preserving the architectural design of buildings (Cohen, 2013). Although this system involves slightly higher costs, it is expected to meet 60-70% of the hot water demand, saving a considerable amount of energy.

Electricity Generation Panels: Solar energy, or photovoltaic technology, converts sunlight directly into electricity. Although many types of solar electrical systems are available today, they all essentially consist of three main components: modules that convert sunlight into electricity, inverters that convert it into usable electricity for most household appliances, and sometimes batteries that store excess energy produced by the system (Miller, 2012). The rest of the system includes wiring, circuit breakers, and supporting structures. In the study area, it is proposed to install solar panels on the roofs and facades of buildings.

Given the technological advancements in photovoltaic panels, it is appropriate that these panels be integrated as part of the architectural design of the building. Therefore, developments in the area will make the best use of this innovation. The goal is to fulfill over 50% of the electricity needs of the entire area through solar energy. This ambitious goal is achievable through proper technology and design, setting a positive example of renewable energy production in our country.

The proposed scheme for energy production will not include batteries, so the system will be directly connected to the electricity grid. This significantly reduces initial investment costs and minimizes operating expenses. This system is currently accepted by Albanian legislation, but it will be necessary to reach an agreement in advance with the electricity distribution operator to install a two-way meter for incoming and outgoing measurements. This system is highly efficient, as surplus energy is fed directly into the electricity distribution network, and additional energy is retrieved when needed.

Panels for Specific Use Energy Products: In addition to installing electricity-generating panels on the terraces and facades of buildings, equipment with integrated photovoltaic panels will be used in the study area. This system will be used mainly for outdoor lighting, where batteries will be charged during the day and will provide lighting for roads and areas at night. This system is widely used, highly efficient, and of high quality. For safety reasons, the system will be connected to the electricity grid, with smart sensors allowing the use of grid energy when solar energy is insufficient.

Environmental Requirements for Water Use Efficiency: Rainwater collection is an alternative water supply method that collects and stores rainwater for later use (Mitchell, 2012). Collected rainwater is primarily used for non-potable purposes such as sanitation, irrigation of gardens, landscaping, and others. Although rainwater is relatively clean and its quality is generally acceptable for many uses, filtration and disinfection are required before use. The rainwater collection system is proposed for use only with water from the roofs/terraces of the buildings, where it will flow naturally into a storage tank buried underground. The carrying capacity of this system ranges from small to several hundred cubic meters. Installing a rainwater collection system aims to reduce about 20-40% of the total water demand.

A rainwater collection system consists of three basic elements: the collection area, the water transport system (pipes), and the underground storage tank, pump, and distribution system. The collection area, in most cases, will be the roof or terrace of a building. The effective area of the roof and the materials used in its construction impact the collection efficiency and water quality.

In addition to conserving water resources, implementing rainwater collection techniques provides direct benefits such as reducing water supply demand, minimizing flood and erosion risks, and reducing surface water pollution. Furthermore, protecting the landscape through planning in harmony with nature and landscape elements will be prioritized. Specifically, special attention will be paid to:

- Preserving the current state of natural areas covered with indigenous vegetation, forming green belts and isolated forests in the area;
- Preserving the natural, intact characteristics of Vilun Lagoon and the small wetlands located inside the study area.

3.3.8. Green spaces and Types of greenery

Green spaces in urban areas, particularly in tourist zones, are a vital component in terms of landscape aesthetics and comfort. The area where the plan is located is almost entirely natural, with well-developed vegetation and considerable biological diversity (***Figure 21***). This characteristic will be preserved, as it is the most prominent feature of the area, contributing both to its character and its potential as a tourist destination. Specifically, most of the project area will remain conserved and later serve as a natural public space. Designated areas will be enhanced by densifying the greenery, mainly with indigenous vegetation, using planting techniques as close to natural as possible (Mucaj, 2022).

The vegetation and trees to be planted will follow the form of forest strata, starting from the seaside with herbaceous plants and shrubs and progressing to taller trees. This approach will create green spaces that not only offer an attractive landscape, in the form of an amphitheater pleasing to the human eye, but also provide a genuine habitat for wildlife. Indigenous plants, which are adapted to the soil and climate conditions and are resistant to diseases, will be used to increase green areas. Some of the proposed plants include ash, black poplar, bulger, juniper, and others. It should be noted that non-native plants may also be introduced, but only after a thorough evaluation of their characteristics to ensure their suitability.

Figure 21: *Types of trees in Baks-Rrjoll*

During the selection of plant species for collection, species that do not cause allergies and are not considered invasive will be studied and planted. Strict adherence to technical rules for collection, as well as the specific planting period for each plant or tree species, will be ensured.

Development is considered important because it can create jobs and contribute to the country's growth and development. However, this sector also consumes significant amounts of energy and is a major contributor to environmental pollution (CEN, 2005). In fact, the buildings where we live, work, and play protect us from extreme natural conditions but can also impact our health and the environment. Sustainable development, including sustainable architecture, aims to create mutual support between social, economic, and environmental aspects, with access to adequate public health services, peace, gender equality, human rights, decent work opportunities, quality education, law enforcement, and proper production while preserving the environment.

There are various ways to achieve sustainability, including efforts to develop without requiring extensive regeneration, using appropriate technology in buildings, energy savings, and creating and utilizing healthier, more resource-efficient construction, renovation, operation, maintenance, and demolition models. Reducing the negative environmental impacts of buildings, minimizing climate change, and improving air quality and population health are also key efforts toward sustainability.

The biggest challenge of sustainable development remains raising global awareness—from households to boardrooms—about the importance of overcoming the challenges of the Industrial Revolution, which has led to the unlimited exploitation of human and environmental resources.

It has been observed that there is more attention to environmental impacts and a lack of social and economic considerations. Therefore, analyzing tools from various countries is beneficial for a more integrated approach that includes social, economic, and other critical parameters, even in the context of sustainable housing (Sopinka, 2014). As noted in previous research, residential houses are major energy consumers and contributors to climate change, so it is important to examine how sustainable housing practices balance human behavior and contribute to various environmental issues. To support sustainable housing practices, analyzing tools from different countries will help create a more integrated approach that incorporates social, economic, and other significant parameters.

3.4. Case Studies

3.4.1. Beach Huts

Beach huts are small, often wooden structures or cabins typically located near beaches (Magazine, n.d.). They offer shelter and convenience, serving as a base for beachgoers to relax and enjoy the seaside. Here are the main characteristics of beach huts:

- Size and Structure: These huts are usually compact and often built on stilts or raised platforms to protect them from tides or sand erosion. They range from simple, single-room huts to more elaborate designs, sometimes with multiple levels.
- Construction Materials: Traditionally, beach huts are made of wood with sloping roofs and large windows to capture the scenic beach and sea views.

However, in some areas, they may also be constructed using other materials like fiberglass or concrete.

