

The Historical Evolution of Design in Architecture and the Medieval City of Kruja, Albania: A Comparative Study of Byzantine, Ottoman, and Local Architectural Trends

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Abstract – The evolution of architectural design has been shaped by various cultural, technological, and socio-political factors throughout history. This paper explores the historical progression of architectural styles, focusing on the medieval city of Kruja, Albania, and its unique blend of Byzantine, Ottoman, and local architectural influences. Kruja, with its strategic location and rich cultural heritage, has long served as a crossroads of different civilizations, which has greatly influenced its architectural development. The study highlights Kruja's role in preserving and adapting architectural heritage through centuries of foreign rule and political change by analyzing key design trends, structural techniques, and aesthetic elements and comparing them with broader Byzantine architectural principles. The paper examines notable structures within the city, such as the citadel, churches, and residential buildings, providing a detailed assessment of their historical, cultural, and architectural significance. Additionally, the study explores how these buildings reflect their time's social, religious, and military dynamics, offering insights into the resilience and transformation of Kruja's built environment. This research contributes to the understanding of how local traditions intersected with external influences to shape the architectural identity of one of Albania's most iconic medieval cities.

Keywords – Kruja Architecture, Byzantine Influence, Medieval Architecture, Cultural Heritage, Historic Preservation, Albanian Fortifications.

I. INTRODUCTION

Architecture is not only a physical manifestation of human creativity but also a powerful reflection of the values, beliefs, and priorities of a society at a given point in time. It embodies a civilization's interaction with its environment, the evolution of its technology, and the expression of its social structures. As societies evolve, so too does their architecture, adapting to new realities, from technological advancements to changes in cultural practices and economic needs. This continuous transformation over centuries has led to the development of architectural styles that tell the story of human history, encapsulating both external influences and local innovations [1].

Albania's unique geographical position, nestled at the crossroads of the Mediterranean world, has made it a significant point of intersection for numerous powerful civilizations throughout history. The influence of ancient Rome, the Byzantine Empire, and later, the Ottoman Empire, has left an indelible mark on the country's architectural landscape. These various civilizations have not only influenced the forms and structures within Albania but have also shaped the cultural and spiritual fabric of its people. The medieval city of Kruja, in particular, stands as a remarkable example of how architectural design evolves when different cultural forces collide and intertwine [2].

Kruja, with its rich historical background, is especially significant in understanding the evolution of architectural styles in Albania. This city, which served as the center of resistance against the Ottoman Empire during the 15th century under the leadership of Gjergj Kastrioti Skanderbeg, is a symbol of both cultural and military resilience [3]. The architecture of Kruja reflects this duality, with structures that served not only as defensive fortifications but also as places of worship and daily life. The influence of Byzantine architectural principles is evident throughout the city, particularly in religious structures such as churches, while the local building traditions have led to unique design elements, particularly in residential dwellings [4].

The city's strategic location at the crossroads of civilizations allowed Kruja to adopt and adapt a variety of architectural elements over the centuries. This fusion of external influences with local materials and techniques has created a distinct architectural identity that blends Byzantine grandeur with local craftsmanship [1]. The fortress of Kruja, for example, is a perfect representation of this synthesis, combining Byzantine military architecture with traditional Albanian building practices to create a formidable yet aesthetically pleasing structure [5]. The evolution of these architectural forms within the city mirrors broader trends in the development of medieval Albanian architecture and its interaction with external powers [6].

By examining the architectural evolution of Kruja through its religious buildings, fortifications, and residential structures, this study will offer a deeper understanding of how the city has maintained a balance between preserving heritage and responding to external influences. The research will also explore how these structures were built, focusing on the materials and techniques used and highlighting how Kruja's unique geographical and cultural setting contributed to the development of its architectural style [7]. By exploring these elements, the study seeks to provide insight into how Kruja's architecture serves as a testament to its historical and cultural significance while reflecting broader trends in medieval architectural design [3]. This investigation into the fusion of Byzantine and local architectural elements underscores the importance of Kruja in preserving architectural traditions, adapting to new contexts, and establishing its own identity within the broader historical narrative of the region [4].

