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Complementarity of architecture in historical settings: Case of Bagamoyo Old Town, Tanzania

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Abstract: Bagamoyo, a historic town on the East African coast, has experienced multiple civilizations, including native, Persian, Arab, Indian, and European influences. Recent urban developments have sparked discussions on architectural complementarity within its historical setting. This study examines the concept of architectural complementarity in Bagamoyo's Old Town by analyzing historical architectural artifacts and their relationship with new developments. It aims to explore how various architectural styles—ranging from indigenous to contemporary—have shaped the town and how new buildings interact with the historical fabric. The study employs descriptive and graphical methods of analysis to assess architectural complementarity, drawing insights from existing architectural elements and urban development trends. The concept of architectural complementarity is ambiguous, with two prevailing schools of thought: Those advocating for the preservation of the historical urban fabric. Those supporting the integration of modern architectural elements into the historical setting. Complementarity is influenced by multiple factors, including culture, materials, design approaches, styles, building techniques, economic considerations, environmental factors, and societal needs. Understanding these elements is essential to harmonizing new developments with historical contexts. Architectural complementarity in historic settings is a complex and context-dependent concept, requiring a balance between tradition and modernity. A critical engagement with both historical and contemporary architectural discourses is necessary to ensure that urban development in places like Bagamoyo respects its historical heritage. To achieve sustainable and contextually appropriate architectural complementarity, a collaborative approach involving policymakers, architects, historians, and the local community is essential. This study underscores the importance of policy frameworks that guide development while preserving the architectural heritage for future generations.

Keywords: Conservation, Culture, Heritage, Sustainability, Swahili, Tourism

1. Introduction

1.1. Tanzania's historical towns and cities

Tanzania is one of the countries with a rich history in its towns and cities, where coastal cities along the Indian Ocean evolved as fishing villages and developed into port towns through different civilizations to date. Some towns still specialize in trade and form economic hubs for their region, including Bagamoyo, Dar es Salaam, Kilwa, Mikindani, Pangani, and Tanga, which are exemplary existing towns founded as fishing villages (Henschel, 2005). Besides their importance for the country's local economy, Tanzania's historical towns and cities have many cultural values dominated mainly by foreign-based architecture and indigenous architecture (Ibid). The historical towns reserved special cultural values that manifested in architecture depicting the daily living styles of the inhabitants. As time passed, new generations emerged with an evolved cultural version influenced by the development of science and technology.

1.2. Birth and Growth of Bagamoyo Town

The historical cities reserved particular cultural values that were expressed in architecture representing the daily life patterns of the residents. Most of these towns and cities are undergoing rapid change as a result of the construction of new buildings in previously existing, historic areas. Due to construction styles, the introduction of new industrially processed building materials, and the lack of coordinated urban growth between the new and the old, to name a few factors, the new structures have been affecting the historical relics of the majority of historical locations (Lupala, 2005). The harmony between the old and new is a serious worry since the younger generation growing up in places like Bagamoyo lacks knowledge and respect for the historical context and cultural diversity (Sheuya, 2010).

1.2 Meaning and history of Bagamoyo

Approximately 75 kilometers north of Dar es Salaam, in the coastal region, is the small historic township of Bagamoyo. It is one of the cities in East and Central Africa that has a long history of involvement with the slave trade, which integrated African civilizations into global markets and boosted exports and infrastructure (Lucian, 2010). The expression "Bwaga moyo" (which means "lay your heart down") is where the slaves were resting after long journeys from the countryside to the shore while they awaited being sold to foreign traders, and that is where the name Bagamoyo originates. Bagamoyo, which served as the German East Africa headquarters between 1886 and 1891 (first under the aegis of the German East African Company and later the German Imperial Government), became the capital of the German occupation in East Africa in the late 18th century (Henschel, 2011).

Bagamoyo is distinguished by the presence of several cultures and ethnic groups in the area, which is graced with famous buildings in the local Swahili, Persian, Arab, Indian, and European styles, as well as a blend of multiple architectural forms (Kessy, 2017). Some of the historic structures have been destroyed by time change; some are in danger of collapsing, while others are now nothing more than foundation marks. If action is not taken to reverse the current trend, which is causing Bagamoyo town to lose all of its history, identity, and worth, the current situation in the historical town raises worries and questions about what will happen to it in the future (Mabala, 2018).

The expansion of industries along Bagamoyo Road and the plans to build a new harbor, where the two are causing Bagamoyo Town to expand in such a way that people migrate from different angles of the nation towards it, posing a threat to the heritage of Bagamoyo Historical Town (Kombe, 2015). Due to the rate of urbanization occurring on the fringes of the historical town of Bagamoyo, the new constructions do not take historical elements in terms of the architectural features of the old buildings and the existing situation since pre-colonial times. Due to the daily disappearances, this circumstance dilutes Bagamoyo's worth and identity (Nnkya, 2007).

Again, while working to preserve the history, significance, and identity of the Bagamoyo historical town's architecture, a mushroom of new buildings with various architectural styles, primarily contemporary and modern, is sprouting up (Lupala, 2005). One wonders if Bagamoyo will continue to be known as "Bagamoyo" if this tendency of creating new structures with new characteristics inside the ancient town continues.

In summary, historical locations, like Bagamoyo Town, are undergoing rapid urban transformation as a result of technological advancement, economic development, and urbanization (Sheuya, 2008). These development activities have significant architectural ramifications for the town's historical setting because the new architectural styles do not complement the setting, and if left unmanaged, they can destroy the architectural identity of such locations (Kironde, 2012). This necessitates conducting research to broaden an understanding of the architectural complementarity in design, choice of building materials, and building typologies adhering to the patterns laid out by historical public buildings and the way they may be blended with the upcoming

buildings that will be integrated into the old historical setting (Nnkya, 2009). Furthermore, there have been some mixed feelings among stakeholders (scholars, professionals, investors, and municipal administrators) on whether Bagamoyo should remain with only the old historical structures or the town should be mixed with new development to stir up the vibrancy of the urban fabric (Mushi, 2011). Through the concept of architectural complementarity, this study intends to shed light that will enhance a healthy debate that will guide the development of Bagamoyo's historic town.

