

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**COLLEGE OF ARCHITECTURE AND PLANNING**

**FACULTY OF ARCHITECTURE AND BUILDING TECHNOLOGY**

**DEPARTMENT OF ARCHITECTURE**

**KNUST**

**BUI DAM SITE DEVELOPMENT**

**(MIXED-USE DEVELOPMENT)**

A Thesis Report Submitted To The Department Of Architecture, Kwame Nkrumah  
University Of Science And Technology In Partial Fulfillment Of The Requirements For  
The Award Of Master Of Architecture (M. ARCH.)

By

Emmanuel Otchere-Darko

May 2009.

### DECLARATION

I hereby declare that this submission is my own work towards the M.Arch and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

Emmanuel Ofchere-Daniel      [Signature]      18th Sept, 2009

Student Name and ID

Signature

Date

Certified by:  
Dr. V. KOSTIN-SAMU      [Signature]      Sept 18<sup>th</sup>, 2009.

Supervisor(s) Name

Signature

Date

Certified by:  
.....  
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### **DEDICATION**

This design thesis is gratefully dedicated first and foremost to the Almighty God who has strengthened me throughout my studies on this thesis and secondly to my mother, Agnes Apraku whose encouragement and quiet charm have provided me with a gracious pillar of integrity, common sense, strength and achievement, upon which to lean. No son could ask for more!

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I am grateful to several people for their involvement in bringing this work to a completion. My sincerest thanks go to Dr. Kootin-Sanwu for supervising me through this project, I also appreciate the knowledge and skills I have acquired under his supervision. You never made me feel a 'subordinate student' but a protégé which I accepted with humility. I have gained invaluable training under your mentorship and my ability to perform as a professional can only be envisaged with the blatant obvious.



## ABSTRACT

Rising cost of energy. Shifting population demographics. Residential inequity. A highly ethnocentric populace that is always prone to conflict. The Bui Dam Project may be solving energy insufficiency in Ghana but at the same time has the potential to push the frontiers of development of Bui into a special economic development zone (SEZ). In the brink of oil discovery the nation is replete with forces to renew its commitment to economic and infrastructural development pushing simultaneously the development of the deprived three northern regions of the country by establishing Bui as SEZ.

This thesis posits that there is both the need and an inherent potential for the emergence of Transit Oriented Development (TOD) at Bui due to its strategic geographical location on the transport corridor of the country. TOD is a mixed-use development around a transit station with smart growth principles and its application in the proposed 'Bui City' will help solve the problems associated with congestion, housing deficit, and fragmented growth. Bui Dam Site has lain fallow ever since it was considered for a possible dam construction and the US\$622 million loan for the project has come at the right time.

The thesis analyses the factors for the possible development of a transit rail network through the 'Bui City', making it an interchange for travellers between the northern and southern part of Ghana. This is studied through a series of case studies that would be mapped and compared with a literature survey. This methodology is then tested on a selected site of the proposed master plan, where the confluence of the Black Volta and other site infrastructure makes an ideal site for a mixed-use (Transit Oriented) development.

Findings are then translated into a three-dimensional architectural expression.



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## LIST OF ABBREVIATIONS

BPA – Bui Power Authority

CAUPD – China Academy of Urban Planning and Design

EIA – Environmental Impact Assessment

ERM – Environmental Resource Management

ESIA – Environmental Social Impact Assessment

GTV – Ghana Television

HEPP – Hydroelectric Power Project

KPIs – Key Performance Indicators

MXD – Mixed-use Development

PUD – Planned Unit Developments

SEZ – Special Economic Development Zone

TND – Traditional Neighbourhood Development

TOD – Transit Oriented Development

ULI – Urban Land Institute



## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 PREAMBLE

The construction of the 400MW Bui Hydro-electric power project has necessitated a need for the regeneration of the Bui Township into an urban status. The Black Volta crossing between the Banda Hills (Bui Gorge) has not only become a viable source for the dam project but also serves as a great resource for tourism among mixed-use development in bringing Bui into a renewed existence.

Prior to the construction of the hydro-electric power project Bui has predominantly been a small town/village with settlers mainly engaged in subsistence farming (including fish farming). The town is under the administrative functions of the Tain District with Nsawkaw as its district capital. Ideally, Nsawkaw having been elevated to the status of a district capital would have enjoyed government funding in raising it to the model of a city. But the water resource of Bui would snatch that privilege off the town which prides itself with the district capital.