- Amenities: While basic, beach huts typically include seating, storage, and sometimes small cooking facilities or electricity, providing added comfort for beachgoers, especially for longer stays.
- Personalization: Many beach huts can be rented or leased, and individuals often personalize them with curtains, decorations, and furnishings to create a cozy and welcoming environment.
- Convenience and Privacy: These huts provide a space for relaxation, changing clothes, storing belongings, and seeking shelter from the sun, wind, or rain. They offer a degree of privacy, making them an appealing retreat on the beach.

Beach huts vary in design and availability depending on location (***Figure 22***). Some beaches feature rows of huts, while others may have scattered huts along the shoreline, contributing charm and character to the coastal landscape. They offer beach enthusiasts a functional, yet cozy retreat by the sea.

Figure 22*: Example of beach huts*

3.4.2. Beach Bungalows

A bungalow is a type of house or cottage typically characterized by a single-story design and a low, horizontal profile (***Figure 23***). The rooms are generally arranged on one level, offering a compact and functional living space. The term "bungalow" originated in India during the colonial era, where it was used to describe small, detached houses with verandas. Over time, the concept and design of bungalows spread globally, giving rise to various architectural styles and adaptations (Britannica, n.d.).

***Figure 23**: Example of beach bungalows*

Beach bungalows, located near or on the shoreline, provide a comfortable and serene lodging option for beachgoers and travelers seeking a beachfront escape. While they share similarities with traditional bungalows, beach bungalows are specifically designed to highlight their coastal surroundings and offer an immersive beach experience. Key Features of Beach Bungalows (***Figure 23***):

- Proximity to the Beach: Strategically situated close to the shoreline, these bungalows ensure convenient access to the beach and its facilities.
- Coastal-Inspired Design: Their interiors often feature light, airy spaces with nautical themes, beach-inspired color schemes, and natural materials such as wood, rattan, or seashells.
- Outdoor Living Areas: Many include patios, balconies, or verandas, allowing guests to enjoy ocean breezes and scenic beach views.
- Beachfront Amenities: Depending on the location, they may provide private beach access, sun loungers, umbrellas, or even beachfront dining options.
- Relaxed Ambiance: Designed to promote a casual and carefree vibe, these accommodations encourage guests to unwind and embrace the beach lifestyle.

- Privacy and Seclusion: Often standalone or part of a small cluster, beach bungalows offer a level of exclusivity and privacy not typically found in larger hotels or resorts.

Beach bungalows are available in many coastal destinations worldwide, catering to different budgets and preferences. They offer an intimate and unique accommodation experience, ideal for those seeking a tranquil and beach-themed getaway.

3.4.3. Sustainable Beach Residences

Sustainable houses on the beach are residential properties designed to minimize environmental impact while promoting sustainable living principles in a coastal setting (Lawrence, 2017). These homes integrate various design elements, technologies, and practices to reduce energy consumption, conserve water, protect natural ecosystems, and enhance the overall sustainability of the beach environment. Key features of sustainable beach houses include:

- Energy Efficiency: Sustainable beach houses prioritize energy efficiency by incorporating advanced insulation, energy-efficient appliances, LED lighting, and high-performance windows. Renewable energy sources, such as solar panels, are often utilized to generate clean electricity.
- Passive Design: These houses are designed to maximize natural ventilation, daylighting, and passive heating and cooling strategies, reducing reliance on artificial lighting and mechanical systems for heating and cooling.
- Water Conservation: Features like low-flow fixtures, rainwater harvesting systems, and graywater recycling help reduce water consumption and preserve freshwater resources.
- Sustainable Materials: Environmentally friendly and locally sourced materials, such as reclaimed wood, recycled materials, and eco-friendly finishes, are used to minimize the ecological footprint and promote resource conservation.
- Coastal Ecosystem Protection: Sustainable beach houses prioritize the preservation of coastal ecosystems by maintaining natural vegetation and dune systems, avoiding harmful chemicals, and implementing erosion control measures to protect the surrounding environment.

- Efficient Waste Management: These homes incorporate waste reduction and recycling practices, such as dedicated recycling facilities, composting systems, and proper waste management infrastructure, to minimize landfill waste and support a circular economy.
- Resilience to Climate Change: Sustainable beach houses are built to withstand climate change impacts, including sea-level rise and extreme weather events. Elevated foundations, flood-resistant construction techniques, and resilient landscaping are common features.
- Connection with Nature: Emphasizing a strong connection with the natural surroundings, these houses often include outdoor living spaces, green roofs, and large windows that provide expansive beach views and encourage residents to connect with nature (Dotoli, 2023).

***Figure 24**: Sustainable beach front homes in Denmark by Arkitema Architects*

Sustainable houses on the beach aim to create a harmonious balance between comfortable coastal living and environmental responsibility (

***Figure* 24**). By implementing sustainable design practices and adopting eco-friendly technologies, these houses contribute to the preservation and protection of beach ecosystems while providing a sustainable and enjoyable living experience for residents.

3.4.4. Casa Wabi, Tadao Ando Architect & Associates

In 2014, artist Bosco Sodi chose the picturesque coastal town of Puerto Escondido in the state of Oaxaca, Mexico, as the location for his minimalist complex with Brutalist influences. This sanctuary for artists serves as a bridge between two cultures. Casa Wabi is a sustainable beachfront house designed by architect Tadao Ando (***Figure 25***). The house is located in a coastal nature reserve and features passive cooling strategies, rainwater harvesting, and the use of local and recycled materials. It emphasizes a connection with nature and a low environmental impact (Ando, 2016).

Figure 25*: Casa Wabi Masterplan*

Renowned for his large-scale artworks that blend explosive colors with raw materials, Sodi envisioned a versatile space that would welcome international artists and foster artistic collaborations with the local community. With deep admiration for Tadao Andō and the principles of wabi-sabi, Sodi successfully persuaded the esteemed Japanese architect to undertake this project (***Figure 26***). The outcome is a hybrid complex comprising six villas, two studios, a grand art gallery, and a breathtaking botanical garden. Rooted in a profound connection to nature, the entire compound harnesses the elemental forces to inspire communal introspection.

Figure 26: *The view from the main building*

Casa Wabi seamlessly integrates Mexican traditions with the essence of wabi-sabi. Instead of traditional doors and windows, the compound features three partitions cast in pearl grey concrete. The entire structure is sheltered by a roof reminiscent of traditional local palapas—open structures covered with thatch or dried leaves commonly found on Mexican beaches. This architectural masterpiece harmoniously blends contemporary and traditional elements, as well as the rugged and the delicate. Constructed by local artisans using regionally sourced materials, Casa Wabi elegantly merges with the Pacific coast landscape. Nestled between the ocean and the mountains, it offers an awe-inspiring perspective of the untamed surroundings, inviting contemplation of nature's power.