2. Literature review

2.1. Complementarity as a movement in architecture

According to the literature, complementary architecture is a trend in modern architecture that supports architectural practice rooted in a thorough understanding of context and aims to improve or highlight the environment's existing qualities (Lev, 2019; Jencks, 2002). Complementary architecture has characteristics like sustainability, compassion, contextualism, endemism, the continuation of a particular regional design language, and art and design principles (Lev, 2019; Bandyopadhyay, 2017). Some scholars have stated repeatedly that complementary architecture has historical roots that became more apparent after the 20th century, or after the industrial revolution, up to the present day and will continue to play a significant role in the future (Leon, 2019; Mallgrave, 2005). Complementary architecture promotes sensibility-based strategies that consider historical values in the present while considering the future (Stavreva, 2017; Pomeroy, 2016).

According to Stavreva (2017), complementary architecture is a set of traits and characteristics that make a building or other structures distinctive or historically recognizable. It aims to strike a balance between the demands and requirements of the present with a thoughtful and realistic grasp of the future while minimizing environmental impact (Stavreva, 2017; Lechner, 2014a). This suggests that complimentary architecture is a subcategory of style in the visual arts in general and that the majority of architectural styles are strongly related to a larger current creative style as shown by shape, building method, architectural materials, and regional character (Jencks, 2002; Steele, 2014). The importance of complementarity architecture is associated with the appreciation of historical areas, which are thought to significantly improve quality of life by connecting us to the past, which gives us a sense of continuity and stability, and by giving us the comfort of the familiar and serving as a point of reference in a world that is changing quickly (Mavor, 2005).

2.2. Complementarity as a historical transformative tool in design

The new buildings are changing the appearance of well-known locations such as the custom building and the marketplace, which frequently have a rich history that has been permanently imprinted in the memory of the locals for many generations due to their penetration into the historical and compact urban fabric of cities and towns like Bagamoyo (Lupala, 2005; Sheuya, 2010). This demonstrates the importance of complementary architecture, which preserves and values the architectural identity brought about by the inevitable, progressive, and natural dynamics of social behaviors (Stavreva, 2017; Lev, 2019). It thus suggests that the designs for these sites require a considered approach and careful management of any adjustments so that the area's context is preserved and improved (Pomeroy, 2016; RIBA, 2017).

Complementary architecture is viewed as an effort to reveal identity in modern Arab architecture, where some local and foreign architects started to incorporate vernacular architecture's distinctive elements, forms, and motives into the designs of new structures (Bandyopadhyay, 2017). As a result, this strategy took on the appearance of a facial mask; rather than being seen in the design idea or internal spaces, it was more noticeable on facades, openings, and architectural elements like arches, decorations, and domes (Steele, 2014).

The aforementioned idea is comparable to another piece of scholarly work by Fletcher (1996), which demonstrates that one of the most significant examples of complementary architecture in classical Greek and

Roman architecture is the Greek columns, including Doric, Ionic, and Corinthian (Orders), which were later adopted by the Romans. Nearly every notable building of Greek and Roman architecture contains these orders (Fletcher, 1996; Mallgrave, 2005). This indicates unequivocally that complementary architecture has existed throughout human existence (Jencks, 2002; Leon, 2019).

Architectural complementarity is also achieved through building transformation that involves the modification of existing buildings to improve functionality while maintaining the integrity of the buildings (Bauhaus-Universität Weimar, 2016). In this case, new materials and technology are involved to blend the old and the new, or to insert the new into the old fabric/façade or element. In the process, care is needed to avoid compromising the historic aesthetic value of the old structure/fabric (Pomeroy, 2016; RIBA, 2017). It is further contended that architectural complementarity can be achieved through the restoration of old buildings to their original condition by preserving the architectural features of the original structure, including facades, ornamentation, and details, while also upgrading the interior to meet building codes, uses, and requirements. This gives the building the ability to remind us of the past while providing a functional space for contemporary use (Pomeroy, 2016; Henschel, 2011). This is further supported by RIBA (2017), highlighting that architectural complementarity can be achieved through adaptive reuse, which involves converting an old structure from one use to another, such as the conversion of a church to a library or an industrial building to a school library, preserving the history while providing space for new uses (Nnkya, 2009).

2.3. Complementarity in building materials selection

Complementarity plays a significant role in the selection of building materials, where materials must complement each other in terms of aesthetics, functionality, and sustainability to create cohesive and harmonious designs that meet the needs of both occupants and the environment (Nelsen, 2013). To achieve complementarity, a building's exterior can be designed using materials that blend seamlessly with the surrounding environment, such as natural stone or wood in forested areas, or brick and concrete in urban settings. However, this approach contrasts with current developments in historic towns such as Bagamoyo, where there is a lack of proper and coordinated initiatives to ensure the complementarity of historic architecture.

According to Leijten et al. (2017), complementarity in new developments can be achieved by combining building materials in ways that allow their individual properties to enhance overall building performance. This may involve integrating materials with varying thermal or acoustic insulation properties or combining materials that provide structural support with those offering weather resistance. Similarly, Morgenroth et al. (2021) argue that the integration of green roofs with conventional roofing materials exemplifies complementary design. In this context, green roofs provide insulation and help mitigate the urban heat island effect, while traditional roofing materials contribute durability and weather resistance. The authors further note that such combinations not only improve environmental sustainability but also reduce energy costs (Ibid.).

Complementarity in building materials is thus a fundamental concept in sustainable construction, contributing to the development of structures that are more durable, aesthetically appealing, and energy-efficient. It involves selecting materials that enhance one another's properties, thereby improving the structural integrity and overall performance of buildings. This principle is evident in practices such as the use of steel and concrete in high-rise construction or the combination of wood and stone in residential architecture, where materials work synergistically to strengthen the structure (Kim & Lee, 2017). The authors further assert that the use of complementary construction materials can lead to buildings that are sturdier, longer-lasting, and more energy-efficient (Ibid.).

