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## The Influence of Planning and Architectural Styles on the Sustainability of the City of Kumasi, Ghana

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### ABSTRACT

*The city of Kumasi that was once dubbed the ‘Garden City of West Africa’ was founded in the late 17th century and served as the seat of government for the medieval Greater Asante Union. It later served as a commercial hub for the British Colony after undergoing massive transformation in the first two decades of the 19<sup>th</sup> century. Post-independence, the city went through various urban planning projects that mostly targeted social development. The architecture of Kumasi has also been changing through different periods of its history. This article examines the relationship between the evolution of the city of Kumasi through urban planning and architecture and the general sustainability in construction. The results show that there is massive depletion of the green belt in Kumasi. Moreover, contemporary architecture uses fewer passive designs for indoor climate control and less local materials for construction. Use of technology for improvement of local materials compressive strength and integration of renewable energy sources in architecture are recommended as course of action.*

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### INTRODUCTION

Kumasi is the second largest city in Ghana, being also the regional capital of the Ashanti Region. Due to its rich green urban landscape, Kumasi was labelled the ‘Garden City of West Africa’ in the 1940s (Cobbinah *et al.*, 2019). The whole city area is estimated to be 254 km<sup>2</sup> with a population density of about 6,575 ha/km<sup>2</sup> resulting from a population of around 1.8 million, with the Asante as the predominant

ethnic group (Ghana Statistical Services, 2022).

Like any other city, Kumasi, is made by a collection of buildings that evolve through time, design, materials, and planning to make its built environment. This built environment has a crucial role to play for a sustainable future (UNEP, 2021). The sustainable development goals (SDGs) which outline sustainability targets, specifically touch on city development in Goal 11, requiring cities and human

settlements to be inclusive, safe, resilient, and sustainable. This requires, among others, safe and affordable housing, accessibility to public spaces, enhanced air quality and waste management, strengthened national and regional development planning, and sustainable and resilient buildings through the utilization of local materials (UN, 2015).

However, the evolution of a city that is caused by rapid urbanization can be an area of concern in terms of sustainability in its development. Therefore, this article aims to analyse the relationship between the evolution of planning, architectural styles and construction materials to the sustainability of Kumasi.

## MATERIALS AND METHODS

This article presents the analysis of literature review on the subject of urban sustainability in relation to Kumasi's evolution through urban planning and architectural style. It is of importance to note that a broad literature review was conducted albeit with a limitation on available published data.

This article bases on the hypothesis that the evolution of urban planning and architecture style have an effect to the sustainability of the city of Kumasi. The conceptual framework of this article is given in Figure 1.

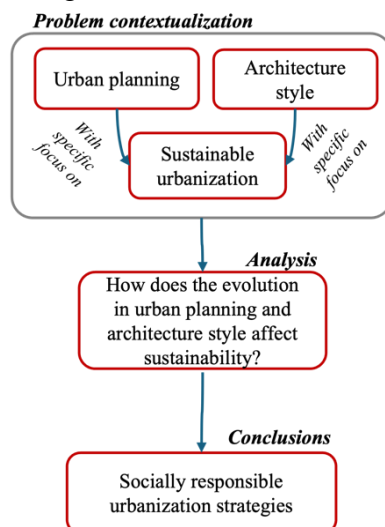


Figure 1: Conceptual framework.

## REVIEW OF URBAN PLANNING

### Historical Review of City Development

Kumasi was founded by Asantehene Osei Tutu I in the late 17th century. The town served as the seat of government for the medieval Greater Asante Union, commonly known as the Asante Empire or Asanteman. The Asante empire was capable of controlling commerce between the coast and savannah due to its advantageous position of being situated at the intersection of the Trans-Saharan trade routes. The increasing wealth of the Ashanti Empire spurred the growth and development of the old Asante Empire and its capital, Kumasi (Baeyens, 2012). The first plan of Kumasi in 1817 is given in Figure 2. During the first two decades of the 20th century, Kumasi underwent a massive social and economic transformation made possible by the subjugation of the native population through the success of the British wars of 1874 and 1896 (Korboe and Tipple, 1995). After the conquest of Kumasi in 1874, the colonial government took action to gradually change the socioeconomic structure of the now-defunct capital. The town's physical layout was changed by the British to a 75-foot grid-iron configuration to improve the previously unsanitary conditions of the razed town (Amoako and Korboe, 2011).

Owing to the strategic geographical location of Kumasi, the British built the town as a sub-regional wholesale hub for cattle and sheep from the north and western goods from abroad. The role of the wholesale centre was appropriate for Kumasi's historical significance as a commercial hub. The Central Market of Kumasi arose on its current site where it is still operational (Cobbinah *et al*, 2019). By erecting a fort on Kumasi's highest peak, amassing a military power, and creating a prison yard, the colonial administration solidified its hold over the Asante Kingdom's territory, thus weakening its strong socio-political structure (Amoako and Korboe, 2011).

The business class was spurred by the brisk trade and cocoa boom of the time to build commercial structures across the central business district that had previously been home to traditional compounds. Up until that point, Kumasi's compound homes had adopted a rural design, with each compound consisting of three or four separate buildings.

In 1903, the British constructed a railway connection linking Kumasi to the coastal region (Amoako and Korboe, 2011; Cobbinah *et al.*, 2019). This encouraged migration, especially from coastal regions, and aided Kumasi's development as a commercial hub. The significant socioeconomic transformation of the city's physical and visual appearance was a result of its diversity and sophistication in the early 20th century (Korboe and Tipple, 1995; Cobbinah *et al.*, 2019).