Currently greater portion of the land area of the Bui Township is covered with green vegetation with the Bui National Park on the north of the dam forming greater portion of the total land area. Though 26 percent of the 700 sq. mile Bui National Park would fall within the inundation zone on the upstream of the dam, the downstream on the other hand in the southern part would be the most viable location for a concomitant growth of a new city. The issues, however, associated with the creation of a successful city need a proper urban design approach and control not only to ensure the creation of a 'Bui City'

but also taking into account future sustainability in whatever decisions being made today at the design stage.

The China Academy of Urban Planning and Design (CAUPD) and Sinohydro Corporation, the planning team of the Bui City and the contractor of the dam have laid out a planning scheme of the city with an objective to making it a tourist destination without compromising on the main concern of making it a liveable place.

Based on the planning (policy-led) proposals for the Bui City, this thesis would seek to link the desired and proposed design objectives of the master plan to the pattern or layout of the environment with a clear statement of how these design objectives are to be met. The planning proposals might have been done but the essence of urban design would be met only when there is an arrangement of the urban design elements into three dimensional spaces over time and make the place liveable and sustainable.

To meet this challenge of urban design, however, there should inevitably be a mixture of economic, behavioural and aesthetic needs. This therefore calls for a series of performance guidelines to come up with a design that would be sensitive to the context of the Bui Township and at the same time is sympathetic with the needs of the inhabitants. These needs are possible and easily met in trying to achieve **Mixed-use Development (MXDs)**.

Mixed-use developments have been variations on Planned Unit Developments (PUD). On the larger scale the thesis design proposals, planned within the master plan of the Bui City, have been planned at the level of a Transit Oriented Development (TOD), not unmindful of the need to integrate the thesis proposals with the proposed master plan. It is for the reason to interpret the variations of mixed-use developments considering the



opportunities that Bui brings, that this design thesis concentrates on the Transit Oriented Development (TOD) within the proposals of the master plan.

The design of the TOD would help integrate segregated uses by activating urban areas during more hours of the day, increase housing options for diverse household types, reduce auto dependence, create a local sense of place, and among other benefits increase travel options, a condition complementary to tourists needs. This in the end can trigger the growth of the city while ensuring its sustainability for future generations.

## **1.2 DESCRIPTION OF BASELINE CONDITIONS (PROJECT ANALYSIS)**

The proposed 'Bui City' has been a welcoming idea with enthusiasm from the general public, business corporations, private industrialist etc. with its conception largely owing to the construction of the 400MW hydroelectric power generation plant at the Bui Gorge.

The dam project which has been *raison d'être* for the proposal of the 'Bui City' has been a viable project with the natural landscape element provided by the Bui Gorge which is located at about 400km northwest of Accra the Capital of Ghana and about 300km and 330km of the existing hydroelectric power generation plants at Akosombo and Akuse respectively.

The baseline conditions that Bui presents are so advantageous that the privilege of hosting the proposed 'Bui City' could only have been lost to any other place at an expensive choice. The expectancy of the 'Bui City' becoming a new growth pole is also confronted with the challenges of its environmental conditions whose potentials and constraints are to be turned into opportunities and possibilities.

### 1.2.1 Physical Environment

This covers areas of geology, seismicity, soils, erosion and sedimentation, landscape, topography, climate, hydrology, hydrogeology, water quality etc. It is based on these surveys that information collected can be presented in a form that will facilitate the processing, analysis and the design of the master plan for the 'Bui City'.

Geological surveys of the project area as contained in the final report of the Environmental and Social Impact Assessment of the Bui Hydropower Project as prepared by the Environmental Resources Management (ERM) reveals that the bedrock of the site is composed of alternated series of sandstones that vary from metric strata of fine-grained facies to beds of coarse-grained and conglomeratic type<sup>1</sup>. Like any other geological feature, surveys from Bui reveal the development of rock weathering which are within lows due to high quartzite content.

The groundwater occurrence and flow of the project area is controlled primarily by the presence of fracture zones in the bedrock and a thick weathered zone along the river bank with high secondary permeability in areas where there are well-developed fracture zones<sup>2</sup>.

The geomorphology, soils, water quality etc. clearly defines the land use pattern of the settlements within the project area including the Bui Township which falls within the Guinea Savannah woodland ecological zone which is basically under the influence of the Sudanese climate characterised by pronounced wet and dry season. Majority of the people are therefore engaged in the farming of food crops such as yam, maize, cassava, tobacco, groundnut, rice, legumes, millet, guinea corn, cotton, tiger nuts, vegetables and cashew nuts.