II. THE HISTORICAL EVOLUTION OF THE CITADEL OF KRUIJA

Kruja's development began after it was flattened by barbarian invasions during late antiquity (5th to 6th centuries). It gradually transformed into a city between the 7th and 9th centuries AD, as evidenced by the discovery of a cemetery on the territory of Kruja during archaeological excavations in 1959-1960. The name of the city is closely linked to the word "fountain," highlighting the significance of water sources in the area. In 1190, Kruja became the capital of the first autonomous state of "Arbër." The city suffered significant damage during the earthquake of 1618, which destroyed much of the structures within the castle. As a result, many of the buildings inside the fortifications are from different periods, including the 13th, 14th, 15th, 18th, and 19th centuries [8]-[12].

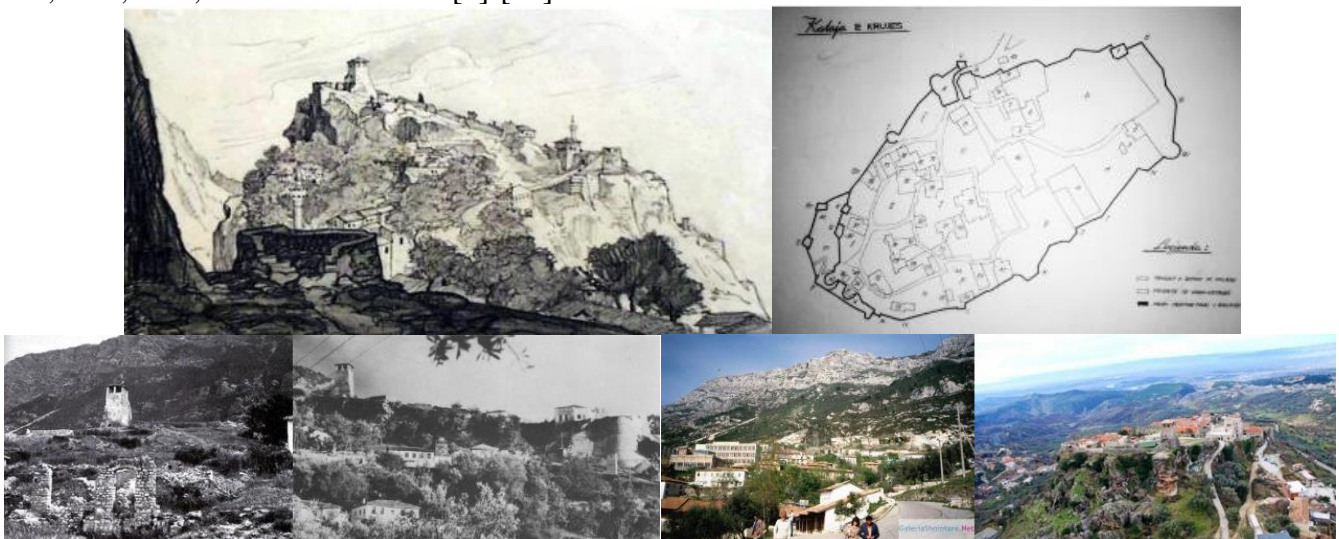


Figure 1. A, B. Citadel of Kruja; C, D. Photos taken between 1974 and 1989 [9].

The citadel of Kruja has played a pivotal role in the historical and architectural evolution of the region. Dating back to the early medieval period, the citadel served as a defensive stronghold against various invaders, including the Byzantine, Norman, and Ottoman forces [2]. It became especially significant in the 15th century when Skanderbeg used it as his headquarters in the fight against the Ottomans.

Architecturally, the citadel reflects a blend of Byzantine and medieval Albanian military design. The thick stone walls, reinforced towers, and strategic hilltop location provided a formidable defense against sieges. Within the citadel, remnants of medieval residential buildings, cisterns, and places of worship showcase how daily life was organized within fortified environments [3]. The presence of the Dollma Teqe, a religious site within the fortress, further illustrates the citadel's function as both a military and cultural hub.

Over the centuries, the citadel has undergone various modifications. During the Ottoman period, parts of the structure were repurposed, with new religious and administrative buildings integrated into the existing medieval framework. Today, the ruins of the citadel stand as a testament to the resilience of Albanian heritage, preserving the architectural techniques and cultural history of the region.