2.4. Complementarity as a tool to enhance architectural design

According to Duany and Plater-Zyberk (2002), complementarity is a process that involves designing buildings with consideration for their context, including the physical environment, cultural heritage, and social dynamics of the community. This approach helps create buildings that are well-integrated into their surroundings and that positively contribute to the local urban fabric. Complementarity in design, as noted by Lechner (2014a), establishes a harmonious relationship between various elements in a design, such as color schemes, materials, textures, shapes, and even the overall spatial layout. When applied effectively, complementarity fosters a sense of balance, unity, and coherence within a design (Ibid.).

Other scholars (Mallgrave, 2005; Steele, 2014; Lechner, 2014b) assert that complementarity in design is supported by fundamental principles such as contextualism, sustainability, human scale, materiality, and integration. These principles contribute to the creation of buildings that are not only functional and efficient but also aesthetically pleasing, culturally appropriate, and environmentally sustainable.

Jencks (2002) adds that complementarity is a crucial concept in architectural design because it promotes harmony and balance among the various components and aspects of a structure. The combination of complementary elements can produce a rhythmic visual effect as well as a sense of order and completeness. This design strategy is frequently employed in structures intended to be both visually appealing and practical.

The literature reviewed above highlights numerous studies on the significance and role of complementarity in architecture, particularly in achieving a balance between traditional and contemporary architectural values and urban fabric. However, it also reveals a gap in the literature concerning the complementarity of the built environment in older communities, such as Bagamoyo Historic Town. Therefore, the purpose of this study is to enhance understanding of the concept and its applicability in improving the current deteriorating conditions of buildings in Bagamoyo's historical areas.

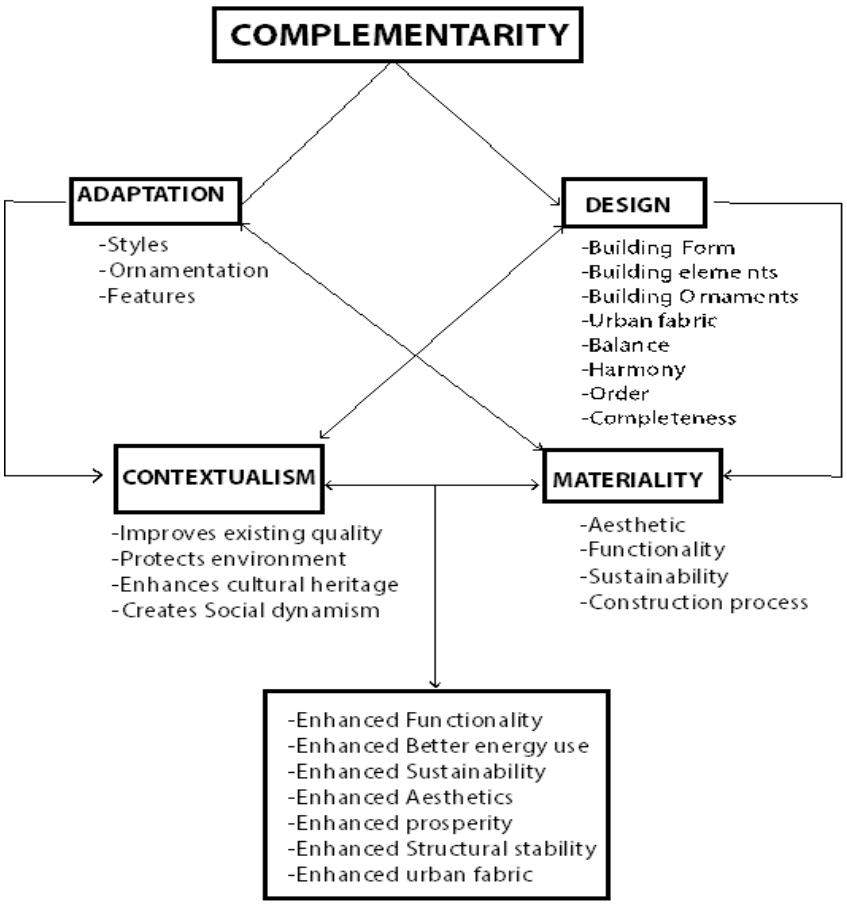


Figure 1: Conceptual framework of the study

3. Research methodology

3.1. Case study method and criteria for the study site selection

The study applies a case study approach and is focused on Bagamoyo, particularly in the historical region where there are both modern developments and antique structures in diverse architectural styles. The location was chosen in line with the subject matter, which attempts to reveal complementarity's insights into urbanizing ancient cities. Bagamoyo is chosen to illustrate the case because of its extensive and rich historical background, artifacts, styles, culture, and architectural evidence. For this type of study, Bagamoyo is an information rich case selection that can gives the researchers an in-depth understanding of relevant and critical issues (architectural complementarity) under investigation.

The study emphasizes architectural styles and design considerations while keeping its character in the historical town since it is an exploratory study that aims to investigate the level of complementarity of architectural styles in the new development with the historical structures. To provide a benchmark for how the new development corresponds to the principle of complementarity, an inventory list of the historical structures based on their typologies, building elements, styles, architectural objects, and accompanying features is produced. Seven architectural styles, including Swahili style, Indian style, Arab style, Islamic style, classical style, modern style, and contemporary style, are contained in an inventory list of various architectural styles and artifacts.

This investigation lays the groundwork for lists of the architectural components that characterize Bagamoyo's historicism. The investigation of the new development's (buildings) followed a random selection of the complementary idea. The collection includes a range of newly constructed residential, commercial, institutional, and religious buildings. Data are examined using descriptive and graphical techniques in light of the literature, and a conclusion on the complementarity of the architecture in the old town of Bagamoyo is reached as a result.