Throughout the space, the homage to Japanese philosophy is evident, reflecting Sodi's artistic vision (***Figure 27***). The minimalist, uncluttered environment creates a profound sensory experience, poetically revealing the subtle imperfections in the materials used. The legendary 312-meter-long, 3.6-meter-high concrete wall stands as a testament to the architect's skill in merging Brutalist elements with Japanese minimalism. It also serves as a boundary, separating the public foundation area from the private spaces reserved for artists.

***Figure 27**: Shared space*

Casa Wabi serves as a community art center, featuring several independent pavilions designed by esteemed architects, each highlighting specific themes and contributing to a collective project. Mexican designer Alberto Kalach celebrates ceramics through his striking 22-meter red brick chimney, while Portuguese architect Álvaro Siza's clay pavilion encourages local children to reconnect with the earth and nature. Renowned Japanese architect Kengo Kuma designed a unique henhouse — an ultra-modern structure with individual 'houses' for hens and a shared space for the foundation's cooperative activities.

Bosco Sodi himself created a site-specific work called 'Atlantes,' an installation of 64 hand-fired clay cubes arranged as a captivating labyrinth which questions humanity's perspective on nature's power. These endeavors aim to introduce the local population to art and encourage cultural exchanges. The foundation's central complex is surrounded by six freestanding residences (***Figure 28***).

***Figure 28**: The residences*

Located in Puerto Escondido, Mexico, Casa Wabi stands as a testament to the intersection of architecture, art, and community, offering an immersive and transformative experience in an extraordinary coastal setting.

CHAPTER 4

4. RESULTS AND DISCUSSIONS

4.1. Existing State

4.1.1. Baks-Rrjoll Settlement

Situated in the southeastern part of Velipoja town, approximately 30 km (19 miles) from Shkodra, the charming village of Baks-Rrjoll boasts a diverse and picturesque habitat (***Figure 29***). The area includes natural dunes, alluvial forests, temporary ponds, wetlands, agricultural lands, and a beautiful sandy beach.

Figure 29*: Baks-Rrjoll Situation*

The area of Baks-Rrjoll is blessed with several natural attractions, with the majestic Rrenci mountain and the tranquil Viluni Lagoon standing out as notable highlights. One particularly awe-inspiring sight is the sandy formation known as Rana e Hedhun, which refers to the sandy slope that gracefully descends into the sea, creating a captivating destination not to be missed (***Figure 30***).

Figure 30: *Viluni Lagoon in Baks-Rrjoll*

In addition to its natural wonders, Baks-Rrjoll is renowned for its diverse and delicious gastronomy. Visitors are encouraged to indulge in local specialties such as cheese, butter, various fruit jams, fresh wild fish and seafood, honey from local beekeepers, and artisanal ice creams. For outdoor enthusiasts, the village offers a wealth of activities, including surfing, windsurfing, boat rides, kayaking, canoeing, cycling, underwater diving, and a variety of ecotourism experiences.

Baks-Rrjoll is a destination that appeals to both nature lovers and food enthusiasts, offering a delightful blend of natural beauty, delicious cuisine, and exciting outdoor pursuits (***Figure 31***).

***Figure 31**: The unparalleled scenery of Baks-Rrjoll*

4.1.2. Houses of Baks-Rrjoll

Baks-Rrjoll village is characterized by a variety of homes that reflect the local architecture and way of life. The houses in Baks-Rrjoll range from traditional stone and wood cottages to more modern buildings. Many residences feature charming gardens and outdoor spaces where both residents and visitors can relax and enjoy the coastal surroundings. The village is a mix of permanent homes and vacation properties, creating a vibrant community that attracts locals and tourists alike.

However, most of the people in Baks-Rrjoll have built their homes with the intention of transforming them into hotels, apartments, or vacation homes.

4.1.2.1. Sizes & Layout

The size of houses in Baks-Rrjoll can vary depending on several factors, including location, design, and individual preferences. In general, the homes in the village range from small cottages or bungalows to larger family residences.

Smaller houses in Baks-Rrjoll typically feature compact layouts, making them suitable for individuals or small families. These homes are often one or two stories high and generally consist of a living area, kitchen, one or two bedrooms, and a bathroom (***Figure 32***). A unique characteristic of the area is the practice of "never-finished buildings," where additional stories are added over time, year after year, as the need arises.

Figure 32*: A typical one-story villa in Baks-Rrjoll*

On the other hand, larger houses in Baks-Rrjoll offer more spacious living arrangements. These homes may feature multiple bedrooms and bathrooms, a larger kitchen, a dining area, and a living room. Some also include additional rooms such as a home office or guest room. These larger residences cater to families or individuals who prefer a more expansive living space.

Figure 33*: Larger Houses of Baks-Rrjoll*

4.2. Architecture

The architecture of houses in Baks-Rrjoll reflects the local style and cultural heritage of the region. Traditional houses in Baks-Rrjoll typically exhibit a mix of Albanian architectural influences, along with some Mediterranean and Ottoman elements (***Figure 34***).

Figure 34*: Traditional Houses in Baks-Rrjoll*

One characteristic feature of the architecture in Baks-Rrjoll is the use of local materials such as stone, wood, and clay (***Figure 35***). These natural materials not only provide durability but also help houses blend harmoniously with the surrounding environment.

The design of traditional houses in Baks-Rrjoll often includes elements like arched doorways, wooden balconies, and tiled roofs. The use of decorative elements, such as ornamental woodwork and intricate carvings, adds a touch of elegance and uniqueness to the houses.

Figure 35*: Blended Architecture*

In recent years, there has been a blend of traditional and modern architectural styles in Baks-Rrjoll, with some newer houses incorporating contemporary designs and materials. These modern houses often prioritize functionality, open floor plans, and large windows to maximize natural light and scenic views (***Figure 36***).

Figure 36*: Modern Houses of Baks-Rrjoll*

It's important to note that the architecture of houses in Baks-Rrjoll can vary based on individual preferences and the specific time period of construction. As the village continues to evolve, a blend of traditional and modern architectural styles may emerge, contributing to the diverse architectural landscape of Baks-Rrjoll.

4.3. Results from research methodologies

In this paper, several research methodologies were implemented to help achieve a strong result that contributes to the healthy development of the main building destination in Baks-Rrjoll: Houses.

The two primary methodologies applied are the Case Study and Literature Review methods. Intertwined with these are direct and indirect interviews with architects, users, and other stakeholders, along with comparative analysis (comparing different architectural projects, typologies, or approaches to identify similarities, differences, and patterns that lead to a deeper understanding of design principles and strategies).

Additionally, a deeper understanding of how design elements influence human experience and behavior was gained through multiple immersions in the research site. Immersion in the context also supported the Ethnographic research, focusing on understanding the cultural, social, and contextual factors influencing architectural practices, traditions, and meanings.