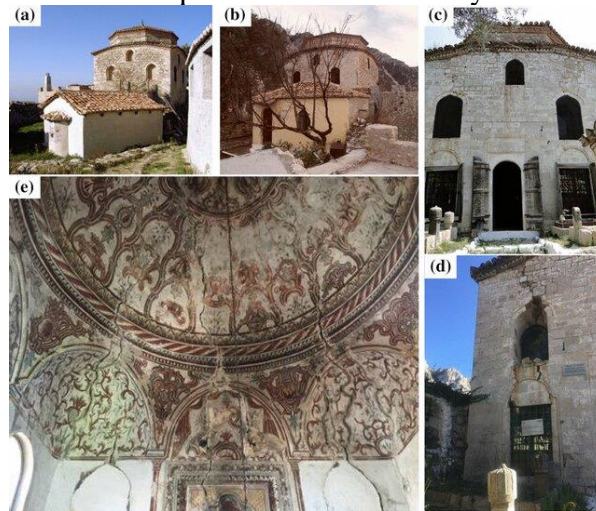


Fig. 2 Dollma Teqe, Kruja, Albania. A. Front View; B. Rear view; C. Front view; D. Cracks due to the November earthquake 2019; E. Interior view [15]

III. ARCHITECTONIC CHARACTERISTICS OF THE BUILDINGS WITHIN THE INNER CITADEL

Architects and engineers consider historic building construction based on standard performance characteristics. The industrialization of construction demands specific production techniques and design criteria to support these processes, which must be integrated into the design phase [13].

The buildings within the inner citadel of Kruja exhibit a distinctive combination of military, residential, religious, and public architectural elements, each designed to serve specific functions within the fortified environment. The architecture of these structures reflects the strategic, defensive, and social needs of the medieval city, showcasing both Byzantine and local architectural influences. The key architectonic characteristics of the buildings in the inner citadel include fortification elements, residential structures, religious buildings, and public spaces, all integrated into a cohesive urban design that facilitated both defense and daily life.

- Fortification Elements

The citadel's fortifications were primarily designed to provide robust protection against sieges and military attacks. The walls of the citadel were constructed using large stone blocks sourced from nearby quarries, providing both strength and durability. These thick, high walls formed a formidable defense against enemy forces and were reinforced with defensive towers positioned at strategic points to allow for maximum visibility and control of the surrounding landscape.

The entrances to the citadel were designed with multiple layers of defense, including narrow passageways, heavy wooden doors reinforced with iron, and fortified outer walls. These design elements were intended to slow down attackers and provide defenders with strategic advantages during confrontations.

The towers were built with a combination of stone and wood, providing height and vantage points for guards to monitor potential threats. The walls were thick, which not only served defensive purposes but also insulated the inner spaces against external temperature variations, contributing to the fortification's multi-purpose function.

- Residential Structures

The dwellings within the citadel were built to ensure both security and comfort for the inhabitants. These homes reflect local architectural traditions while integrating elements of Byzantine and Ottoman design. The materials used in construction were primarily stone and wood, which were locally sourced from “Zgerdhesh”, ensuring both practicality and durability [9], [14].

Residential buildings featured walls made of large stone blocks, providing insulation and stability. Wooden beams supported the roofs and floors, while clay and lime mortar were used to bind the materials together. The use of ceramic tiles on the roofs provided protection against rain and cold temperatures, a feature commonly found in both Byzantine and Ottoman architecture.

The residential spaces within the citadel were typically organized around a central courtyard, a common feature in traditional Albanian architecture. These courtyards served as communal spaces where families could gather, socialize, and perform domestic tasks. The rooms surrounding the courtyard were designed for specific functions, such as living, food storage, and craftwork.

The residential buildings were also designed with security in mind. Thick stone walls and small, arched windows were incorporated to protect the inhabitants from potential attacks. The secure entrance doors, often reinforced with metal, further added to the defensive aspect of these homes.



Fig. 3 A. Aerial view of Kruja's citadel (source: Google Earth, elaborated by the author). B. Residential dwelling within the citadel.

- Religious Buildings

Religious structures within the citadel reflect a blend of Byzantine, Ottoman, and local Albanian architectural styles, underscoring the city's spiritual significance. Two primary types of religious buildings were present: small medieval churches and the Dollma Teqe, a Sufi religious structure.

The small churches within the citadel followed the Byzantine tradition of a cross-in-square plan, with a central domed space that served as the focal point for religious ceremonies. The interior of these churches was often decorated with frescoes depicting religious scenes and saints and carved stone iconostasis that separated the sanctuary from the nave. These architectural features are indicative of the strong Byzantine influence on the region's religious architecture.