### **1.2.2 Biological (Natural) environment**

The wide range biodiversity of flora and fauna within the project area are much concentrated at the Bui National Park which primarily consists of Guinea savannah woodland and rich riparian gallery forest along the Black Volta<sup>3</sup>. Even though it is not within the scope of this thesis to discuss at great length the Environmental Impact Assessment (EIA) of the hydroelectric power project, it is important to note that a great deal of biodiversity will be lost and the habitats of wildlife including hippopotami, buffalo, waterbuck, kob, oribi, dulkers, warthog, porcupine, four species of primates, serval, gent, cive, leopard, crocodiles, monitor lizard, turtles and a variety of snakes will be under threat.

The sparsely inhabited lands, the forest reserves and the Bui National Park as well as the riverine woodlands along the Black Volta and its tributary rivers and streams, harbour limited number of game where hunters visit especially in the nights to poach the games and prepare the carcasses for sale in the local markets or those of big towns away from the project area. The available game hunted for includes, monkeys, buffalos, duikers, antelopes, birds reptiles etc.

### **1.2.3 Socio-economic environment**

Social concerns among the issues of health and economic impacts are assessed considering factors such as permanent displacement of settlements, loss of land and natural resources, pressure on social networks and social infrastructure, increased health risk, economic changes, loss of or pressure on water resources and inducement of development around the reservoir perimeter among other factors. Mitigations of these social impacts are outlined in a Resettlement Planning Framework. Over 1720 villagers

would lose their lands and accommodation and has been resettled in the Gyama village with some more yet to be resettled.

Most of these ousters are farmers and they would lose most of their lands on which they cultivate their crops. Most of these lands are lost permanently to the Bui Hydroelectric power project. With the creation of the reservoir most of the villages under permanent displacement would be Bator, Bui, Brewohodi etc. Among impacts associated with the displacement and resettlement are the permanent loss of natural resource-dependent livelihoods, loss of other livelihoods including wage based employment such as teaching, loss of household and community infrastructure including healthcare facilities, loss of cultural properties such as cemeteries, sacred sites etc, disruption of social and economic networks, and last but not least impacts on the host communities.

#### **1.2.4 Archaeology and cultural heritage**

The dam construction and the building of the Bui City might render some archaeological and cultural features being lost in the process. The inundation zone (reservoir) extending 40km upstream would flood an area of 440km<sup>2</sup> which in effect would bury possible archaeological artefacts of cultural significance. According to the Final ESIA – Bui HEPP by ERM, archaeological reconnaissance suggests that there are a number of Neolithic, Iron Age, and later archaeological sites, in the area of the Bui Project. The project area has not been subject to extensive archaeological investigation, but it is clear that in the past, the basin of the Black Volta River was an important ecological niche and a significant habitat for several ethnic groups and cultures. The sites documented during this study date from the Neolithic (Late Stone Age) to the Iron Age, through the Portuguese period (circa A.D. 1000-1637), to the later historic periods of the 18th and



19th centuries. Later archaeological sites include abandoned settlements, indicated by individual and clusters of mounds, and ancient cemeteries<sup>4</sup>.

It is estimated that ancestral sites, indigenous iron production centres, features and material remains, due to the dam construction would be painfully lost, a loss irreplaceable.

The consolation would be the mitigation measures which would centre on 'salvage archaeology' to obtain an adequate documentation of and samples from a selected number of areas.

Among the cultural heritage under threat of disappearance are shrines, old and contemporary cemeteries, burial inside homes or in open spaces in the settlement, and old settlement sites.

The Resettlement Planning Framework by ERM stipulates that sufficient attention must be paid to the effects of resettlement on the loss of culturally valued sites, and to displaced people's reactions.

### **1.3 PROJECT BACKGROUND**

Bui has become a household name in Ghana since the colonial days in the 1920s when a feasibility study on the Black Volta revealed the viability of a hydro-electric power generation between the Banda Hills (Bui Gorge).

Successive governments after independence from the British have tried to bring the project into reality but could not source the needed funds for execution. The Government of Ghana under the leadership of President J. A Kufuor has been able to successfully negotiate for a US\$622 million loan facility for the construction of the Bui dam and Bui City. This investment is the second largest single investment in the history

of the country after the Akosombo Dam and it is to help improve upon the generation, transmission and distribution of electricity and create a new growth pole for economic development.

The US\$622 million loan facility is largely contracted from China Exim Bank and the Chinese Government for the Bui Dam construction and is to be built as a Build-Operate-Transfer by Sinohydro, the contractor of the project. It is estimated that the dam construction will foster the social-cultural and economic development of the Bui Township, hence, the proposals for a new Bui City.

The project is also not unmindful of the concerns of conservationists as it tries to solve the energy insufficiency problem that the country is faced with. There have been concerns raised by environmentalists about the loss of biodiversity and the threat to ecotourism with quite a number of the primates and hippos population being displaced and lost due to the reservoir of the dam construction.