3.2. Theoretical and conceptual framework

The literature from various scholars demonstrates that complementary as a concept can be accomplished either through ***adaptation*** of existing structures or built environments wherein ***styles*** (classic, modernism, contemporary, Swahili, Arabic), ***ornamentations*** (different artifacts, patterns, lines, articulations), ***features*** (roof, windows, doors, facades), ***materials*** (wood, that, coral stones, coral lime, mud, concrete, steel, glass), are incorporated in urban development as part of the existing infrastructure. Creating new buildings with building shapes, building ornamentation, harmony, balance, order, and completion arranged to blend in with the surroundings is another way to accomplish complementarity.

The contextualism and materiality characteristics may be used to achieve the two techniques, with contextualism potentially influencing or being impacted by architectural design or adaptation, which is further conveyed through materials. When contextualism is successfully implemented, it may improve the built environment's cultural legacy and foster social dynamism, in addition to helping to conserve the environment. The building process is also greatly influenced by materiality, which also enhances utility, aesthetics, stability, strength, and sustainability. When the aforementioned goals are met, the structure improves functionality (mixed-use, adaptive reuse); it also improves energy use (composite of traditional and industrial materials or use of technologically improved materials); and it may also improve structural stability (combination of steel and wood, concrete and steel, glass and stones, etc.). It may also enhance the aesthetics of a specific structure or the urban fabric as a whole (pattern, order, rhythm, and completeness) (Figure 1).

3.3. The study Area

The primary focus of this study is the historical town of Bagamoyo, which boasts a rich array of architectural and historical treasures dating back to the pre-colonial era. The town has been influenced by foreign slave traders, explorers, missionaries, and later, by developments in the post-independence period. Bagamoyo has a long and diverse history that reflects various human civilizations and stages of development, encompassing social, political, architectural, and economic dimensions.

This research concentrates on the town's historic core, bordered to the east by the Indian Ocean. Historic building sites are identified by the numbers 1, 2, 3, and 4, while newly developed sites are designated with the letters A, B, C, D, and E, corresponding to specific case study structures (Figure 2). These examples are intended to demonstrate how the complementary nature of historical and contemporary architectural scenarios can be effectively utilized.

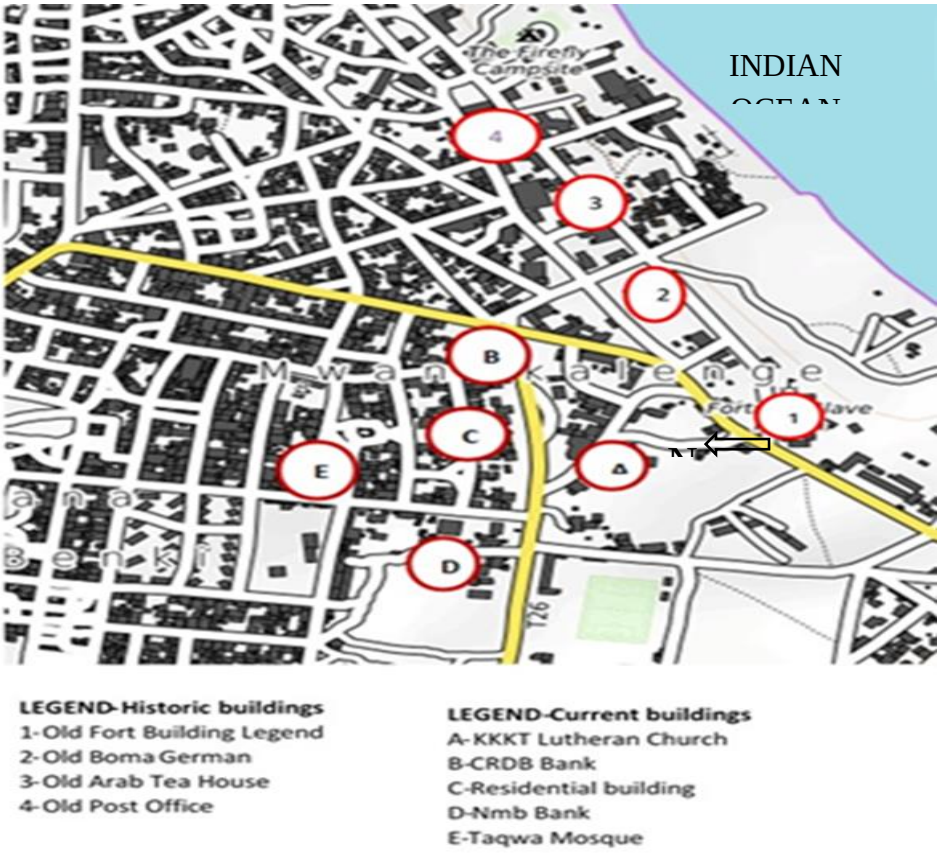
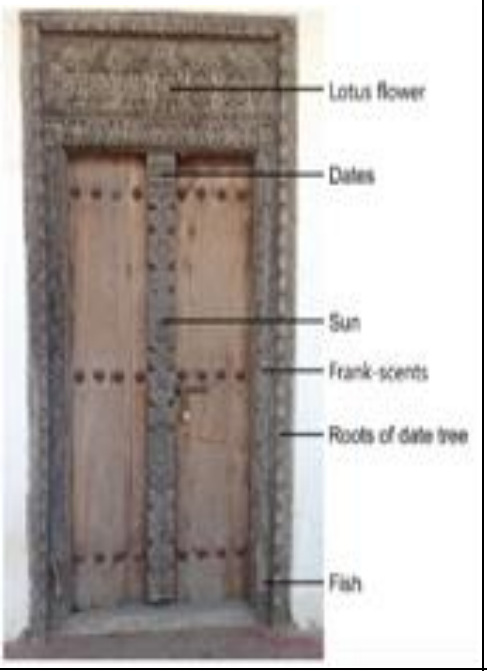