The Dollma Teqe, a Sufi shrine, was characterized by an open prayer hall and a domed roof, a feature also common in Ottoman religious structures. The walls of the Teqe were adorned with intricate Ottoman and local Albanian decorative motifs, reflecting the spiritual and cultural fusion present in Kruja at the time.

- Public and Administrative Spaces

The public and administrative spaces within the inner citadel served as centers for governance, commerce, and social interaction. These spaces were strategically placed to facilitate the functioning of the citadel, particularly in times of conflict.

Large open courtyards were central to the urban design of the citadel, providing areas for military assemblies, local governance meetings, and public gatherings. These spaces facilitated the exchange of goods, news, and ideas, playing a central role in the social and political life of the city.

Small markets and trade areas were integrated into the citadel's layout, ensuring that commerce could continue even during sieges. These spaces were designed with functionality in mind, providing sheltered areas for merchants and buyers to exchange goods securely.

- Water Management Systems

The citadel's water management system was designed to ensure a stable water supply during times of siege or conflict, reflecting the advanced planning involved in its construction. The inner citadel included several underground cisterns designed to collect and store rainwater, providing a reliable water source for the inhabitants. Stone channels and drainage systems were also implemented to direct rainwater away from the living quarters, preventing erosion and maintaining the structural integrity of the fortress.

The architectural characteristics of the buildings within the inner citadel of Kruja illustrate a thoughtful integration of military, residential, religious, and public functions. The materials, design elements, and spatial organization reflect both the practical needs of the citadel's inhabitants and the cultural influences of the Byzantine, Ottoman, and local Albanian traditions. The resulting architectural blend not only reflects the historical and defensive needs of the region but also highlights the resilience and adaptability of Kruja's built environment throughout its long history.

- Repeated Windows in Kruja's Architecture

In Kruja's traditional architecture, the presence of repeated windows is a distinctive feature, especially in residential buildings. These windows are often a key characteristic of the city's vernacular style, which blends local traditions with external influences from the Byzantine and Ottoman periods.

The repeated window design in Kruja's traditional buildings serves both functional and aesthetic purposes. This feature is commonly found in residential structures, and it can be observed across various periods of construction, reflecting the adaptation of architectural principles over time.

The repeated windows in Kruja's dwellings are typically arranged in symmetrical patterns along the facades, creating a sense of harmony and balance in the building's exterior. The windows are often spaced evenly across the walls, contributing to the overall aesthetic coherence of the structure. This repetitive design is reminiscent of the Byzantine architectural tradition, where symmetry and order were seen as important aspects of sacred and public buildings.

The windows are often repeated both vertically (across multiple stories) and horizontally (along the length of the building). In many cases, they are aligned with other architectural features, such as doors and decorative elements, enhancing the visual rhythm of the building's facade.

The repeated windows allow for maximum natural light and ventilation throughout the home, improving the internal living conditions. The use of multiple windows on each level enables airflow, keeping the space cool in summer and aiding in the circulation of fresh air. This was particularly important in a region with varying climatic conditions, where adequate ventilation helped regulate indoor temperatures.

The placement and design of the windows also had a defensive function. The small, narrow windows were typically built to be higher up on the walls or with small openings, minimizing the risk of intrusion or attack. The repetition of such openings might have served as strategic elements for surveillance, allowing inhabitants to monitor their surroundings while maintaining a level of security from potential invaders.

The repeated window design reflects Byzantine architectural principles, where windows were often incorporated into the design of religious and civic structures to allow for light while ensuring privacy and protection. The cross-in-square plan of Byzantine churches, for example, frequently featured repeated windows at the nave or clerestory level, designed to flood the interior with light.

Ottoman architectural styles also influenced Kruja's window design, particularly through the use of *mashrabiya* (wooden latticework screens) or window shutters that allowed light to enter while maintaining

privacy. Ottoman architectural elements often emphasized decoration and the integration of intricate patterns, which were sometimes incorporated into the window frames or coverings, creating a rich texture on the building's exterior.

The repeated windows in Kruja's architecture are often framed with stone or wood, with some displaying intricate carvings or decorative features. These embellishments were not only functional but also added an artistic touch to the building's design. The repetition of windows often extended to these decorative elements, reinforcing the uniformity and visual rhythm of the facade.