Kumasi was also offering a lot of Western-style jobs at the lowest levels of administration, banking, and construction in addition to its commercial standing thus increasing levels of migration. Another

factor in the reshaping of Kumasi's society and reorganization was the influence of Christian evangelization and the promotion of Westernized education (Amoako and Korboe, 2011).

By 1915, Kumasi had undergone a significant transformation, with streets now lined according to the required grid-iron plan as shown in Figure 3 (Amoako and Korboe, 2011). The British impact was considered significant that the exiled Asantehene Prempeh I hardly recognized Kumasi when he returned from exile in 1924 (Amoako and Korboe, 2011).

Kumasi has had many changing phases over the past century, yet some aspects of the city have remained intrinsically, the same. The city still functions as a trading hub despite its evolution, and the Asantehene and his chiefs are considered traditional rulers of Kumasi and at large the Ashanti Region. Consequently, it can be said that the tradition in Kumasi has been held by the chieftaincy institution, though there have been few adaptations to the contemporary way of life.

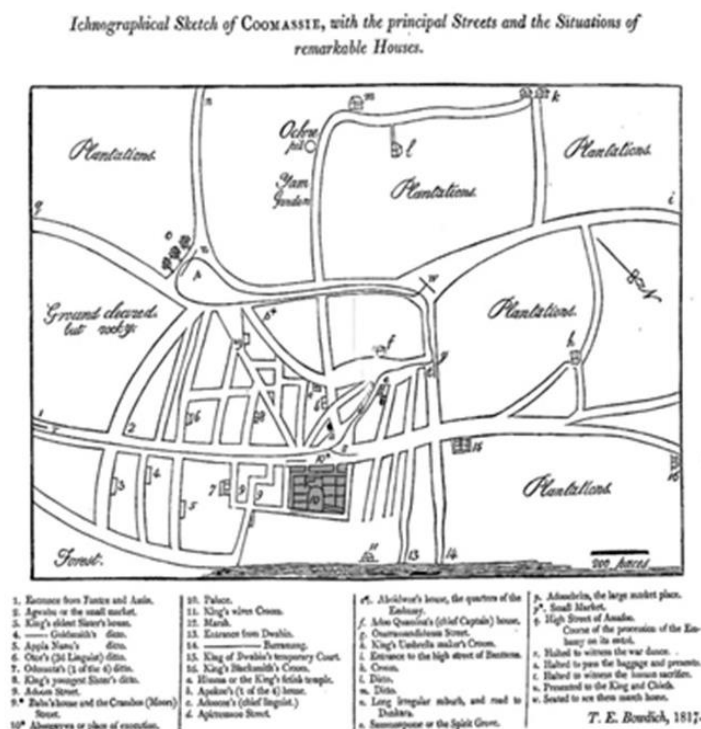
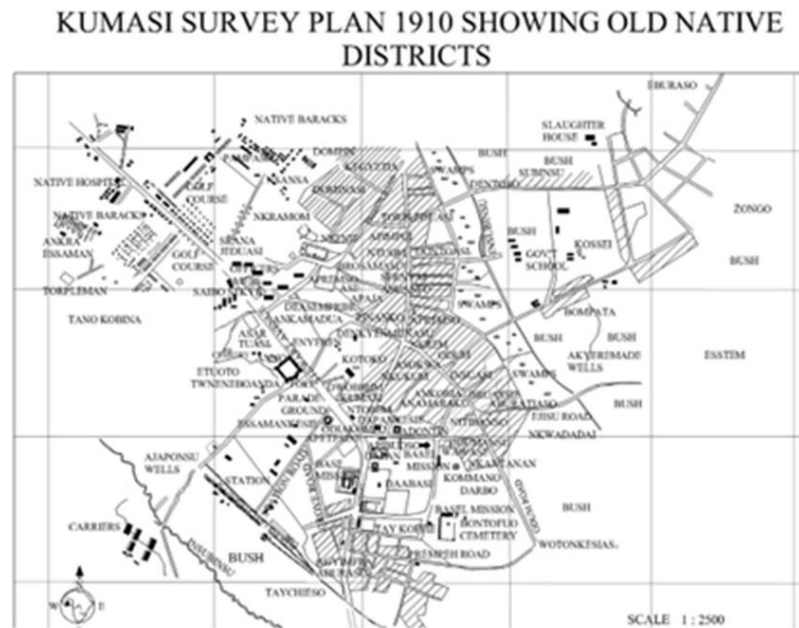


Figure 2: The Town of Kumasi in 1817 (Edwards, 2023).



**Figure 3: Kumasi survey plan (1910) showing the old native district (Amoako and Korboe, 2011).**

### *The Garden City Concept for Kumasi*

When the British decided to occupy Kumasi, they required urban planning ideas that would suit their purposes. In 1945, Kumasi was dubbed the "Garden City of West Africa" under Maxwell Fry and Jane Drew's conceptual landscape plan (Quagraine, 2011). The garden city idea popularized in the West by Ebenezer Howard in 1902 was to be incorporated into the design (Cobbinah *et al.*, 2019). Sir Howard developed the idea of a garden city in reaction to the subpar living conditions of labourers in the rapidly urbanizing British cities in the late 19th century. The goal behind the concept was to build self-sufficient, planned communities that incorporated the best aspects of urban and rural living. These aspects include self-sufficiency where everyone's needs could be met on foot including homes, stores, schools, and parks; a Green belt surrounding and separating each garden city while halting urban sprawl; and small populations.

In light of this, urban green belts and urban parks were the key landscape components of Fry and Drew's 1945 Kumasi city design.