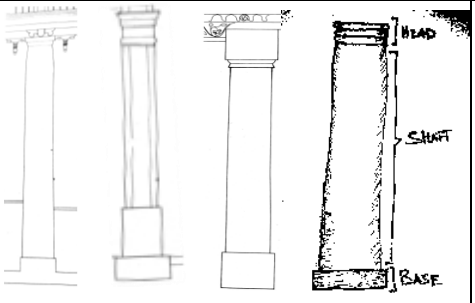
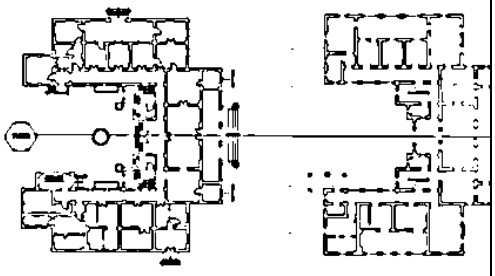
Figure 2: Location of the studied buildings

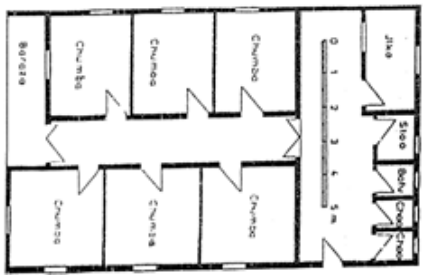
4. Findings

Exploration of historical artifacts in Bagamoyo reveals a variety of architectural styles, including native, Swahili, Arabic, Indian, European, modernist, and contemporary influences. These styles are evident in different elements of existing buildings, such as windows, doors, ornamentation, balconies, fascia, and facades. Additionally, a diverse range of building materials is used, including coconut thatch, coral stones, mangrove wooden poles, and coral lime, as shown in Table 1. These characteristics contribute to the rich architectural diversity and cultural heritage of Bagamoyo, attracting visitors, scholars, and investors alike.

Table 1: Documented list of the architectural artifacts of Bagamoyo historic town

S/N	STYLE	BUILDING ELEMENTS	PROPERTIES
S/N	**STYLE**	**ARCHITECTURAL ARTIFACT**	**FEATURES**
1 i)	**ARABIC STYLE** • Arabic Door	 	• -Dates, fish, date tree roots, lotus flower, frank scents, and the sun are all symbols seen on Arabian doors • *Fig: 01, Arabic door found in Bagamoyo.* • Fish is a symbol of fertility and the birth of humanity. The fish sign, which appears at the bottom of the door, is a prayer for the people of a particular building to have more fertility and security. • The roots of date trees, which enable the tree to grow fruit even during the dry seasons in places with deserts or semi-deserts, are the second sign on Arabian doors.
ii)	Arabic Window • Curved window opening • Omani Arabs style	 *Custom house curved windows Mwambao Primary School*	• -Arabic Curved opening (wxh) 1500x2650 • -Materials used are stones finished with white lime. • Window has two sashes and is divided into two segments • -Wall ornamentation • -Window(wxh) 900x1500mm

iii)	Arabic Roof • Parapet walls		• Parapet walls were utilized not just for safety, but also for decoration and to conceal the roof structure. • *Fig:05, Triangle parapet wall (old post office)*
2 i)	**INDIAN STYLE** • Indian Door Hand-carved heavy doors and frames Copper knobs	 *Indian Door found in Old Fort main entrance*	• -Prayer space, lotus flowers, palm fronds, pineapples, and date tree roots are five ethnic motifs seen on Indian doors. At the top rail, there is a decorative, symbolic prayer place that also serves to write the house owner's name. • The palm leaves on the design represent the wealth that the Indians have amassed over many generations through coconut plantations on the Swahili coast.
	•		•
ii)	• `Indian Windows • Hardwood Doors and windows	 	• -Basic window with two sashes divided into three parts on top wire mesh for security. • Window sill and door sill are at the same height.
3 i)	**WESTERN STYLE** • Classical Column		• Various Greek Doric columns as a structure part in the old post office(millennium hotel) and other historic buildings • 3M Height
ii)	• OLD BOMA • Floor Plan • Circulation		• The floor plan is symmetrical as well as the interior circulation is linear, rooms mostly have 3x3m and headroom is 3.6m and the plinth level is 750m. • Symmetrical layout, balance and order

Iii	• Germany Buildings		• Wide balcony • Long eave towards the Indian Ocean • Wooden deck. • Stone walls • Concrete columns
4	**ISLAMIC STYLE** Islamic Roof		• The Islamic roof décor parapet wall • While color and crescent sign • Roof cover hidden with parapet walls
5	**SWAHILI** • ROOF • FRONT BARAZA		• Hipped roof covered by corrugated iron sheets. • Layout with front Verandah, central corridor three rooms on each side. • Front verandah used as a social space for men's interaction • Materiality: corrugated iron sheets, wooden pole and mud, sand cement screed.
	FLOOR PLAN Circulation		• Corridor terminates in the courtyard which is a central social and family space • Cooking place and toilet located within the courtyard • Central courtyard • The house's focal point for daily activities and family gatherings is the courtyard.
6	**MODERN**	 *(old post office)*	• -Clean, minimal lines. • Broad roof overhangs. • -Walls of glass and large windows. • Open and well-defined floorplans • -Modern and traditional building materials.

			• -A relationship to the outside environment • Parapet wall with Islamic clerestory
7	**CONTEMPORARY**		• Large windows • Open plan • Use different element styles in the single building
	AApartmentBuildi ng		• Concrete materials • Mixed colors • Rectangular windows • Rectangular doors • Flat concrete roof • Glazed Aluminum windows

4.1. Architectural Complementarity through Materiality-Old Fort and BOMA

The German Administration Building (BOMA) (Figure 3A) and the Old Fort (Figure 3B), two colonial governmental structures in Bagamoyo, were constructed using Swahili architectural principles rather than traditional European styles. These buildings feature flat roofs and ceilings made of mangrove poles, with walls constructed from stones, sand, and lime mortar. The ground level is arranged around a central courtyard, reflecting a design approach that integrates local materials and spatial organization. This aligns with the study by Wahab and Bari (2019), which highlights the use of natural materials such as adobe and lime plaster as examples of complementarity. These materials enhance thermal mass and regulate indoor humidity levels, thereby protecting walls from moisture damage. In this context, complementarity is achieved by merging materials with different properties to enhance their overall performance.