4.4. Conclusions from the existing state

After gathering information from reliable sources and employing various research methods, a process of stratification was undertaken. This involved organizing data that shared similarities in specific aspects and systematically considering the different requirements and factors of each individual case. To arrive at an effective solution, a comprehensive examination of the problem was conducted, which included analyzing its underlying causes, lifespan, and weak points. By generating numerous combinations of data, it became possible to identify the problem and determine suitable solutions. Subsequently, common issues, risks, and opportunities were consolidated into a single framework, thus avoiding excessive detail while encompassing a wide range of variables. This generalization was achieved through the application of SWOT analysis, which involved the systematic assessment of strengths, weaknesses, opportunities, and threats. Separate analyses were conducted for both the location and the buildings, which were later integrated into a unified analysis (***Table 1***).

Table 2: *SWOT Analysis*

S	W	O	T
Natural Beauty	Limited Infrastructure	Sustainable Tourism Development	Environmental Impact
Gastronomy	Seasonal Tourism	Infrastructure Improvement	Competition from nearby destination
Outdoor Activities			

Strengths:

- Baks-Rrjoll is blessed with stunning natural landscapes, including coastal dunes, alluvial forests, temporary ponds, wetlands, and a sandy beach. These scenic features make it an attractive destination for nature lovers and tourists.
- The village offers a diverse and delicious gastronomic experience, with local specialties such as cheese, butter, jams, fresh seafood, honey, and artisanal ice creams. The rich culinary offerings provide a unique experience for visitors.
- Baks-Rrjoll offers a range of outdoor activities for enthusiasts, including surfing, windsurfing, boat rides, kayaking, canoeing, cycling, and underwater diving. The abundance of recreational options appeals to adventure seekers and active travelers.

Weaknesses:

- Baks-Rrjoll may face limitations in infrastructure, including transportation, accommodation options, and public facilities. These shortcomings might pose challenges for visitors seeking convenience and comfort.

- The popularity of Baks-Rrjoll as a tourist destination may depend on specific seasons, leading to fluctuations in visitor numbers. This seasonality can impact the sustainability of tourism-related businesses in the area.

Opportunities:

- Baks-Rrjoll has the potential to promote and develop sustainable tourism practices that ensure the preservation of its natural environment and cultural heritage. This can attract environmentally conscious travelers and contribute to the long-term growth of the region.
- Investments in improving infrastructure, such as transportation networks, accommodation facilities, and public amenities, could enhance the overall tourism experience and attract a broader range of visitors.

Threats:

- The increasing popularity of Baks-Rrjoll as a tourist destination could put pressure on the delicate ecosystems and natural resources of the area. It is crucial to implement proper management and conservation measures to mitigate negative environmental impacts.
- Baks-Rrjoll faces competition from other coastal destinations in Albania and neighboring countries. To maintain its appeal, it needs to differentiate itself through unique experiences, sustainable practices, and targeted marketing efforts.

By analyzing these strengths, weaknesses, opportunities, and threats, stakeholders in Baks-Rrjoll can develop strategies to capitalize on its strengths, address weaknesses, seize opportunities, and mitigate threats. This will foster sustainable tourism development and ensure the long-term prosperity of the region.

4.5. Proposal

4.5.1. Architectural Proposal

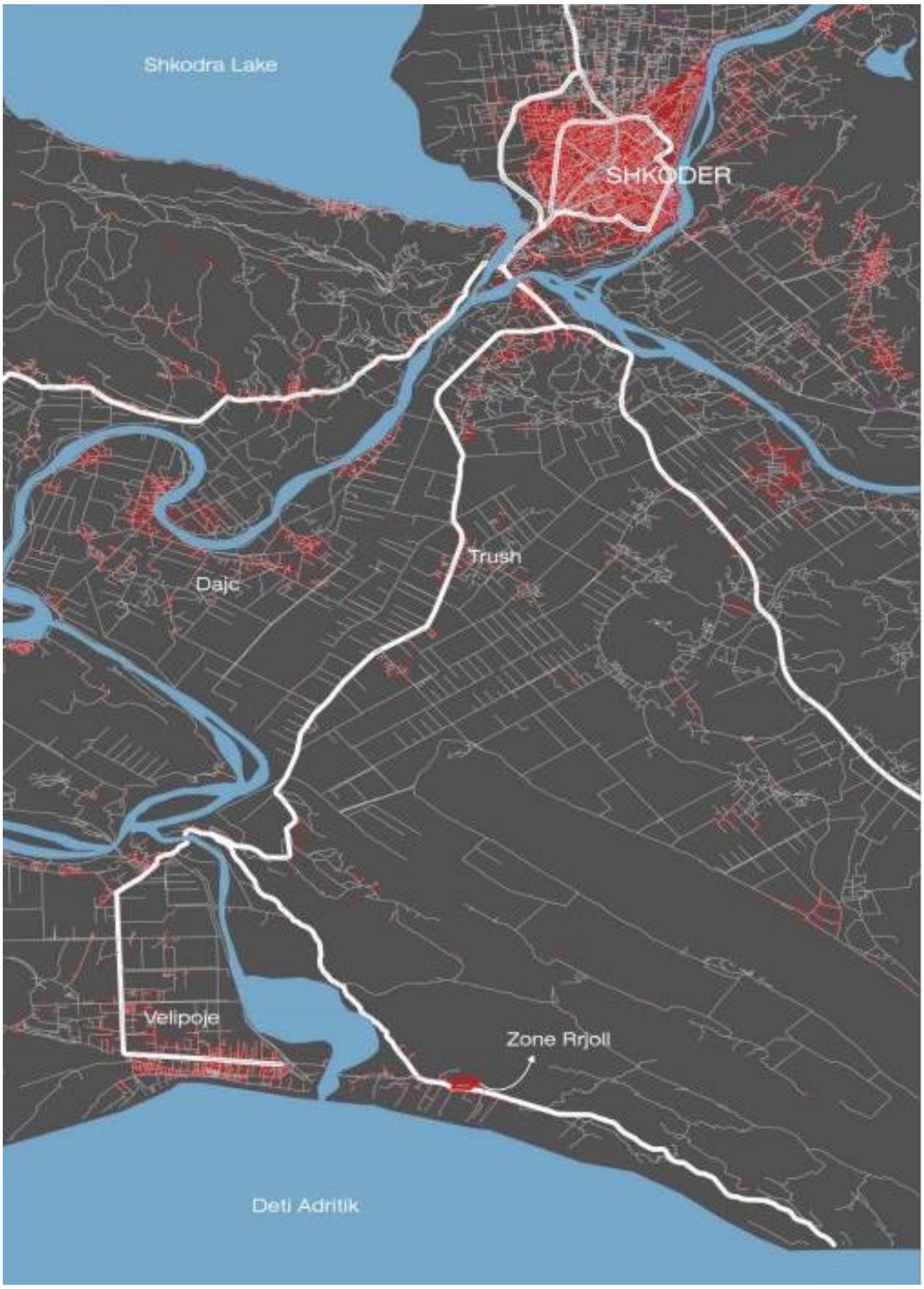

Figure 37: *Topography map related with the existing buildings and main roads*

The map illustrates the relationship between the site and major cities, highlighting connections via the main road networks (***Figure 37***).