In employing the use of green belts, it had the potential to create a border against sprawling, supply of agricultural areas, and to also act as sponges of different air pollutants. However, in contrast to Howard's proposal, Fry and Drew's plan (1945) included a 330-yard wide green belt along stream channels within Kumasi city instead of the city outskirts. Here, the Kumasi green belt served the additional purpose of separating European settlers from their African neighbours, who were thought to be the source of contagious mosquito-borne diseases such as malaria and yellow fever (Quagraine, 2011).

The 1963–88 Kumasi Planning Scheme (Figure 4) and the 1996–2000 Kumasi Development Plan (Figure 5) were two planned initiatives that had a vision to foster Kumasi's reputation as the 'Garden City of West Africa'. However their implementation and enforcement was difficult and therefore ineffective. This was a result of the start of rural-urban migration after independence and its associated problems (inadequate housing, infrastructure, etc.) as well as weak institutional capacity in terms of human and logistical resources, that eventually caused

the ‘garden’ in the city to gradually erode (Adarkwa, 2011; MESTI, 2013; Cobbinah *et al.*, 2019; Government of Ghana, 2021).

By the 1990s, the reserved green landscape was depleted (Figure 6) by the progressive land use change (Cobbinah *et al.*, 2019).

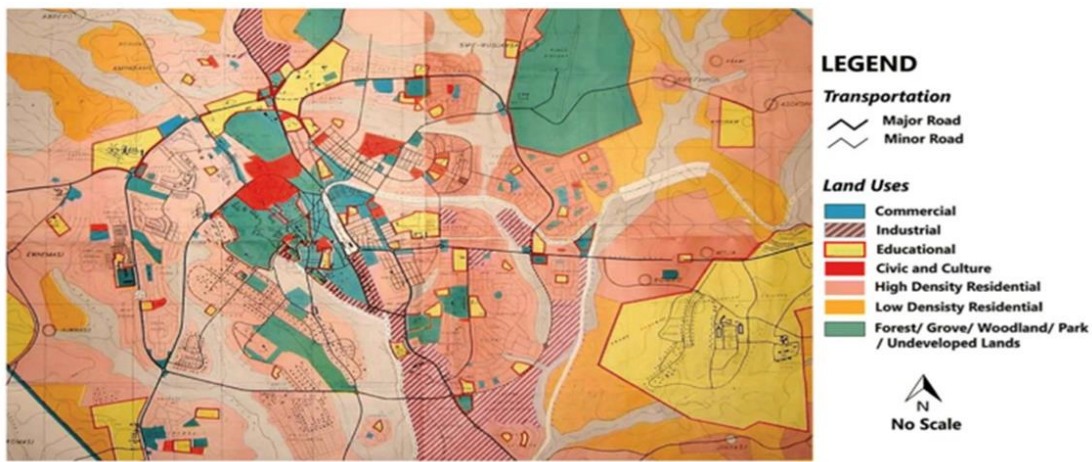
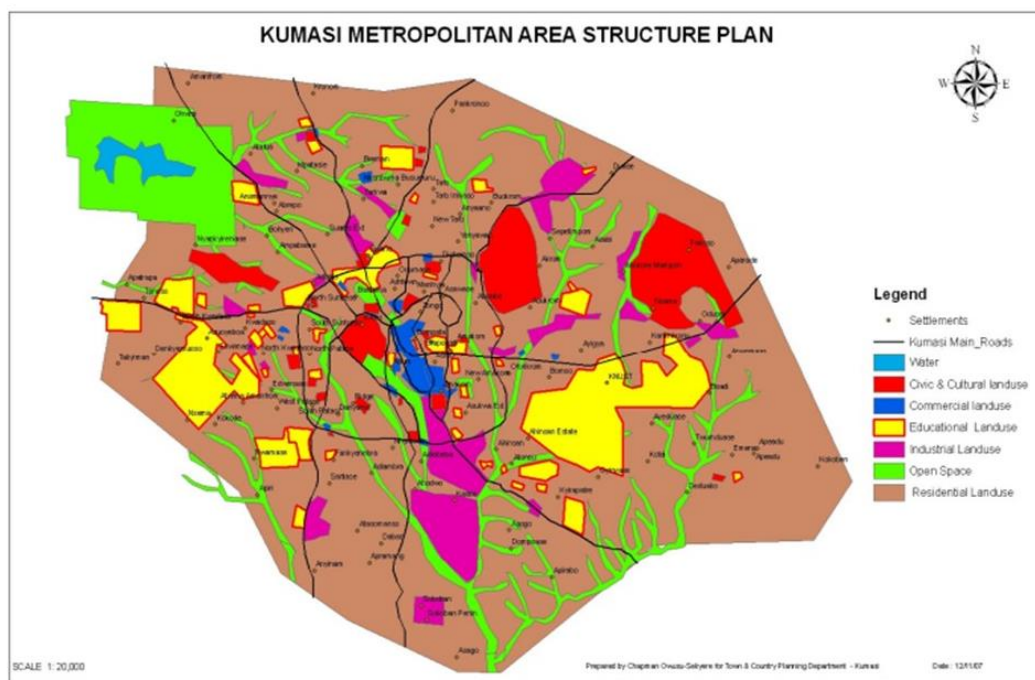


Figure 4: Planning scheme for Kumasi in 1962 Master Plan (Cobbinah *et al.*, 2019).



Source: Town and Country Planning Department, 2007

Figure 5: Land use of Kumasi metropolis in 2007 (MESTI, 2013).