The repeated windows also adapted to the specific environmental conditions of Kruja. The region experiences both hot summers and cold winters, so the design of these windows provided a balance between insulation and exposure to the external environment. The windows could be opened to allow cooling breezes in summer and closed tightly during the winter months to preserve warmth.

The repeated windows in Kruja's architecture are a crucial design feature that reflects a blend of practicality, aesthetics, and cultural influence. They serve both functional and symbolic purposes, enhancing the building's ventilation and light while providing a sense of order and beauty. The influence of Byzantine and Ottoman architectural traditions is evident in this characteristic, underscoring the city's unique architectural identity as a crossroads of civilizations.



Fig. 4 Characteristic residential dwelling in the citadel of Kruja. Source: Author

IV. CHARACTERISTICS OF CONSTRUCTION MATERIALS IN THE CITADEL OF KRUJA

The construction materials used in the Citadel of Kruja reflect both the strategic and functional demands of the site, as well as the availability of local resources. These materials were selected not only for their durability and strength but also for their ability to adapt to the region's climate, defense needs, and cultural influences. The citadel's construction reveals a blend of local Albanian building traditions and external architectural influences, such as Byzantine and Ottoman practices.

- Stone

Stone was the primary construction material used in the citadel, chosen for its strength, durability, and resistance to weathering. The use of local stone, sourced from nearby quarries, was not only practical but also a testament to the region's access to high-quality building materials.

Stone was used extensively for the fortifications, walls, towers, and foundations of the citadel. Its thickness and mass made it ideal for creating strong defensive structures capable of withstanding sieges and military attacks. The exact types of stone used include limestone, which is abundant in the region, and other local varieties that were cut into blocks. The stones were meticulously shaped and arranged to ensure stability and load-bearing capacity.

Limestone is the most commonly used stone in Kruja's architecture, particularly for the construction of walls, towers, and foundations. Its widespread availability in the region made it an ideal material for large-scale construction projects, including the citadel and residential buildings. Limestone is durable, relatively easy to cut, and can be worked into precise shapes. It also has good insulation properties, which make it suitable for both hot and cold climates. Additionally, it is resistant to weathering, making it ideal for the harsh conditions of the Mediterranean region. Limestone has a light color, often ranging from white to light gray, which gives Kruja's buildings a distinct appearance, especially under the sun. The texture of the stone varies depending on the specific quarry source, contributing to subtle variations in the appearance of different buildings.

In some cases, a variety of other local stones may have been used for smaller elements, such as thresholds, lintels, and other architectural details. These could include stones like sandstone or basalt, though they were less commonly used than limestone. These materials were often selected for their specific characteristics, such as density, durability, or ease of shaping for fine details.

In certain high-status buildings or religious structures, marble may have been used for decorative elements, columns, and floors. Marble, with its fine texture and aesthetic appeal, was often employed in churches and other significant structures within Kruja. However, it was not as widely used as limestone due to its higher cost and less availability. For roofing, in addition to the ceramic tiles that covered the sloped roofs, some houses and buildings used stone slabs for specific roofing areas or paved courtyards. These stones were typically cut from local quarries.

The mass of the stone walls helped maintain an even internal temperature, offering insulation against extreme heat or cold. Stone also provided significant protection against artillery and other siege tactics, making it the ideal material for fortifications.



Fig.5 A characteristic dwelling in Kruja citadel. A. Ceramic Roof tiles; B. Stone wall in direct contact with the terrain; C. Ceramic tiles covering the roof; D. Additional concrete pavement for moisture protection. Source: Author

- Wood

Wood played a crucial role in the construction of various buildings within the citadel, particularly for roofs, door frames, and structural supports. Its flexibility, availability, and ease of manipulation made it an essential material for many aspects of the citadel's architecture.

Wood was primarily used for roofing structures, including the trusses and beams that supported the roof tiles. It was also used for door and window frames, as well as for internal supports within residential and administrative buildings.

Wooden beams were placed within the stone walls, especially at the level of floor slabs and the roof structure. These beams were used to support the weight of the stone and distribute the load evenly across

the structure. The integration of wood into the stone walls helped reduce the overall weight of the building, allowed for greater flexibility, particularly during seismic events, and served to level the wall at specific elevations. Wood was used to create frames for windows and doors, as well as for decorative elements such as lintels or thresholds. These wooden inserts were carefully designed to fit into the stone walls, ensuring stability while also providing an aesthetic contrast to the rougher stone surfaces. In some cases, wooden planks were used to cover or clad sections of the building, such as the exterior of some residential structures. This helped improve insulation, especially in winter, and created a more uniform appearance.