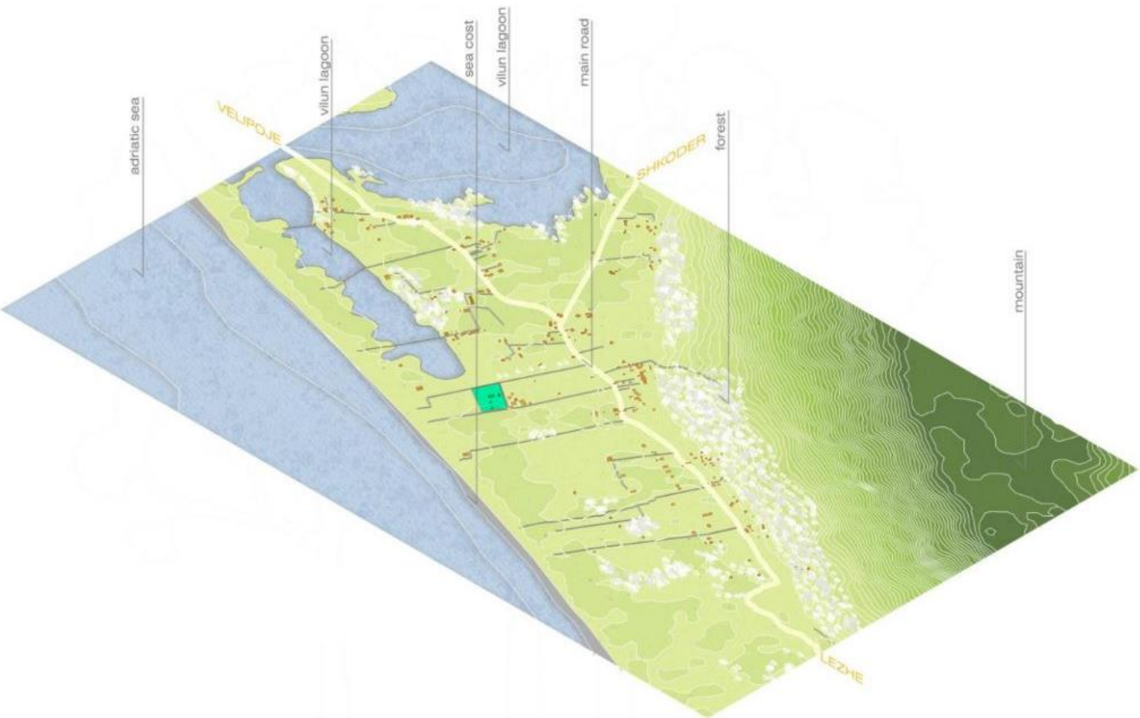

***Figure 39**: Site related with the land marks*

***Figure 38**: Site Analyses (main roads)*

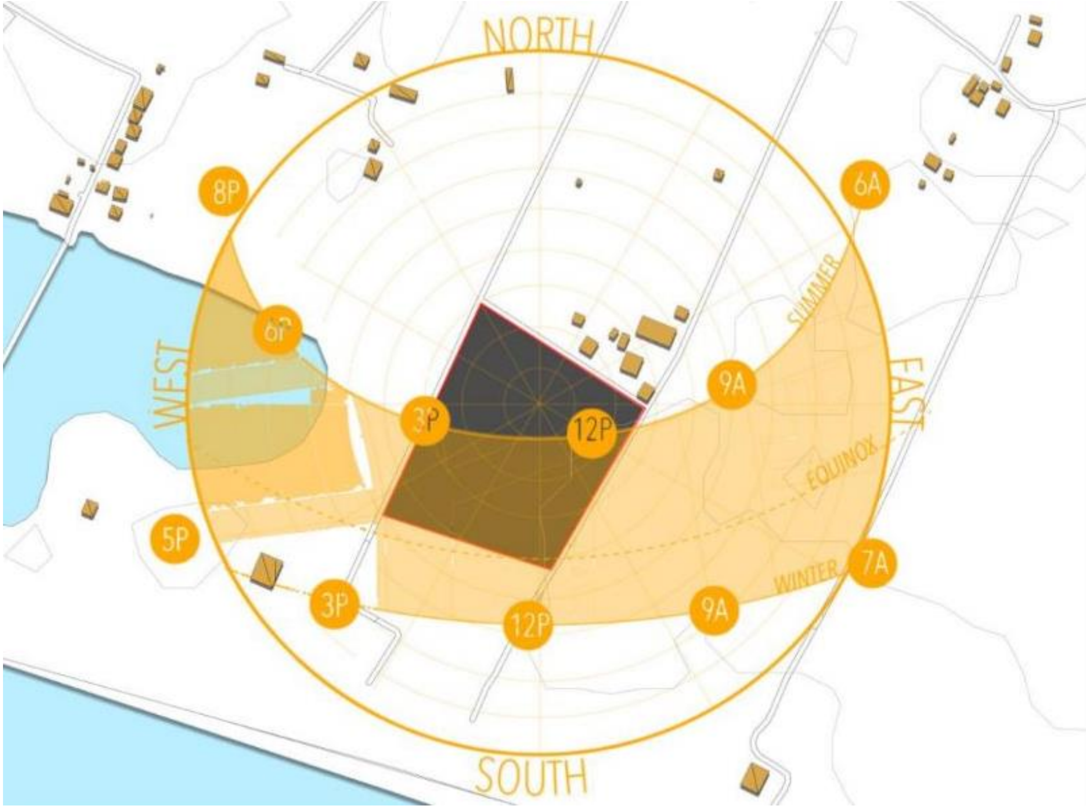

***Figure 41**: Sun path*

***Figure 40:** Site section*

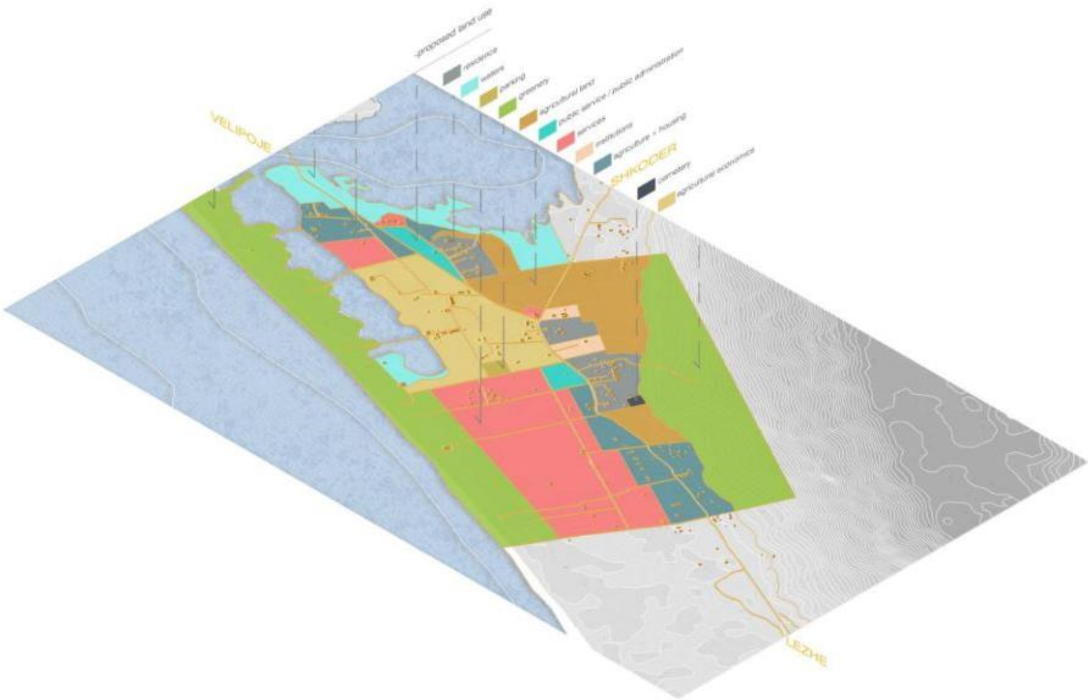

Figure 42: *Land Use proposed from the plan of the government*

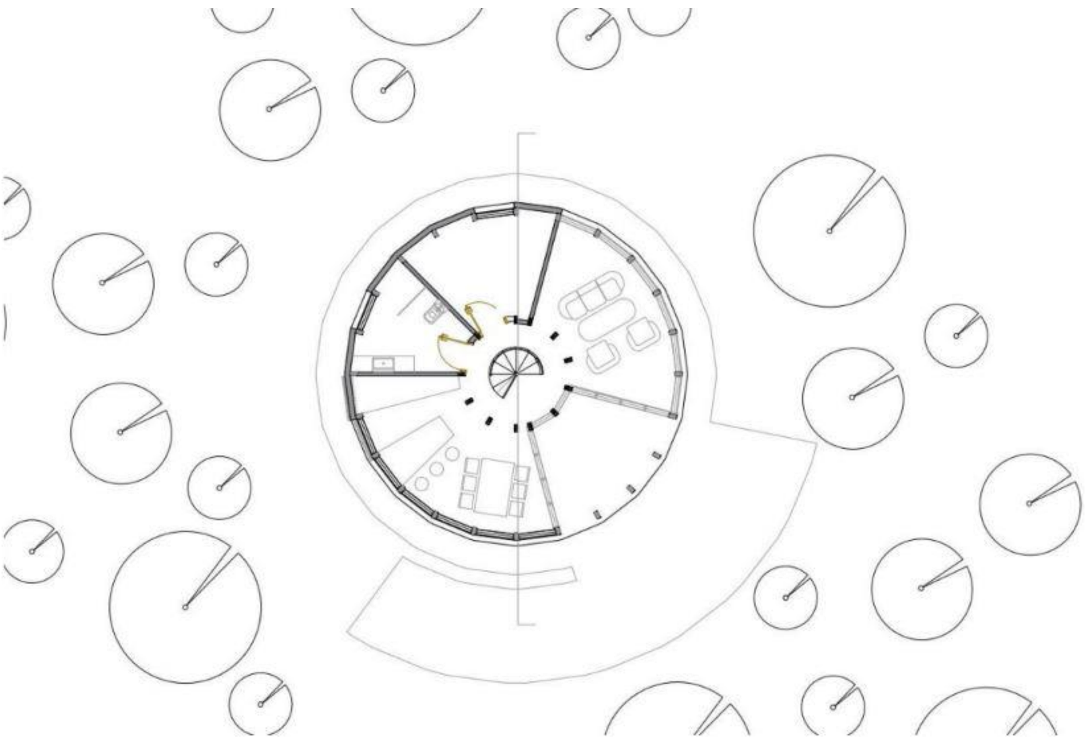

Figure 43: *Proposed Unit Plan (ground floor)*

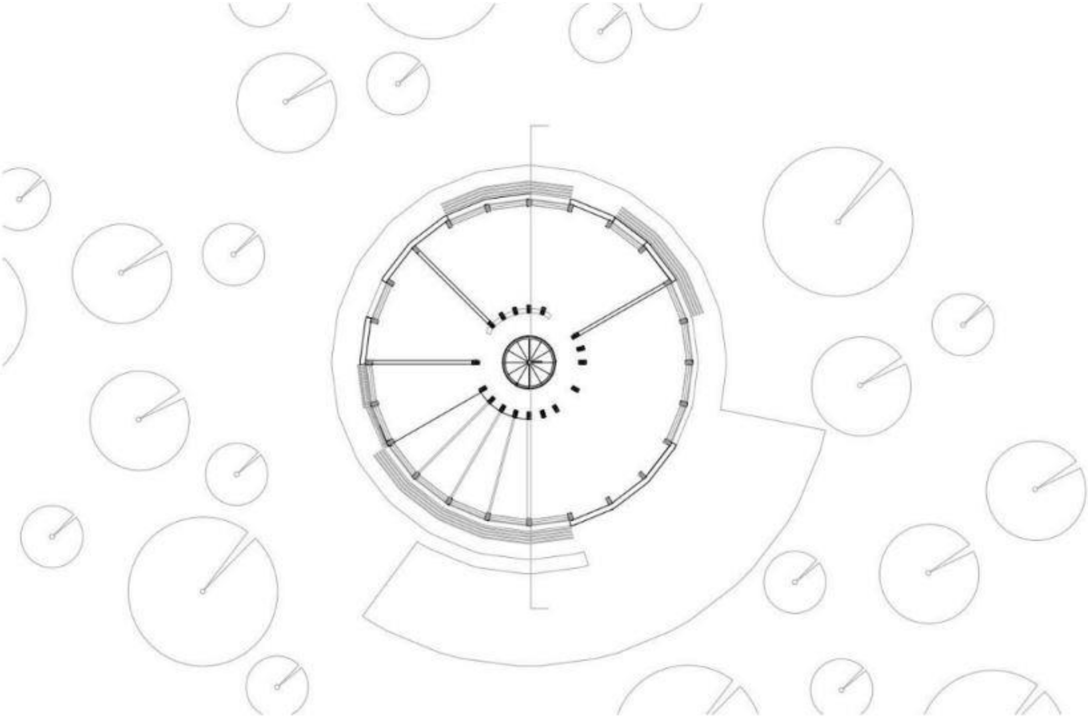

Figure 44: *Proposed unit plan (first floor)*

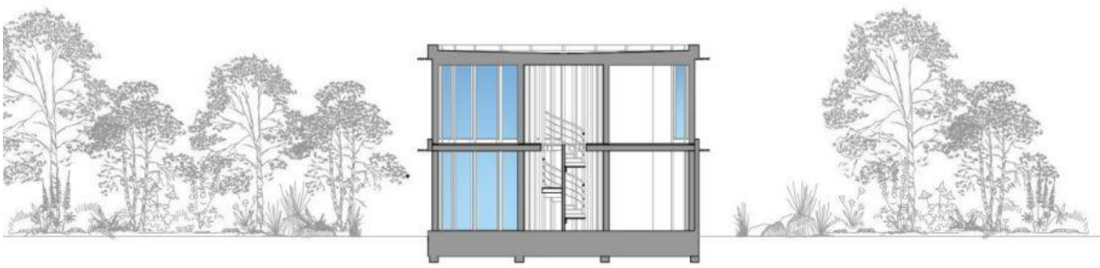

Figure 45: *Proposed unit plan (section)*

Figure 46*: Render of the proposed unit*

Figure 47*:Render of the proposed unit*

Figure 48: *Render of the proposed unit*