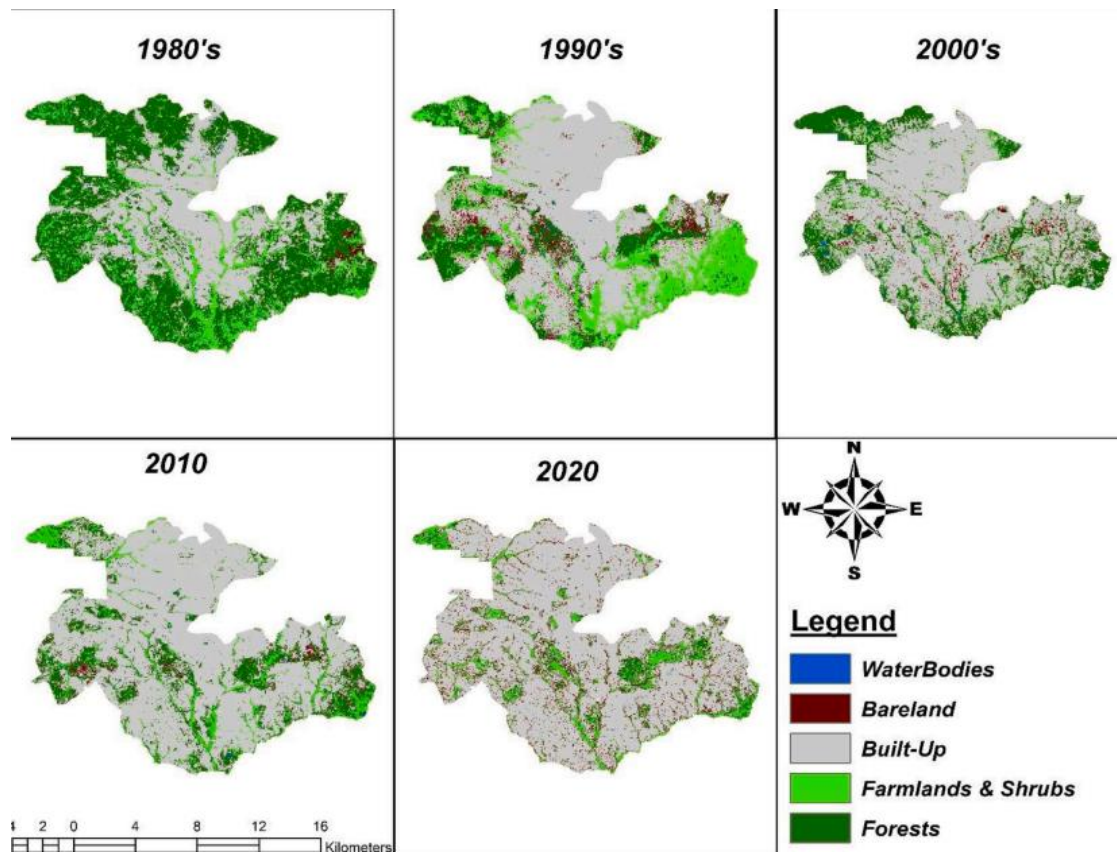


Figure 6: Land use change of Kumasi (Sarfo *et al.*, 2023).

### ***Current Development Plan of Kumasi***

Presently, the city has a revised spatial development plan that was created in 2013 which spans between 2013 and 2033, as shown in Figure 7 (MESTI, 2013). To anchor the overarching development programme, the Kumasi Metropolitan Assembly (KMA) has a Medium Term Development Plan (MTDP) titled the KMA Development Plan (2018-2021), which outlines the city's priorities and strategies for development. The plan focuses on several key areas, including infrastructure, social and economic development, and environmental sustainability through development of new infrastructure including Bus Rapid Transit system, construction of new healthcare facilities and housing for low-income households

and promotion of renewable energy sources (Cobbinah *et al.*, 2019; MESTI, 2013; Government of Ghana, 2021).

Per the goals set in the MTDP, some progress has been made with the construction of an airport terminal, markets as well as healthcare facilities (Ghana Airports Authority, 2013; The Ghana Report, 2023; Ministry of Health, 2023). However, Kumasi still faces issues related to urbanisation that most developing cities face including inconsistencies in governance structures, distortions in planning processes, poor land tenure management and deteriorating infrastructure and services within the metropolis that slow the progress to create a sustainable and resilient city (Cobbinah *et al.*, 2019).



**Figure 7: Current spatial plan of Kumasi (MESTI, 2013).**

## REVIEW OF ARCHITECTURE

The city of Kumasi has several styles of architecture. The presence of these architectural styles burgeoned as a result of the influence of culture, climate, colonialism, construction materials, and changing socio-economic factors of the people. Consequently, predominant architectural styles within Kumasi include the traditional Asante architecture (Winterhalter, 2022) and the revivalist styles which were popular in Europe during the period such as the Neoclassical styles, which were also used in European colonies. Contemporary styles such as Modernism and Postmodernism were also built within Kumasi. Modernism for an instance gained popularity after the independence of Ghana and many foreign built-environment professionals were invited to build the new Ghana in the late 1950s. This coincided with the emergence of modernism on the world stage where the style was linked to the functional open-plan interiors and rational use of materials (often new), innovative structural design, and the rejection of adornment. On the other hand, eclectic postmodernism used bright colours, playful shapes, classical motifs, and a combination of materials to create

unusual effects (Adjei and Oppong, 2017). This style was reflective of the new republic of Ghana that was attempting to find its signature tune in the industrialized world.