Rossi et al. (2019) emphasize the complementary nature of architecture by comparing the use of stone and wood, where one material helps control interior thermal temperatures while the other provides structural support and aesthetic appeal. According to the same authors, utilizing locally sourced natural materials like wood and stone can significantly reduce the environmental impact of construction, as they require less energy for processing and have lower embodied energy compared to synthetic materials.

Based on these insights, it is evident that many historic buildings in Bagamoyo's old town were constructed using coral stones embedded in mud and supported by wooden poles. These materials contribute to structural stability, indoor thermal comfort, environmental protection, and aesthetic value. Moreover, they require minimal energy for processing and transportation, embodying the principles of contextualism. The use of local materials fosters cohesion, sustainability, and harmony with the surrounding environment, ultimately enhancing the longevity, energy efficiency, and low carbon footprint of these structures (Eastman, 2011).

Additionally, Gerosa and Pacheco-Torgal (2019) commend the Pacific Northwest for its extensive use of wood, a locally abundant material. The authors highlight wood's strength, adaptability, and natural beauty, noting that its reduced transportation costs and natural biodegradability further enhance its sustainability. This perspective is supported by Rashed-Ali and Nuruddin (2015), who argue that achieving complementarity and

sustainability in architecture requires the adoption of innovative design and construction methods, especially as global attention on sustainability intensifies.

The utilization of traditional building materials and construction methods in Bagamoyo exemplifies the concept of complementarity. This research demonstrates how regional materials have historically been integral to the construction of significant structures. The use of locally available mangrove wood and coral stones, complemented by other regional materials such as handcrafted ceramics and woven baskets, unifies various environmental elements into a cohesive whole, creating a sense of continuity and harmony.

A: Old Boma **B**: Old FORT

Figure 3: Demonstration of architectural complementarity through natural/contextual materials

4.2. Complementarity through the use of architectural artifacts

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Khan (2002) emphasizes that complementarity in architectural artifacts involves combining various elements to create a cohesive and functional building that vividly exhibits the strengths of each component, thus maximizing their benefits while creating a harmonious whole. The author further notes that the use of architectural artifacts enhances a building's aesthetic appeal, functionality, and cultural relevance. Evidence of this can be seen in the Old Arab Tea House and the Old Post Office (Figure 4), which showcase numerous architectural features on both the ground and first floors. The columns, stairways, balconies, wooden railings and balustrades, and color schemes all work in harmony, making these structures stand out within their environment. In these examples, complementarity is effectively achieved through the thoughtful integration of architectural artifacts.

A: Old Arab Tea house

B: Old Post House

Figure 4: Architectural artifacts complementing buildings

Additionally, Walter (2013) and Khan (2002) highlight complementarity through the use of architectural artifacts, specifically noting the inclusion of latticework in traditional Islamic architecture. This decorative screen provides privacy and shade while allowing light and air to pass through.

It should be noted that various buildings in Bagamoyo feature elaborate patterns and textures in their architecture, complementing one another in terms of form, function, and design within the urban fabric and streetscape. For instance, buildings like the Old Post Office and the Old Fort (Figure 5A and Figure 4B) exhibit similar front elevation designs, including a series of columns, balconies, front verandahs, extended eaves on one side, wooden columns on the upper floor verandah, decorated fascia boards, and white paint.

In this context, the similarity of the two structures' ***shapes*** (rectangular massing), colors (white limestone plaster), and ***materials*** (coral stone and mangrove wood poles) contributes to creating a unified setting that is greater than the sum of its parts. According to Jenkins (2014), the intricate patterns and textures used in building

design, reminiscent of Swahili and Arab architectural traditions, are another way complementarity is achieved in Bagamoyo's architecture. Jenkins further states that these patterns and textures provide a sense of harmony and cohesiveness to the town's architecture by connecting various structures and design elements into a cohesive whole (Ibid.).

A: Old Post Office

B: Old Fort

Figure 5: Complementarity through patterning

Furthermore, the placement of a couple of historic structures within the urban fabric of Bagamoyo creates complementarity. As the administrative center of Germany, the Old Boma, for instance, was arranged to maximize its impact and create a sense of visual interest in movement (strategic loci), which creates a sense of dynamics and energy in the town's architecture, drawing the eye and evoking excitement and anticipation (Figure 6). The site is depicted on the map as being in a sparsely inhabited region where all roads radiate outward. There is also a sizable garden in front of the Boma to represent its essence, splendor, authority, and dominance. These were the instruments used by colonists to demonstrate their presence in their colonies. Architecturally, the Boma's site turns into Bagamoyo town's genius hub, where the layout and growth of the entire town are based.

Germany Old Boma

Germany Old Boma facing large garden towards Indian Ocean

Figure 6: Strategic location of the Germany Old Boma facing garden and Indian Ocean

Source: Fernando Mahesh, 2010

4.3. Architectural complementarity through a combination of modernity and African style

The study demonstrates that Bagamoyo town has expanded in several ways and that this expansion has led to the loss of traditional architectural styles, building materials, and textiles in general. The evidence from both first-hand and second-hand accounts demonstrates that the bulk of the heritage building structures have deteriorated over time, owing to a lack of upkeep and rehabilitation but also because more attention is paid to the new development.

According to the survey, Bagamoyo's modern developments are distinct from the area's older ones in terms of taste. There has been a substantial change, notably in the architecture, which contrasts with the traditional

style and has generated curiosity in figuring out how they work together. Although the new architecture in Bagamoyo lacks a distinct style in terms of materiality, height, scale, concentration, color, functionality, etc., one can still say that the new development is a fusion of traditional African building methods and modern designs that create a distinctive blend of the old and new, formal and informal, low rise and high rise, which create complementarity from a different angle (Figure 7).

Figure 7: Fusion of Tradition and Modernity in Bagamoyo

The outstanding building known as the Bagamoyo Arts and Culture Institute (BACI), which combines elements of Scandinavian and African design, has been cited by scholars as a prominent example of recently constructed architectural structures in Bagamoyo (Architectural Review, 2014). The same researcher notes that the building's design incorporates contemporary layout elements, such as large spaces and expansive windows, with traditional African construction methods, exemplifying the concept of complementarity through the use of locally sourced materials. This fusion of traditional and modern components creates a remarkable aesthetic impact that harmonizes well with the local culture and environment (Ibid.).