Figure 49: *Master Plan of the proposed site and the buildings*

4.6. Sustainability Parameters

By integrating sustainability parameters, modern houses aim to minimize their environmental impact, enhance energy and resource efficiency, and foster healthier, more sustainable living environments.

In this project, several sustainability parameters have been implemented to support eco-friendly and energy-efficient living:

- Energy Efficiency: Optimization of energy use through energy-efficient appliances, effective insulation, advanced lighting systems, and the incorporation of solar panels (***Figure 50***).

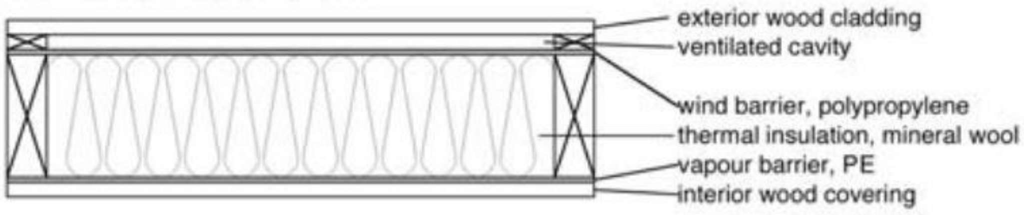

Figure 50: *Standard timber-frame wall, Energy efficiency scheme*