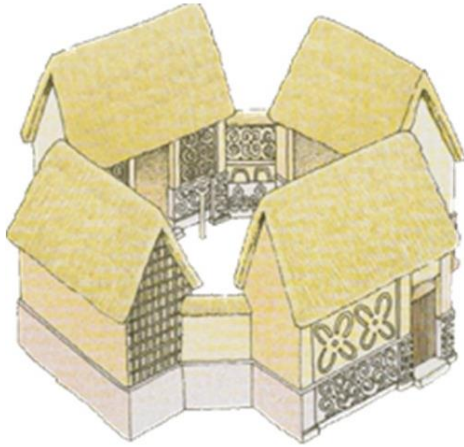
## Architectural Style of Buildings

### *Traditional Asante Architecture*

Traditional Asante architecture is characterized by the use of natural materials such as wood, mud, and thatch. The architecture is also characterized by its intricate decoration, which includes the use of geometric patterns and motifs that are unique to the Asante culture. The traditional architecture of the Asante people can be seen in their houses, palaces, and public buildings. Domestic dwellings are typically constructed with a timber frame and filled with mud (wattle and daub construction) (Kessie and Amoateng, 2015). The roofs are thatched with grass or palm leaves which have a high roof pitch to offset the recurrent rain typically in rainforest zones. The houses are usually rectangular in shape, with a central courtyard that is used for social and cultural activities. The courtyard is surrounded by rooms that are used for sleeping and storage (Kessie and Amoateng, 2015). The palaces,

on the other hand, are larger buildings that feature more elaborate traditional motifs “adinkra” and patterns on their earth buildings as illustrated in Figures 8.

Despite the modernization of Ghana, the traditional architecture of the Asante people remains an important part of their cultural heritage.



**Figure 8: Traditional Ashanti dwelling (Thierry, 1996).**

### ***Neo-colonial Architecture***

This type of architecture in the Gold Coast is also referred to as ‘Afropean’ architecture, which borrows some elements from European architecture. From a purist perspective, this category of architecture cannot be entirely classified as neoclassical architecture, however as a reference for the period, it is herein used. In this category, classical column orders (typically non-structural) and arches interspersed with traditional motifs served as sun-shading devices/brise soleil and ‘honeycombs’ for

cooling. The shadows cast by these elements provided an interesting outlook on the architecture of the time. This architecture is characterized by balconies/porches, hip roofs, and jalousies as shown in Figure 9. These characteristics were climate-induced as a result of the tropical attributes of the Gold Coast. For such buildings found within the commercial precinct of Kumasi, the building facade typically serves as commercial advertisements. This attribute is purely transactional between the owners of the buildings and the commercial entity



**Figure 9: Example of Afropean Architecture (Authors image, 2023).**

### ***Modernism***

The period of post-independence was characterized by creating a distinct identity for Ghana, as it was the first sub-Saharan

Africa to achieve Independence. In this light, the city of Kumasi was not left out of this endeavour. The modernist style was ‘regionalized’, where architectural



modernism was adopted in Ghana taking into consideration shared cultural values and climate. The architecture was characterized by the use of concrete minimalism. This involved the use of balconies and cantilevers for shading; and the use of brise soleil with indigenous patterns for aesthetics and shading (Roux, 2004). This style of architecture was eventually termed tropical modernism.

Examples of this style of architecture include the traditional halls found in Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi (i.e., Unity, Republic, Africa, Independence, Katanga, and Africa Hall). Others found within the environs of Kumasi include SSNIT Asuoeyeboah Apartments, Prempeh Assembly Hall (Figure 10), and Cedi House.



**Figure 10: Prempeh Assembly Hall (Adjei and Oppon, 2021).**

### ***Post-Modernism Architecture***

Postmodernism is characterized by bold forms, colourful yet employs the application of classical motifs. This architectural style was developed in opposition to the functionality of modernism. Additional features of

postmodernism include the use of sculptural forms, ornamentation, anthropomorphic forms, colour, and novel materials (Conway and Roenisch, 2005). Within Kumasi, KNUST holds a plethora of post-modernist designs as shown in Figure 11.



**Figure 11: Business School (KNUST, 2020).**

### ***Contemporary Architecture***

Currently, popular architectural styles within Kumasi have influences from the

functional modernism style, neoclassical, and eclectic postmodernism styles. Intrinsically, these buildings use shadows of the Asante traditional architecture albeit

by incorporating modern materials, designs, and the modern interpretation of traditional motifs. While the use of natural materials such as mud and thatch are still prevalent in rural areas, urban areas such as Kumasi have seen an increase in the use of concrete and other modern building materials such as steel, glass, and aluminium cladding (popularly referred to as alucobond) (Schmidt, 2005) shown in Figure 12. However, these attempts without the guidance and supervision of a

professional, result in a 'mismatched hybrid' of influences.

In recent times, Afropean architecture has been retrofitted to 'look modern'. This entails the change of jalousie windows to sliding windows. Additionally, the use of aluminium cladding has been popularized to provide a shiny finish. Alternatively, inhabitants make use of vibrant porcelain tiles as exterior cladding, which reflects a busy effect as one observes the city's vista in motion.



Figure 12: An explosion of colour, symbols, patterns, large and elaborate roof (ArchPose, 2019; Gya-son Royal Guest House, 2023).

### Architecture Style of Neighbourhoods

Kumasi is divided into several administrative areas. Currently, the city is divided into one metropolitan area and six municipal areas namely: Kumasi metropolis<sup>1</sup>, Oforikrom municipality,

Asokore Mampong municipality, Asokwa municipality, Tafo municipality, Suame municipality, and Kwadaso municipality (Cobbinah *et al.*, 2019). For the purpose of this study, a few neighbourhoods with distinct characteristics were chosen to be analysed (Figure 13).