Wood was also integral in defining the internal spaces and creating functional divisions within the building. The use of wood for internal separation was common in the layout of traditional homes, where flexibility in space usage was key for daily life. Wooden partitions were commonly used to separate rooms within the home, particularly in areas where privacy was required. These partitions were often movable or adjustable, allowing residents to reorganize the interior space based on their needs. In some cases, woven wooden panels or latticework were used to divide rooms while still allowing air circulation and light to pass through. In multi-story homes, wooden stairs were frequently used to access upper floors or loft areas. The wooden framework was carefully placed to ensure the stability of the stairs while allowing for ease of movement between levels. Loft spaces were also commonly constructed using wooden beams and rafters, providing additional living or storage areas within the building.

Wood played a critical role in the roof construction and the creation of slab systems, essential elements of the building's overall structure. The roofs of Kruja's buildings were typically framed with wooden trusses, which acted as the support structure for the ceramic tile roofing. These trusses consisted of intersecting wooden beams that created a rigid framework capable of supporting the weight of the roof tiles while allowing for an open ceiling space underneath. Wooden beams were commonly used to create floor slabs and ceilings, particularly for upper stories. These beams were spaced at regular intervals and laid across the walls or stone supports, providing a strong and stable platform for flooring materials. The wooden beams worked in conjunction with the stone to create a solid structure, offering flexibility while maintaining strength. In some cases, wooden planks or boards were used as the flooring material on upper levels, creating smooth, durable surfaces for living spaces. The ceilings below these floors often featured exposed wooden beams, adding to the aesthetic appeal of the interior while showcasing the skillful craftsmanship of the builders. Sometimes, the ceiling was covered with reeds and plaster. The craftsmanship involved in working with wood was highly skilled, and the resulting woodwork was both functional and aesthetically pleasing, contributing to the unique architectural identity of Kruja.

Local varieties of wood, such as oak and beech, were likely used due to their strength and resilience. Wood was also employed in smaller-scale elements like furniture, interior fittings, and tools.

Wood provided both structural flexibility and insulation properties. It allowed for quicker construction compared to stone, and its use in roofing ensured the citadel's buildings were adequately protected from rainfall and temperature fluctuations. Moreover, wood can be easily replaced or repaired when needed, offering practical benefits for maintenance. To preserve the wood from the elements and prolong its lifespan, the beams and wooden elements were often treated with natural oils or resins, helping to protect them from rot and insects, particularly in the humid climate of the region.



Fig. 6 A. Detail of the partition wall made with a wooden structure and plaster; B. Dimensioning of the wooden soffit (25-30cm); C. Detail of the ceiling closure with reeds + plaster; D. Wooden ceiling cutout. Source: Author

- Clay and Lime Mortar

Clay and lime mortar were commonly used as binding agents in the construction of the citadel. These materials were essential for binding the stone blocks together, ensuring that the walls, towers, and other structures remained stable over time.

Lime mortar was applied to bond the stone blocks together, providing additional cohesion and strength. In some cases, clay may have been used to provide a finer, more workable mix for plastering surfaces or sealing gaps in the construction.

Lime mortar has the advantage of being resistant to weathering and seismic activity, which was particularly important in an area prone to occasional earthquakes. Over time, lime mortar can also become stronger and more durable, contributing to the long-lasting stability of the citadel's structures. The use of clay provided an additional layer of protection against moisture ingress and extremes temperature.

- Ceramic Tiles

Ceramic tiles were commonly used for roofing throughout the citadel, providing an effective solution to the region's weather conditions. The combination of local production techniques and imported influences can be seen in the roofing materials used in the citadel's construction.

Ceramic tiles were applied to the roofs of residential, public, and religious buildings. These tiles were laid in overlapping patterns, which helped protect the buildings from rain and snow, as well as provided insulation during colder months.

The ceramic tiles used in the citadel were likely produced locally, as the region has a long history of pottery and ceramic craftsmanship. The tiles were often made from fired clay, shaped into rectangular or curved forms, and baked in kilns.