- Water conservation: The water-saving measure implemented here is rainwater harvesting system.

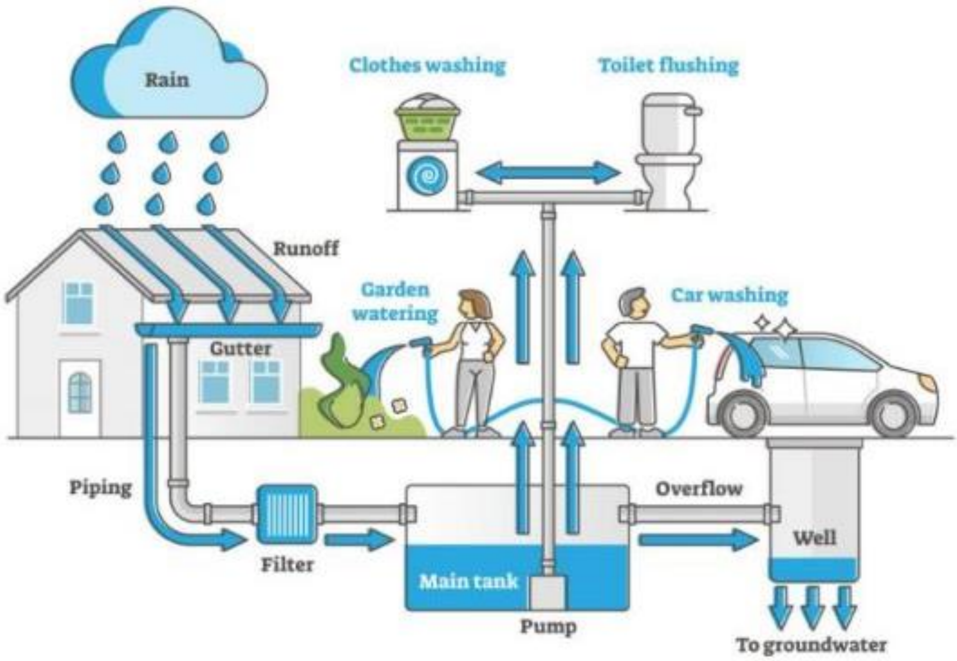

Figure 51: *Rainwater harvesting procedure*

- Materials and resources: The choice of construction materials in these houses focuses on sustainability, favoring eco-friendly and materials with low embodied energy (***Figure 53***, ***Figure 54***). The materials used on these buildings are: Concrete, Bricks, and Timber. Considering the life-cycle impacts of materials, construction processes, and building systems helps assess the environmental footprint of the house from production to operation and eventual disposal or recycling (***Figure 52***).