The construction of the dam has also come at a high price with as many as 2,600 people displaced and who are expected to be relocated, albeit facing the loss of fishing grounds and the danger of schistosomiasis. They have since been resettled in Gyaman, the new community for these ousters.

It is partly for this reason that it has become relevant for the provision of mixed-use development through an integrated approach in the midst of anticipated economic, commercial, civic and industrial growth. MXDs will serve as a catalyst for the growth of the new Bui City and with its water resource holds the potential to be developed into a tourist destination.



#### 1.4 PROBLEM STATEMENT

During the period of world history known as Renaissance, human civilisation emerged from the dark ages to embark upon a new era of human achievement and progress some consider to be unparalleled even today. Extraordinary advances in the arts, sciences, literature and politics were all driven by the underlying notion that human capability is limited only by the reach of the imagination. It was an age defined by names like Da Vinci, Michelangelo, Palladio, Medici, and Farnese. It is important to understand that perhaps their greatest asset was also their greatest achievement: The Renaissance City. The City was intrinsically linked to her citizens by mutually supportive bonds that promoted the betterment of both. As such, the Renaissance City was built simultaneously as the expression of the age and as the crucible from which sprang forth the achievements that defined the age. The worthy merchant families of the time shaped the buildings and spaces that today, centuries later, are as inspirational and delightful as they were when they were built. These cities remain a living and breathing testament to the enduring value of great city building<sup>5</sup>.

Today, most cities in Ghana planned in the colonial and post-colonial periods have one way or the other either failed or could not live up to their master plans due to either poor policy guidance or ineffective management and execution planning framework. The few that can be quoted and by far the most ambitious project is the Tema township development which the first President of Ghana commissioned a Greek firm to develop. The execution of the proposals of the master plan in the latter phases of the project suffered from a poor policy-led direction in the approach of the execution and development of the Tema Township.

The proposals for the Bui Township on the other hand may be the next kid on the block but wouldn't be immune to the failures that Tema has gone through unless there is an effective policy-led approach to achieve the master plan proposals. Bui is to be dedicated as an industrial and special economic zone which extensively is to be built on the mixed-use development where industrial, housing, education, and other civic functions/activities intercept each other in a more harmonious and subtle manner. The mixed-use design approach for the development of the Bui master plan may come in different forms and approaches among these are the Traditional Neighbourhood Development (TND), Transit Oriented Development (TOD) etc. These mixed-use development approaches occurs at different levels and scales with the Transited Oriented Development (TOD) occurring at a wider scale than the Traditional Neighbourhood Development (TND). Geographically positioned on the mid-way of the north-south transport corridor of Ghana and also closer to the border of neighbouring La Cote D'ivoire, Bui has a tremendous potential to harness the forces of Transit Oriented Development. Due geographic potentials of Bui, it is assumed that TOD would be the easy on the pocket having comparative advantage over the other forms of mixed-use development which would be reviewed in later chapters of the thesis.

## **1.5 PROJECT JUSTIFICATION**

### **1.5.1 The need for energy sufficiency**

The Ghanaian government's renewed interest in the Bui hydropower has come at a time when the Akosombo Dam has been at record lows since August, 2006 with serious ripple effects on the economy. Bui has always been the choice for the hydroelectric power project in the midst of other proposals. Unlike thermal generation of electricity



where there is often significant flexibility in the siting of the plant hydro-electric facilities are under the mercy of natural features of the landscape for the most advantageous siting. Thus there is limited opportunity to select an alternate site on the Black Volta for hydro-electric power generation.

### **1.5.2 Northern Development**

It has been the apprehension of the Ghana Government on the issue of economic disparity between the poor northern (Northern, Upper East and West Regions and some parts of Brong Ahafo) and middle income southern sector. With the Bui Dam as the catalytic agent the Government of Ghana is taking this opportunity to develop the Bui Township into a model city to energise the economic dullness of the deprived north. This will make the northern sector of the Ghanaian economy cease to be a 'lame duck' to becoming an active player and contributor to the economic development of Ghana.

### **1.5.3 The discovery of oil resource**

In the brink of oil wealth following the July 2007 discovery and the country poised for accelerated growth, a massive infusion of capital into the Bui City is required in order to undertake the necessary infrastructure to facilitate its growth. This in succession will bring new experience to the Ghanaian Economy to strengthen its ability to offer choices within the diversity of its cultural landscape. Inadequate funding has always been the alibi of government to satisfy the many economic challenges facing the country and the oil revenue expected to be accrued to the country can catapult the regeneration and growth of the Bui Township into a 'Bui City' with special central government attention and funding. The discovery of oil in commercial quantities therefore could not have come at a more opportune time.