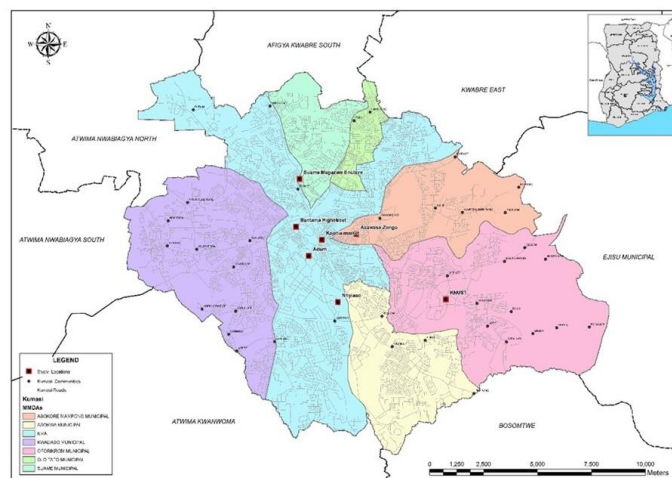


Figure 13: Explored districts in Kumasi (Courtesy Mapping services of Longitude 0 Group).

<sup>1</sup> Kumasi metropolis comprises of Nhyiaeso, Manhyia, Bantama and Subin

The administrative areas within the city play a significant role in the overall development of the city. Each administrative area has its unique characteristics, such as population density, economic activities, cultural practices, and physical features even though there are shared similarities. These unique characteristics influence the architectural styles and building materials used within the various administrative areas.

### **Subin**

The suburb is considered part of old Kumasi which had a major role in trade, commerce, and transportation. Though landlocked, the spatial designation of the British, fashioned Subin to be Kumasi's commerce centre. Hence, Kejetia, Adum, and its environs developed into the central business district within Kumasi. The commerce attribute led to the adaptation and retrofitting of old trading units through the conversion of house frontages into stores, banking halls, etc. Additionally, there was an emergence of low-rise buildings within the district to facilitate increased business activities. Consequently, as the population of the market grew, more market stalls were built for lower income groups. Newer entrants to the commerce district typically sold on the pedestrian pavement thus pedestrians and

traders competing for the right of way. However, in recent times, the Kejetia Market, one of the largest open-air markets in West Africa has been restructured into a post-modern design that features modern amenities that facilitates the movement of goods and people. The market's design incorporates open spaces that allow for the flow of air and sunlight, while also accommodating the movement of vehicles and people (Owusu and Owusu, 2019). The market may have inspired the increased design and construction of 'one-stop shop' shopping centres or malls in Kumasi, such as the Kumasi City Mall, Poku trading and Melcom, which hitherto was unfamiliar to the city. This may have catalysed the design and construction of contemporary buildings within the district (Afram and Olympio, 2010; Adarkwa and Oppong, 2006; Twumasi - Ampofo and Oppong, 2016). With its burgeoning commerce, transportation grew to facilitate trade. An example is the Kejetia market which features a transport terminal that provides a central point for the movement of passengers and goods to other parts of the city and beyond (Boamah, 2016). Due to its busy character, it houses one of the burgeoning red-light districts within the city. A common feature in this business-related district is the use of 'commercial district' (Figure 14).



**Figure 14: Aerial views of Kejetia market (Isham, 2022).**

### **Bantama**

Bantama is a suburb known for its nightlife and art spaces. Bantama had a racecourse, a Gold Coast sports delight (Kuukuwa, 2011), which has now been converted into a market, a far cry from what it was meant to be. The enclave features a myriad of architectural styles including low-rise Afropean architecture, populated with large family units located in courtyards. Due to its proximity to the central business district and key facilities within the city, it has inherently become one of the thriving night suburbs within the city.

Although the streets were designed to allow for the easy movement of people and vehicles, its inherited commerce attribute has resulted in double parking and umbrella stalls on pavements and some parts of the road. Although this may be a cause of traffic congestion within the city, it also provides opportunities for social interaction and entertainment venues. Consequently, commerce has sprawled on the sidewalks, which is a usual sight in business hotspot areas in Kumasi. This ‘fun zone’ quality also tends to make it a hub for petty crimes.

### **Nhyiaeso**

As a notable affluent suburb in Kumasi, Nhyiaeso has in recent years experienced

gentrification which has had an impact on the architecture and evolving identity of the area. The gentrification of Nhyiaeso has led to the redevelopment of old buildings and the introduction of contemporary designs intending to improve the quality of the built environment. However, a mere observation shows the construction of buildings that do not show identity or take cognizance of building sustainability. For instance, some old traditional and neoclassical buildings in Nhyiaeso have been renovated and converted into commercial and high-end residential spaces. The gentrification of Nhyiaeso has also led to the construction of new buildings, with many developers constructing high-rise buildings and modern shopping centres for middle- and high-income earners.

Although the impact of gentrification on the architecture of Kumasi and other parts of Ghana may be seen as a homogenization of contemporary architectural styles as experienced in other parts of the world, however, another perspective is the increasing spatial injustice these developments may create as shown in Figure 15. On the left is the Adiebeba area, and on the right is the True Vine area.