The Kaole Ruins provide another notable example of complementary architectural styles in Bagamoyo. The ruins' designation as a UNESCO World Heritage Site is indisputable evidence of their exceptional design and historical significance (UNESCO, 2014). These ruins exemplify Swahili architectural traditions, showcasing a blend of Arabic and African influences that reflect the region's multicultural heritage. A traditional African building technique, the use of coral stone and lime mortar, known as "Vitus Bwanaheri," is prominently featured in the ruins and has been preserved through generations (Ibid.).

In addition to the BACI and Kaole Ruins, the Bagamoyo College of Arts (BCA) further demonstrates the concept of architectural complementarity in Bagamoyo. The college combines contemporary architectural styles with traditional African building techniques. Indigenous materials such as coral stone, thatched roofs, and mud establish a visual connection to the local community, while modern features like large windows and open spaces lend the structure a contemporary appearance (Kilindo, 2014).

Another example of architectural complementarity is the Bagamoyo Hospital, which integrates neoteric and traditional African architectural elements (Elliott, 2014). The use of local materials, such as adobe bricks and thatched roofs, creates an aesthetically pleasing connection to the community's cultural heritage, while modern design elements like large windows and open spaces provide a functional and practical environment for both patients and staff. One of the hospital buildings features a conical roof, a design inspired by traditional African roundhouses typically covered with thatch or palm leaves, though in this case, corrugated iron sheets were used (Figure 8). This design choice reflects the architect's consideration of the building's context and social history, achieving both aesthetic value and functional relevance.

A: Architectural artifacts of Kaole ruins Swahili and Arabic

B: Bagamoyo Arts and Culture (Swahili and Scandinavian)

Figure 8: Complementarity of old and new Swahili and European architecture (Traditional and Modern)

Figure 9: Conical traditional African forms one with thatch and another with iron sheets **(**Complementarity of modern and traditional African architecture)

The study demonstrates that, although Bagamoyo is a historic town with numerous architectural treasures, contemporary structures are developing unique architectural styles that contribute to the town's historic urban fabric in novel ways. Complementarity can be seen both as a continuation of the ancient history of architectural elements and as a departure from traditional styles, as new structures emerge in Bagamoyo. Overall, the complementary architectural styles of new buildings play a significant role in preserving the town's cultural heritage while supporting modernization and socio-spatial growth.

For instance, the new CRDB building (Figure 10A) illustrates how its height, color, style, materials, purpose, and scale harmonize with the surrounding area, which features single-story homes, low-rise structures, Swahili-styled buildings, and a compact cityscape. The windows of the bank contrast with and complement those of the low-rise Swahili homes, creating a dynamic skyline within the Swahili urban fabric. The building's design integrates contemporary materials like glass and steel with traditional Swahili architectural features, such as hip roofs. This design approach creates a structure that stands out while complementing its surroundings.

The Lutheran Church (Figure 10B) also demonstrates complementarity through its vault roof, color, scale, and design. It embraces the town's rich cultural heritage while providing a modern, functional worship space. The building incorporates modern elements, such as a spacious interior, alongside traditional features like gable, hipped, and vault roof types, complemented by a green roof. Additionally, the façade features both rectangular and curved windows, unified by white walls. Despite these contrasting elements, the designer achieves complementarity through careful use of color, materials, style, and functionality. The striking white façade and green roof create a visually appealing contrast with the surrounding urban fabric.

The new NMB building (Figure 10C) exemplifies architectural complementarity through its color scheme (white and orange), which dominates the structure and complements the surrounding environment. The design incorporates sharp-pointed windows—both real and decorative—that reflect Islamic architectural influences common in Bagamoyo. Furthermore, the combination of large first-floor windows and smaller second-floor windows balances proportions, enhancing the building's aesthetic. The designer also integrates a long eave (European style) and a deep verandah on the first floor, echoing German colonial architecture where verandahs provided outdoor comfort and scenic views. This design creates a distinctive, eye-catching structure while introducing a new architectural style to the area.

Another example is the Taqwa Mosque (Figure 10D), where complementarity is evident in the elevations. The design blends various architectural features, including a parapet wall, gable roof, minaret, glass and aluminum materials, rectangular windows, and curved windows. Curved windows appear on one side of the façade, while rectangular windows are on the other, symbolizing the fusion of traditional and modern styles. The building's white walls and green roof further enhance this blend. The successful integration of traditional elements with modern materials results in a structure that is both functional and aesthetically pleasing, paying homage to Bagamoyo's rich history.

Although functionally similar, new residential structures in Bagamoyo's historic district differ from older ones in scale, materials, finishes, and styles (Figure 10E). While traditional homes were built with poles, mud, coral stones, and thatched roofs, new constructions often use concrete, cement blocks, steel, glass, tiles, and corrugated iron sheets. Additionally, whereas historical homes were typically single-story, new developments include one- to three-story buildings, altering the historic skyline.

The new District Court in Bagamoyo (Figure 10F) also reflects architectural complementarity. Its design incorporates traditional elements, such as Doric columns at the entrance, a gable roof, white walls, and a redbrick roof, alongside modern materials like concrete, aluminum, steel, glass, and cement blocks. The building enhances functionality and reflects local culture through features like a central courtyard, a hallmark of Swahili architecture (Lema, 2016). This creates harmony between the new and existing environments.

Kahimba and Mmari (2019) praise the courthouse's design for incorporating passive cooling and natural ventilation, meeting the functional demands of a modern court while promoting energy efficiency and environmental sustainability. The building also features a water collection system, reducing dependence on the city's water supply. Despite using modern materials, the design maintains a sensibility aligned with traditional structures. Rweyongeza (2018) supports this, noting that the building helps preserve and showcase local architecture, a key part of Bagamoyo's cultural identity. Bonsu and Katunzi (2018) similarly argue that new residential buildings in Bagamoyo achieve complementarity by blending modern and traditional architectural elements.