#### **1.5.4 The dam serves as a catalyst for developing a new city**

The Bui hydroelectric power project has necessitated a concomitant growth pole where a creative, modern and model city can be built. The anticipated Hydropower base can be the backbone enough to support a new city which will assume the role of a Special Economic Development Zone (SEZ), regional tourism service base and agro-base agriculture, education and training base. All these together makes up a city ready to meet the traverse infrastructural and socio-economic challenges that has bedevilled the northern Ghana and the nation as a whole.

Like old cities planned in Ghana with most reference to the Tema Township zoning practices assigned land uses according to function - houses were segregated from commerce, work, and school. During these periods finely mixed land uses were rare in new developments in Ghana.

However, in the 1960s and 70s all over most parts of the world mixed-use re-emerged, as a tool for urban revitalisation in large-scale projects referred to among the development community as Mixed-use Developments (MXDs)<sup>6</sup>. With mixed-use development proven to be one of the most effective town planning approach, the Bui Township developed on this approach is warranted based on the following benefits;

- There can be significant functional and physical integration of project components within the master planning of the township
- To activate 'urban Bui' during more hours of the day – a key significant factor evident in industrial towns and special economic zones



- With the timeless disparity in income levels among community dwellers Mixed-used Developments MXDs increases housing options with diverse household types for different income earners.
- In the reduction/absence of high/motorways which comes along with zoning practices, mixed-used development reduces auto dependence making the city a walkable place
- There is increases in travel options under mixed-use development
- Mixed-use development creates a local sense of place

## 1.6 OBJECTIVES

- To create a creative, modern and a model city that will not only be a hydro power production base but also a regional tourism base
- To develop a city that would serve as an industrial and Special Economic Development Zone (SEZ) that would provide mixed-use development in the areas alternative housing choices, manufacturing, social and cultural developments, education and research and tourism etc.
- The expectation is to industrialise and with time transform Bui from manufacturing to a service base hub within Ghana by providing the necessary educational and research infrastructure.
- To develop a rail network as an alternative means of transport to the conventional vehicular transportation for the Bui City thereby linking the city to the rest of the trading towns such as Techiman, Wenchi and Kintampo and for that matter the whole country

- To take advantage of the geographic position of Bui by turning it to a transit centre on the northern-southern transport corridor of Ghana.

### **1.7 SCOPE**

Considering the geographic potentials of Bui, the thesis will be focusing on the design of mixed-use development that will be transit oriented. The correlation between the construction of the Bui hydroelectric power and the development of the Bui Township would be expressed with detailed architectural design proposals of a mixed-use development that will be transit oriented. This would be preceded by reviewing parts of the existing proposals of the Bui master plan. There would be considerations for transit user needs such as pleasure, business, retail/commerce, accommodation, park-and-ride (parking) etc.

In addition to the mixed-use facility being developed around a transit station, proposals for the use of train as an alternative means of transport would be discussed to ascertain its viability and the necessary mitigation of these new proposals would be considered.

The proposals of the thesis would be within the range of the transit needs for both travellers in transit, tourists and holiday-makers, businessmen etc. with the design of detailed three dimensional architectural expressions.

### **1.8 TARGET GROUP**

The civil institutions, the corporate body, businessmen, tourists and holiday-makers etc. who come to transact business, administer offices, trade, entertain and relax etc. The target group will also include people who come to Bui as visitors or people in transit between the northern and southern transport corridors.



## 1.9 CLIENT BRIEF

The client brief of the mixed-use facility covers the areas of business, transportation, recreational, tour and pleasure needs of users of the facilities.

### 1.9.1 Client Intention

The client wants the facility to serve in diversity the needs of businessmen, travellers, visitors and the Bui community members where they can derive the satisfaction they desire.

### 1.9.2 Client's Space Requirements

#### A. Major facilities

##### Transit Tower (Primary spaces)

- Department store/supermarket
- Police station
- Bank/financial institution
- Retail business
- Conference hall
- Restaurant/cafeteria
- Clinic/specialty
- Office spaces to let

##### Transit Tower (secondary spaces)

- Security
- Reception/control/check-in
- Atrium

- Waiting area

#### Transit station-train (primary spaces)

- Ticketing / Information Counter
- Manager Office
- Café / Seating Area
- Toilet Rooms (men and women)
- Covered Waiting Area
- Vending / Automated Teller Machines

#### Transit station-train (secondary spaces)

- Waiting Room for 100 Passengers
- Seating Area
- Transition Space
- Storage
- Security
- Elevator
- Elevator Machine Room
- Egress Stairs
- Building Mechanical