The use of ceramic tiles provided superior waterproofing properties and insulation. The tiles' ability to resist moisture was essential in maintaining the structural integrity of the citadel's roofs. Additionally, the tiles' reflective properties helped regulate the internal temperature of the buildings, keeping them cooler in the summer and warmer in the winter.

- Iron and Metal Reinforcements

Iron and other metals were used in the construction of key structural elements within the citadel, particularly in fortifications and doors. These materials were essential for reinforcing weaker sections of the architecture and providing security.

Iron was used to reinforce doors, gates, and other access points within the citadel. It was also employed in the construction of locks, hinges, and other small but crucial components that ensured the security of the citadel's structures. Additionally, iron could have been used in the construction of military defenses, such as spikes or reinforcing the stone walls with metal bands.

The use of iron provided additional strength and security to vulnerable areas, such as gates and entrances. The material's resistance to corrosion ensured that the citadel's defenses would remain functional over long periods, even under harsh weather conditions. Moreover, iron's use in locks and hinges allowed for controlled access to the citadel, which was crucial during times of conflict.

- Brick (Limited Use)

While stone was the primary construction material, brick was also used to some extent in the citadel's construction, particularly in some of the smaller buildings and later Ottoman modifications.

Bricks were used in areas where stone was less practical or in later additions to the citadel during the Ottoman period. They were particularly useful for smaller structures like religious buildings and domestic dwellings within the inner citadel.

Bricks, being easier to shape and handle compared to large stone blocks, allowed for more intricate design work in smaller-scale constructions. Bricks also offered better insulation properties than stone, making them ideal for certain types of buildings.

- Plaster and Paint

Plaster and paint were used to finish and decorate both the interior and exterior surfaces of the citadel's buildings. These materials played a significant role in enhancing the aesthetic appearance of the structures while also providing protective coatings.

Plaster was applied to the interior walls of residential and religious buildings to create a smooth, finished surface. In religious structures, particularly, the plaster was often painted with decorative motifs, frescoes, and religious imagery that added to the spiritual ambiance of the space.

Plaster provided a smooth surface for decoration and protected the underlying materials from moisture and wear. The use of paint allowed for cultural expression and religious symbolism, particularly in churches and mosques, further reinforcing the citadel's significance as both a military and cultural hub.

The materials used in the construction of the Citadel of Kruja reflect the careful consideration of durability, defense, and local availability. The combination of stone, wood, lime mortar, ceramic tiles, iron, and other materials provided a solid and adaptive architectural framework that met the citadel's military, residential, and religious needs. The citadel's architectural resilience, facilitated by these materials, allowed it to stand as a testament to the region's history, cultural exchange, and architectural ingenuity over centuries. These materials not only served their practical purposes but also contributed to the aesthetic and symbolic value of the citadel, making it an enduring landmark in Albanian architectural history.

V. VERNACULAR DWELLING TECHNIQUES IN KRUA

The traditional dwellings in Kruja are a remarkable example of local architectural ingenuity, shaped by the region's environmental conditions, social needs, and historical context. These homes reflect a deep understanding of the natural resources available and a strategic response to security challenges. Their construction is marked by the use of locally sourced materials, efficient spatial organization, and a focus on defense.

The construction of traditional homes in Kruja relied heavily on locally available materials, ensuring cost-effective and sustainable building practices. The primary materials used were stone and wood [1]. The walls were built with carefully cut and arranged stone, providing strength, durability, and natural insulation against extreme temperatures and external threats. Wood was used for internal structural support, including door and window frames, roof beams, and columns, offering both flexibility and strength. Additionally, clay and lime mortar bonded the stone blocks, adding resilience against seismic movements and weathering.

The roofing system was designed to withstand the region's heavy rainfall and snowfall. Sloped roofs facilitated water runoff, preventing accumulation. A wooden framework of beams and rafters supported the structure, while ceramic tiles, baked from clay and arranged in overlapping patterns, provided a durable, weather-resistant covering. These tiles also reflected heat, helping to maintain a comfortable indoor temperature during different seasons [4].

The spatial organization of these dwellings centered around a central courtyard, which served multiple purposes. It provided natural ventilation and lighting, ensuring a healthy living environment. The courtyard functioned as a communal space for social activities, domestic chores, and family gatherings. Additionally, it enhanced privacy and security, as rooms faced inward rather than outward, allowing for controlled access and seclusion.