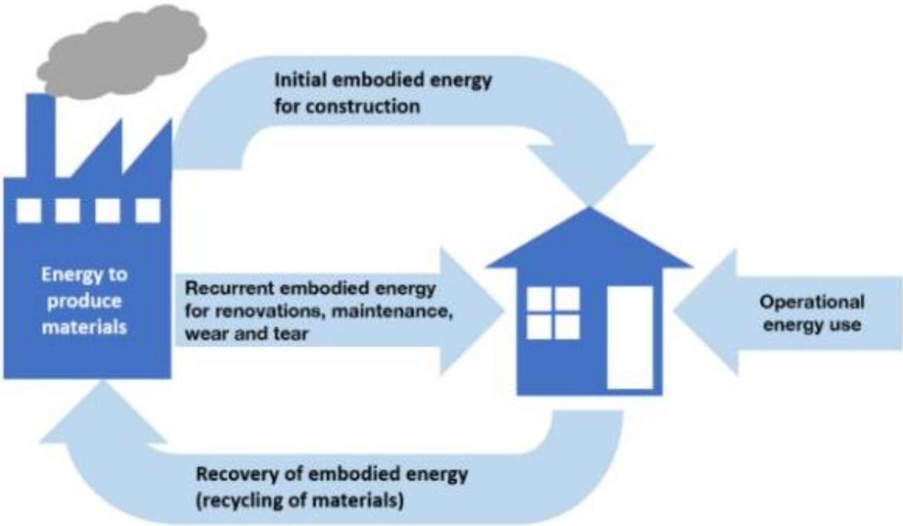

Figure 52*: Life-cycle impact of materials*

Figure 53: *Render showing the facade materials*

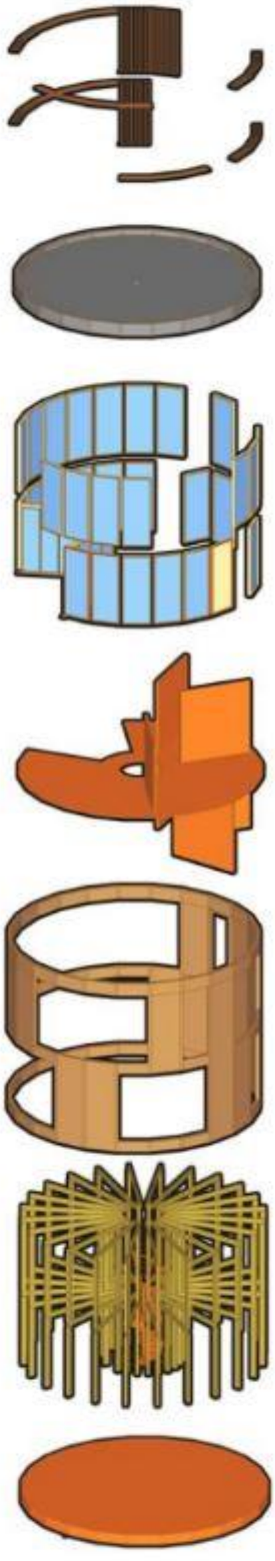

Figure 54: *Breakdown of the unit proposed*

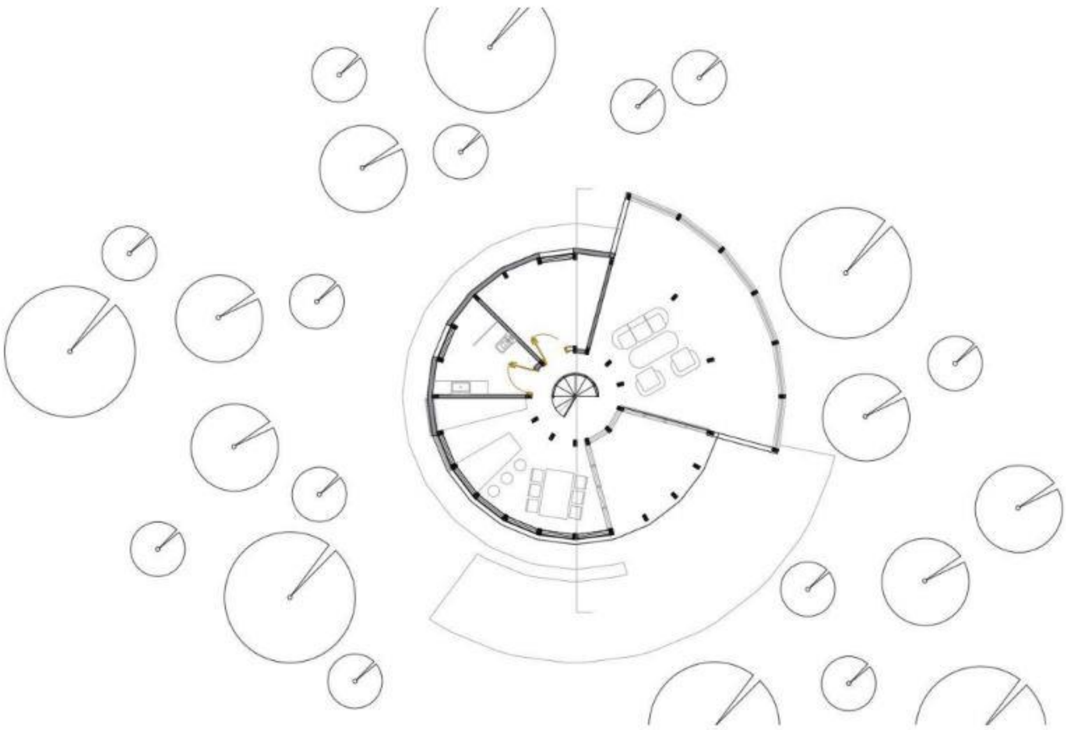

Figure 55: *Plan unit showing how the unit can be extended*

- Passive Design: These sustainable houses utilize passive design strategies to maximize natural heating, cooling, and lighting, reducing dependence on mechanical systems and minimizing energy consumption (***Figure 54***). This is achieved through the use of large windows for natural light and ventilation, as well as solar shields to regulate heat.
- Green Spaces and Landscaping: By incorporating green spaces and native landscaping, these houses help reduce the heat island effect and provide natural habitats for local wildlife.
- Accessibility and Universal Design: Universal design principles are integrated into these houses to ensure accessibility and adaptability for people of diverse abilities. This approach allows for long-term use and minimizes the need for future modifications (***Figure 55***).

CHAPTER 5

5. CONCLUSIONS

5.1. Conclusions

Development plays a crucial role in generating employment opportunities and driving a country's growth and progress. However, it is important to acknowledge that this sector also consumes substantial energy and significantly contributes to Earth's pollution. While buildings provide shelter and protection from nature's elements, they can also impact human well-being and the environment.

Sustainable architecture, akin to sustainable development, aims to establish a harmonious balance between social, economic, and environmental aspects. It strives to ensure access to essential public services, foster peace, promote gender equality, uphold human rights, create decent job opportunities, facilitate quality education, enforce proper regulations, and encourage responsible production, all while preserving the environment. There are various avenues to achieve sustainability, such as promoting development practices that minimize the need for extensive regeneration, employing appropriate technologies in buildings, prioritizing energy efficiency, and adopting healthier, resource-efficient methods for construction, renovation, operation, maintenance, and demolition. The goal is to reduce the negative environmental impact of buildings, mitigate climate change, minimize pollution, enhance air quality, and improve public health.

However, the main challenge lies in fostering global awareness—from households to boardrooms—about the importance of addressing the issues stemming from the Industrial Revolution's uncontrolled exploitation of both humans and the environment. It is essential to emphasize the need for comprehensive analyses that incorporate environmental, social, and economic dimensions, even within the realm of sustainable housing.

As previous research has highlighted, residential buildings are significant energy consumers and contributors to climate change. Therefore, it is crucial to understand how sustainable housing practices can effectively align with human behavior to address various environmental concerns. Analyzing diverse tools and approaches from different countries is instrumental in adopting a more integrated and inclusive framework that considers social, economic, and other pertinent factors to support the implementation of sustainable housing practices.

5.2. Recommendations for future research

This work serves as an initial exploration into identifying ways to develop sustainable beachfront residential buildings. The research and proposals outlined here can be further expanded by:

- Identifying challenges and strategies related to the implementation of sustainable housing.
- Specifying institutional strategies to enhance and maintain energy efficiency.
- Calculating energy efficiency values using analytical programs such as Revit, to evaluate how energy consumption can be minimized.

These tasks can be accomplished by utilizing 3D models and applying the appropriate parameters derived from the research conducted in this study.

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