#### Boat basin and park (primary spaces)

- Esplanade



- Pleasure navigation berth
- Spa/health club centre
- Eating area
- Ticketing

#### Boat basin and park (support/secondary spaces)

- Waiting Room for visitors
- Seating Area
- Storage
- Security
- Egress Stairs

#### Multi-story car park (primary spaces)

- Parking spaces
- Driveways

#### Multi-story car park (support spaces)

- Security
- control/check-in
- elevators
- Egress Stairs

#### General ancillary spaces

- Toilets/washrooms
- Elevator Machine Room
- Kitchen/pantry
- Staircases/elevators

**LIBRARY**  
**KWAME NKRUMAH UNIVERSITY**  
**SCIENCE AND TECHNOLOGY**  
**KUMASI-GHANA**

- Lobbies/foyers
- Corridors

#### General Service spaces

- Plant/mechanical room
- Stores
- General plumbing works

#### **1.9.3 Source of Funding**

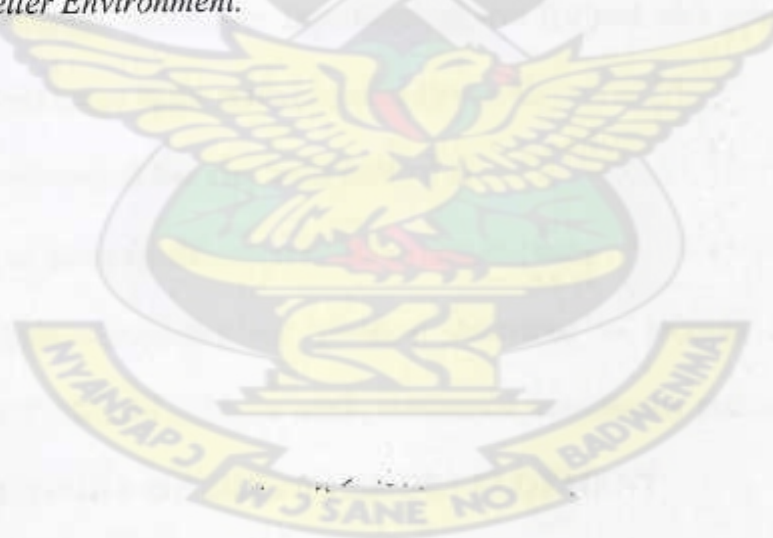
About 30% of the project is funds raised by Government of Ghana from a special fund set aside from the expected oil revenue. The corporate businesses will be funding the other 70% as a private investment with ROI utterly worthwhile. The funding of the MXDs project is generally a private-public partnership.





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## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

#### **2.1 MIXED-USED DEVELOPMENT**

There have been various attempts to define mixed-use development within the development community of which the Urban Land Institute (ULI) came out with its definition of Mixed Use (1976) as;

- integration of project components
- Development in conformance with a coherent plan.

In the Issues and Best Practice, a report by Twin Cities LISC and The Neighbourhood Development Centre, Mixed-use Development was defined as a project with Housing and Commercial space in the same physical structure.

Mixed use development has also been defined as

- Three or more significant revenue-producing uses
- Significant functional and physical described to include a range of many different uses, for example retail, residential, community and entertainment<sup>1</sup>.

#### **2.2 HISTORY OF MIXED USE DEVELOPMENT**

Finely mixed use was the norm before the development of modern zoning and land-use practices. Such mixed-use commercial and residential areas thrived into the twentieth century, often at intersections and transit stops. Modern zoning practices assigned land uses according to function.

Houses were segregated from commerce, work, and school. From the 1910s through the 1950s finely mixed land uses were rare in new developments. In the 1960s and 70s mixed use re-emerged, as a tool for urban revitalization, in large- scale projects referred



to among the development community as Mixed-use Developments<sup>2</sup> (MXDs). In the late 1970s and 80s, mixed-use developments were built on smaller scales than older Mixed-used Developments (MXDs) and Planned Unit Developments (PUDs).

They also were more integrated with their urban contexts, as interest in historic preservation grew.