These new developments often reference traditional buildings, using local materials like coral stones, timber, and thatched roofs to complement the existing architecture. According to Mwakikagile (2010), residential structures in Bagamoyo blend seamlessly with their surroundings, as the vibrant colors of new constructions reflect the lively spirit of Swahili culture. Additionally, features like gardens, balconies, courtyards, and large windows for ventilation complement traditional Swahili designs. Mwakikagile further notes that using local materials and designs fosters a sense of continuity, provides employment opportunities, improves quality of life, and promotes economic growth.

Baskinger (2016) emphasizes that complementarity involves integrating new buildings into their environments without disrupting existing architecture. Instead, new structures should enhance the beauty of their surroundings. While contrast between old and new can be a form of complementarity, Baskinger stresses the importance of achieving harmony. This concept contrasts with some recent residential developments in Bagamoyo, which lack design elements that blend seamlessly with the pre-existing architectural fabric.

As opposed to the ideas presented above, several structures in Bagamoyo were created to demonstrate complementarity using traditional approaches like materials, styles, size, culture, and construction methods (Figure 11). The majority of these are hotels designed to draw tourists by showcasing authentic and natural African architecture, spaces, and materials. Despite having traditional-looking materials and forms on the outside, they were designed by fusing traditional and modern building techniques with a traditional outlook.

Figure 10: Various newly developed buildings in Bagamoyo: source, author 2023

Figure 11: Various developed buildings focusing on traditional materials, styles and culture

5. Discussion and literature reflections

The study sought to explore the concept of architectural complementarity in the historic town of Bagamoyo, focusing on how modern structures can be integrated into historic settings to preserve continuity and harmony within the historical environment. By synthesizing empirical findings with existing literature, the study revealed a rich diversity of scholarly perspectives on architectural complementarity, highlighting both its theoretical underpinnings and practical challenges.

5.1. Theoretical Debates on Architectural Complementarity

Lange (2015) critiques the concept of complementarity, arguing that its emphasis on preserving the status quo of historic fabric stifles architectural innovation. According to Lange, the insistence on adhering to traditional designs and materials limits architects' ability to meet contemporary building standards and functional requirements. This critique resonates with the challenges faced in Bagamoyo, where developers have attempted to use traditional materials like coconut thatch for roofing in hotels to achieve a traditional aesthetic. However, such materials often conflict with modern fire safety regulations, as stipulated by the Municipal Authority. This tension underscores the practical limitations of relying solely on traditional materials and techniques in contemporary construction.

In contrast, Rosales and Reicher (2017) offer a more constructive perspective on complementarity, emphasizing its role in preserving local and cultural traditions. They argue that traditional building materials and techniques not only maintain local aesthetics but also prevent the erosion of indigenous knowledge systems that contribute to sustainable and contextually appropriate architecture. This perspective aligns with the empirical findings in Bagamoyo, where traditional Swahili and Islamic architectural elements have been successfully integrated into modern structures, such as the Taqwa Mosque. Here, traditional features like coral lime plaster and Swahili design motifs coexist with modern materials like glass and steel, creating a harmonious blend of old and new.

5.2. Empirical Findings and Case Studies in Bagamoyo

The study identified two distinct approaches to achieving architectural complementarity in Bagamoyo: one that prioritizes the preservation of historical continuity and another that embraces modernity to revitalize the urban fabric. For instance, buildings such as the CRDB and NMB banks, the new District Court, residential apartments, and churches have introduced new architectural elements—dynamic colors, innovative forms, and modern materials—into the historic setting. These structures infuse vitality into the urban landscape while reflecting the vibrancy of African culture. This approach aligns with Foucault's (1986) notion of complementarity as the peaceful coexistence of old and new, where neither dominates the other but instead creates a sense of continuity and connection.

On the other hand, the Taqwa Mosque exemplifies a more conservative approach to complementarity, where traditional Islamic and Swahili architectural elements are preserved and subtly enhanced with modern features like large windows and aluminum frames. This approach reflects Ashworth and Tunbridge's (1996) argument that complementarity can be achieved by integrating new elements in a way that respects and enhances the existing context.

5.3. Challenges and Practical Considerations

Despite the theoretical and practical appeal of architectural complementarity, its implementation is not without challenges. Marotta and Porta (2018) highlight the logistical and financial difficulties of using traditional materials and techniques in modern construction. For example, the traditional method of producing coral lime plaster in Bagamoyo—a process that involves soaking coral lime for a year before application—is now rarely

used due to its time-intensive nature and the scarcity of skilled masons. Instead, modern alternatives like ordinary lime or wall putty are often employed, which, while more practical, lack the durability and aesthetic qualities of traditional materials. This shift has led to concerns about the loss of indigenous knowledge and the erosion of the historical authenticity of Bagamoyo's built environment.

5.4. Academic synthesis

The study underscores the complexity of architectural complementarity, which is shaped by a multitude of factors, including cultural values, material availability, technological advancements, and socio-economic conditions. While the integration of modern elements into historic settings can revitalize urban spaces and reflect cultural dynamism, it is equally important to preserve traditional techniques and materials that contribute to the historical authenticity and sustainability of the built environment.

6. Conclusion

In conclusion, the concept of architectural complementarity is both multifaceted and context-dependent, requiring a nuanced understanding of the interplay between tradition and modernity. By critically engaging with existing literature and empirical findings, this study contributes to the ongoing discourse on how to achieve complementarity in historic urban settings. It highlights the need for a balanced approach that respects the past while embracing the future, ensuring that the architectural heritage of places like Bagamoyo is preserved for generations to come.

6.1. Policy Recommendation

The study highlights the importance of a **holistic and inclusive policy framework** to guide development in historically significant areas like Bagamoyo. By fostering collaboration, promoting innovation, and preserving cultural heritage, such policies can ensure that architectural complementarity is achieved in a way that respects the past while embracing the future. This approach not only safeguards the town's historical identity but also enhances its socio-economic resilience and cultural vibrancy.

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