**Figure 15: Nhyiaeso Environs (Google Earth image, 2023).**

### **Suame**

Suame is known for its automobile manufacturing and repair activities; locally referred to as ‘suame magazine’ within

Kumasi. The magazine is a bustling district characterized by a unique architectural style that reflects the activities of its occupants. The district's architecture is primarily focused on functional structures

such as workshops, garages, and storage spaces that are created to accommodate the needs of automobile manufacturing and repair. These buildings are typically small, cramped, and informal, constructed with readily available materials, and characterized by minimal ornamentation (Agyeman and Appiah, 2020). The district's architectural style reflects the activities of its occupants and their focus on practicality and efficiency. This has also led to the emergence of a unique architectural style in the area characterized by makeshift structures constructed from waste materials such as shipping

containers, and old roofing materials (Buckley and Puckett, 2014) These structures are designed to serve as shelters for workers and are constructed with a focus on function over aesthetics (Figure 16). The planning of the area is organic, resembling the outline of the veins of a leaf as against its surrounding residential unit which is a grid and circular patterned. Due to the reverence for the dead within the Asante culture, Suame magazine does not encroach on the Tafo burial site. Thus, it becomes the only green space located within the dense enclave of the Suame.



**Figure 16: Suame Environs (Kenu, 2016; Kwaku28, 2011).**

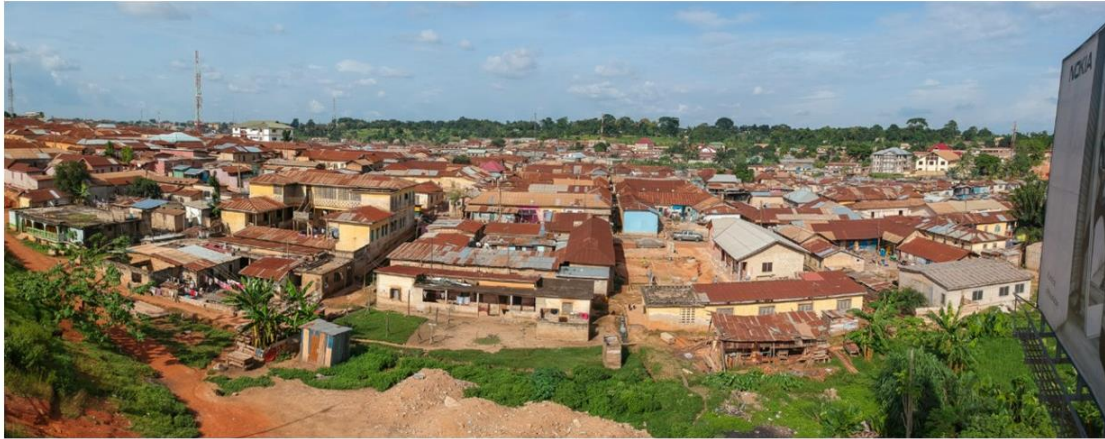
### **Anloga**

Within Oforikrom municipality, there are also 'immigration' enclaves such as Anloga, Lagos town. These enclaves have often developed around ethnic and cultural identities, and thus the emergence of distinct architectural styles and building practices in these areas (Baeyens, 2012). Moreover, immigrant enclaves have also contributed to the creation of vibrant and diverse public spaces. For example, the Central Mosque in Kumasi, which was built by the Zongo community, is not only an important religious site but also a popular gathering place for the wider community (Mohammed, 2018).

Mendis (2017) observed that immigrants from various parts of the world, particularly Europe and Asia, have settled in Kumasi, bringing with them their unique architectural styles. Hudson (2012) asserts that the fusion of different architectural styles has created a unique and diverse

architectural landscape that reflects the city's rich cultural heritage.

As a case study of an immigrant community, Anloga is comprised predominantly of the Ewe ethnic group which relocated to Kumasi after World War II from Eastern Ghana. The majority of these immigrants worked as carpenters and in the charcoal industry. They established the Ewe Migrants' Union as a self-help organization to provide some safety in an unfamiliar urban setting. This Union was able to procure a long-term lease of a piece of the stool land within Oforikrom municipality in 1951. This lease, within Asante, implied that it cannot be readily terminated. As Kumasi began to grow eastward after independence, several attempts to break apart the settlement for other redevelopment purposes have not been successful. Currently, it stands as an unplanned settlement stuck in time with old buildings as shown in Figure 17.



**Figure 17: Anloga Vista (Marful, 2017).**

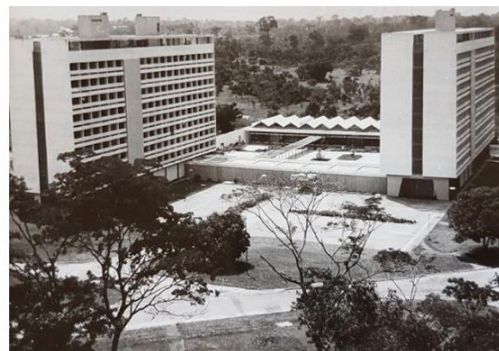
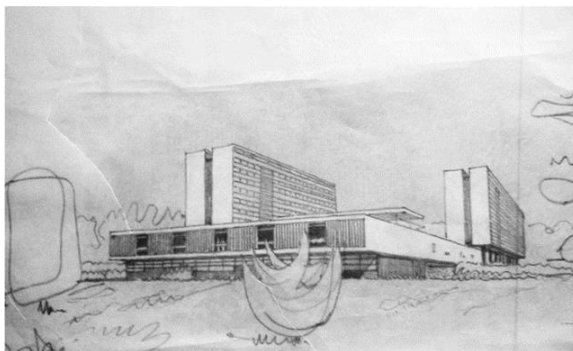
### ***Ayeduaase***

Within the Ayeduaase suburb is the Kwame Nkrumah University of Science and Technology (KNUST) which is the first science and technology institution established in Kumasi, named after the first president of Ghana. As a result of its status, the KNUST campus is littered with a mix

of modernist, post-modernist and contemporary architecture as shown in Figure 18-19. The university's design incorporates open spaces that provide opportunities for social interaction and recreation within the city, such as the KNUST Paa Joe Sports Stadium, Parade grounds, and other facilities on campus (Mensah and Adinyira, 2017).