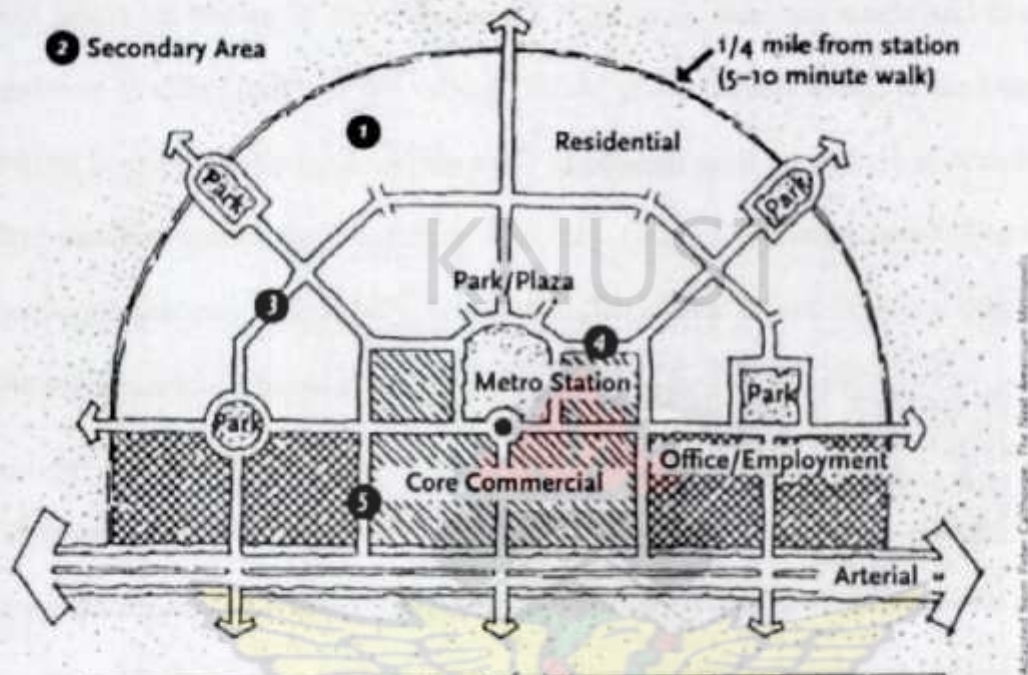
### 2.3 MIXED-USE SCALES AND ISSUES

Mixed-use development may be either vertically and horizontally oriented or both and this may occur and be developed at a range of scales as defined by Nancy A. Miller, Design Centre Research Associate and Jeff Miller, Design Centre Research Fellow in 'Defining Mixed-used Development', Design Pointer, Number 3 / December 2003:

- **Mixed-use Buildings;** where a single building block combines the diversity of building uses ranging from retail, commerce, residential, services etc. This scale involves a vertically mixed-use typology, such as multi-family residential use above a retail use.
- **Mixed-use Parcels or Sites;** this generally may involve the planned unit developments or the traditional neighbourhoods where cluster of buildings on different property lines offer complementary building uses with each other within walking distances. For example a neighbourhood with individual buildings offering users needs ranging from retail, residential etc. This design scale provides for parcels where the mix of uses is developed horizontally, such as an apartment complex adjacent to a retail centre.
- **Mixed-use Walkable or Transit Area;** a mixed use development within  $\frac{1}{2}$  or  $\frac{1}{4}$  mile radius where various user needs can be accessed within 10 minutes walk.

This horizontal development is normally developed around a transit station where the rails pass through the heart of the city, with the needs of travellers and visitors developed around the transit centre.

## Transit-Oriented Development (TOD)



*Fig. 1 TOD schematic diagram showing the core and an edge*

Mixed-use development in its miscellany of scales can further be described under the following issues;

### 2.3.1 Intensity of Development and Density

Mixed-use neighbourhoods have become an incentive and for that matter city centre living has become more desirable. This calls for the need for more buildings, residences, shops, and services to be closer together for ease of walking, to enable a more efficient use of services and resources, and to create a more convenient, enjoyable place to live. The separate scales and issues of MXDs are applied at the full range of densities from towns, to large cities, where the scale is being determined by the facilities and services



provided – how easy it is to be accessed by residents in terms of the distances they need to cover.

### **2.3.2 Mix of Housing**

In the mixed-use neighbourhood design there is the provision of a range of types, sizes and prices of houses in closer proximity. This is to meet the needs and answer the question of affordability to the various income group earners living in the community. Mixed housing mostly occurs at the scale of planned units on parcels of sites to ensure that dwellers within the community find their class of accommodation. The different housing types may individually, however, differ in density one from the other to meet the accommodation needs of the community.