Kruja's turbulent history necessitated defensive elements in the design of these homes. Thick stone walls offered protection against external threats while also acting as insulation. Small, strategically positioned windows limited visibility from the outside, enhancing security. Entrance doors, made of strong wood and often reinforced with iron, were designed to resist forced entry. Some included small peepholes or horizontal openings, enabling inhabitants to monitor visitors without fully opening the door.

The vernacular dwellings of Kruja represent a successful integration of practicality and defense. Through the use of stone and wood, the inhabitants created durable homes that balanced protection and comfort. The courtyard layout fostered communal living while maintaining privacy, and defensive features ensured security. These architectural solutions highlight the adaptability and resilience of traditional Kruja homes, making them a testament to the region's historical and environmental challenges.

VI. DISCUSSION

The historical evolution of the medieval city of Kruja reveals a fascinating intersection of local traditions and external influences, particularly Byzantine architectural elements. Kruja's architectural identity, shaped

by its strategic importance, defensive needs, and cultural significance, offers a unique case study of how architecture adapts to political and environmental conditions over time. The Citadel of Kruja, with its fortifications, residential structures, religious buildings, and water management systems, showcases a blend of Byzantine architectural principles with local Albanian construction techniques. This synthesis reflects a broader regional trend where external architectural styles were often adapted to fit local needs and available resources.

One of the key findings of this study is the preservation of Byzantine architectural elements, particularly in religious buildings like the small churches within the citadel. These churches, with their cross-in-square plan and frescoed interiors, demonstrate the continuity of Byzantine architectural practices in the region. However, the addition of local materials and construction methods, such as stone sourced from nearby quarries and the use of clay and lime mortar, highlights how Kruja's architecture remained grounded in local traditions while simultaneously incorporating broader Byzantine influences. This is particularly evident in the vernacular dwellings, which blend Byzantine and Ottoman roofing techniques with local designs suited to the region's climate and defensive needs.

The Citadel's defensive elements, such as thick stone walls, reinforced towers, and strategic placement, align with both Byzantine military architecture and local Albanian fortification practices. This convergence of defensive needs with architectural style underscores the multifunctionality of the city, which served not only as a military stronghold but also as a cultural and administrative center. The inclusion of religious sites like the Dollma Teqe further emphasizes the city's role as a spiritual hub, with a mix of Ottoman and local Albanian decorative motifs. This reflects the influence of the Ottoman Empire, which introduced new religious and cultural elements to the region while still respecting and preserving the local architectural language.

The broader historical context, including Kruja's role in Skanderbeg's resistance against the Ottomans, plays a significant role in understanding the city's architectural evolution. As a military stronghold, the city had to continuously adapt to changing military and political circumstances. The structural modifications made during the Ottoman period, such as the repurposing of parts of the citadel for new religious and administrative functions, demonstrate how architecture responds to shifting power dynamics and evolving cultural needs.

VII. CONCLUSION

The study of Kruja's medieval architecture highlights the city's role as a dynamic crossroads where Byzantine, Ottoman, and local Albanian architectural influences merged to create a unique architectural identity. The city's fortifications, religious structures, vernacular dwellings, and water management systems provide invaluable insights into the historical and cultural context of the region. Kruja's ability to adapt and preserve these architectural traditions, despite changing political landscapes and external influences, underscores the resilience of local craftsmanship and architectural knowledge.

The comparative analysis between Byzantine and local architectural trends reveals a significant degree of continuity and adaptation, demonstrating that Kruja's architecture was not only a product of external influences but also a reflection of local cultural and historical forces. The blending of defensive, residential, and religious functions within the same architectural framework speaks to the multifaceted role of architecture in shaping the identity of a city. Ultimately, the medieval city of Kruja stands as a testament to the enduring legacy of cultural exchange, architectural innovation, and historical continuity in the face of external pressures.

In conclusion, Kruja's architectural evolution is a testament to the city's resilience and its ability to integrate external influences while preserving its unique identity. By analyzing its buildings, fortifications, and urban planning, this study provides a deeper understanding of how architectural design can reflect the social, political, and cultural dynamics of a place. The architectural heritage of Kruja not only preserves the memory of past civilizations but also offers valuable lessons for future generations about the importance of architectural heritage in shaping cultural identity.

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