**Figure 18: Senior Staff Club House, KNUST, built between 1961 and 1964 (Kwaning and Addo, 2020).**



**Figure 19: KNUST Continental Hall (Kwaning and Addo, 2020).**

## Asawase

Asawase is a neighbourhood found within Asokore Mampong municipal that has experienced rapid urbanization and a growing informal settlement population. Although the older areas of Asawasi are characterized by neat grid planning, albeit densely packed buildings and narrow alleys, the areas of Buokrom and Aboabo seem haphazard spatially and the

architecture is influenced by the socio-economic status of the residents. The lack of planning and oversight has led to unsafe and unsanitary living conditions, with many buildings lacking basic services such as running water and sewage systems (Figure 20). Additionally, the density of the housing and the lack of green space contribute to poor air quality and other associated environmental issues.



**Figure 20: Aerial view of Asawasi. 'New' Informal settlement circled in red.**

## ANALYSIS AND DISCUSSIONS

### Kumasi urban planning: challenges and opportunities

Kumasi is a historically rich yet fast-urbanizing city. This urbanization is influencing the state and character of the city. As a city based on the Garden City concept, the depletion of the green belt due to rapid changes in land uses is alarming (Figure 4), as green belts are important in regulating climatic conditions as well as providing shared public areas for recreation.

Old and new informal settlements that lack basic services such as clean water show the continued social disparities between the inhabitants of the city.

Moreover, the influx of diasporas and expats, or foreign nationals is resulting in gentrification in some suburbs of Kumasi

such as Ahodwo, although currently not a severe phenomenon.

It should be noted that although Kumasi seems to have established strategies to govern land use in the city, the enforcement of the strategies is lacking. Currently, due to this weak enforcement, it is not uncommon that buildings are constructed without proper planning and standard, including construction in unacceptable locations such as waterways and green open spaces (Sarfo et al., 2023). The laws must also protect vulnerable areas and ecosystems, such as areas along rivers, floodplains/wetlands (Amoateng *et al.*, 2018). To engender sustainable development of the built environment in Kumasi, by extension Ghana at large, stakeholders must ensure that the requirements outlined in existing policies i.e., National Building Regulations 1996 (Ministry of Works and Housing, 1996) and the Ghana Building Code (Ghana Standards

Authority, 2018) that shape and direct the construction and management of buildings in the country are adhered and enforced appropriately. As such, to enhance compliance, the formulation of future policies and regulations should incorporate adequate engagement of stakeholders, including ordinary citizens who are impacted by these laws.

As Kumasi is still growing, there is ample opportunities to rectify the situation by reviewing the current regulations and adjust accordingly.

### **Kumasi architectural styles: challenges and opportunities**

The Asante architecture, the original architecture style of Kumasi used locally sourced materials such as wood, mud, and thatch for construction. Locally sourced construction materials have lower carbon footprint and are usually economically more affordable. However, with urbanization and evolution of the city, the use of local construction materials has been decreasing, shifting towards cementitious materials, a major contributor of CO<sub>2</sub> emissions.

For an instance, data show that the use of sandcrete blocks for the outer wall of dwelling units increased steadily from 39.1% in 2000 to 57.5% in 2010 and 64.1% in 2021. Conversely, the use of mud bricks/earth declined from 50.0% in 2000 to 34.2% in 2012, and 29.6% in 2021 (Ghana Statistical Service, 2022).

However, advance in construction technology has brought new opportunities in the use of earthen materials, by increasing their compressive strength. For instance, construction using soil/laterite can be improved by adopting blocks such as interlocking stabilized soil blocks (ISSBs). Since ISSBs are produced using less cement, their carbon footprint is less than the sandcrete blocks which are now commonly used in the construction of both domestic and commercial buildings. Use of alternative binders such as starch from cassava root (Sanga *et al.*, 2022) and agricultural product

ashes such as rice husk ash and corn cob ash (Thiedeitz *et al.*, 2022) can also improve on the sustainability aspect of locally sourced materials.

Combination of earthen material for construction combined with an inner courtyard as seen in the Asante architecture style has also an effect on the regulation of microclimate and consequently energy efficiency and improved indoor thermal comfort. Use of architectural elements to provide shading as seen in neo-colonial and tropical-modernism architecture leads to passive temperature control and ultimately lesser carbon footprint.

Unfortunately, evolution of architectural style, has led to excessive use of glass and cementitious material and necessitates mechanical control of indoor climate. With technological improvement, however, these same façades can be integrated with photovoltaic systems that can be a good source of energy.

With all those challenges, fortunately, urbanization comes with an increased demand for construction and hence an opportunity to reverse the trend once the community is aware of environmental and economic costs of their choices. This, however, requires a more concerted effort from different stakeholders including those in the government and the private sector.

### **CONCLUSION**

The city of Kumasi has undergone an evolution in its planning and architecture style affecting its sustainability. The city shows land use changes that lean away from the garden city concept and massive depletion of urban green belts. Moreover, contemporary architecture styles use less locally sourced materials and less passive designs for indoor climate control. However, opportunities are in the use of construction technologies to improve the compressive strength of local materials, as well as integration of renewable energy sources such as solar photovoltaics on building facades for energy generation.

Since Kumasi is undergoing rapid urbanization and have a huge demand for



construction projects, enforcement of laws and regulations is important in regulating land use. Moreover, lessons learned from previous urban planning and architecture styles can be used as an inspiration for bringing sustainability to the city.

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