### **2.3.3 Walkability**

This underlines the principle of planning mixed-use facilities within walking distances from the residences where community dwellers can access retail, commercial and other services. Walkability is facilitated by pedestrian friendly street design, where the street is considered as a 'place' rather than a 'way'. The issue of walkability is reflected more in the neighbourhood planning rather than the urban block. Walkability emphasises the scale where the city centre becomes a neighbourhood with an edge and a centre. By undertaking a movement assessment will form the basis for creating the street pattern with more considering some factors for enhancing walkability. Factors for consideration to making the street a 'place' for commuters as enumerated by Llewelyn-Davies in the 'Urban Design Compendium' are safety, air quality, kerb design, pedestrian crossings, segregated paths, over bridges, underpasses, noise, pollution, visual amenity, variety in visual amenity, pavement congestion, quality of pavement, cycle facilities etc. With all

these considerations addressed, then will the neighbourhood be designed for easy of walking.

Local facilities bring residents together, reinforce community and discourage car use. So the first component of the issue of walkability should be the walking distances from facilities. The quality of the route is important, especially where there are obstructions such as busy roads or railway lines. To give walking priority means putting the everyday experience of the street first on the agenda<sup>3</sup>.

It continues that people should be able to walk in 2-3 minutes (250 metres) to the post box or telephone box: the newsagent's should be within 5 minutes (400 metres). There should be local shops, the bus stop, the health centre and perhaps a primary school within a walking distance of (say) 10 minutes (800 metres).

According to Llewelyn-Davies, mixed use development can be best promoted by using the distance most people will walk to daily facilities, the corners shop or the bus stop as a starting point. He continues to emphasize that a widely used benchmark is for mixed development neighbourhoods to cover a 400m radius, equating to about five minutes walk. This translates into 50 hectares.

Walkability as an issue should inform the scale at which MXDs are built mindful of how the neighbourhood is overlaid on an integrated movement framework and conceived as a piece of town or city whose activities and forms overlap. When this is done the neighbourhood becomes more compact, hence walkable.



***Fig. 2 Transit access***



The American Plaza in downtown San Diego, CA Metropolitan Transit Development Board (MTDB) in San Diego has TOD projects and plans in place at over 15 of the system's 49 light-rail stations



***Fig. 3 Walkability and pedestrian friendly streets***

#### **2.3.4 Transit Access**

The issue of transit access in mixed-use development emphasizes the integral and complementary role transport plays in cities and communities. People need to move from one place to the other to transact business or for the pleasure of it. There is the need therefore for MXDs to be created at human scales making it pedestrian oriented. In several instances transit provisions have been given the necessary priority in MXDs with examples all over the world some of which will be looked into much detail in subsequent chapters of this report when discussing Transit Oriented Development.

Transit access has been made paramount in cities with communal goals of promoting public mass transport in order to downplay the use of individual automobile in the city. There cannot be thriving MXDs with a pedestrian friendly design when there is much role of automobile in the community. When this happens the community ceases to be walkable. The mixed-use designs should make provisions for transit stations that would

encourage people to drive less and use public transport more. There should be park-and-ride options for a situation where people would have to drive to the city centres.

To identify transit access opportunities, mixed-use developments should consider optimum routes that will serve the community without causing delays to services that also serve other neighbourhoods<sup>4</sup>.

### **2.3.5 Parking**

Albeit automobiles are not given much role in mixed-use developments, space for their stationary as is most in the case can be a major factor in the quality of MXDs. Llewelyn-Davies suggests that having decided what level of parking provision to make, the main consideration is how to incorporate parking in a development without allowing it to dominate everything around.

Mixed-use developments can further encourage walkable environment by making parking provisions for cycles as well.

Adequate parking spaces are likely to be necessary to make a mixed-use centre work. The amount of land allocated to parking can be minimised by sharing parking between business and shopping (mostly in the daytime) and residential (full allocation needed in the evening).

Parking should be convenient, but should not be allowed to dominate the street. Well designed, on-street parking which is integrated to the street and broken up with landscape and street furniture can help encourage use of the street and liveliness at all times of the day. Pedestrian-only streets can be underused and may be perceived as being unsafe in some locations. (Llewelyn-Davies)



To much extent the space and level of parking is determined by the use and building the function of a place. Among the issues of parking and servicing which Llewelyn-Davies enumerates are; parking standards (keeping parking levels down), positioning parking such as parking behind, above or to the side of the building, keeping cars in view, parking next to the house etc. Car parks have other measures to consider, that is, divide up the commercial car park, consider basements and multi-storeys etc.

In MXDs there is the need therefore to accommodate adequate and appropriate car parking levels to meet the needs of the users without dominating or detracting from the external environment.

### **2.3.6 Environment and Open Space**

The environment should be designed to promote positive social interaction and a feeling of community. Like buildings occupy spaces defining their autonomy of the space with its elements, likewise open spaces are clearly defined by elements of pedestrian use such as pavements, parks, and other landscape elements. The expectation is that quality landscape and mixed-use development should go hand in glove. Llewelyn-Davies believes that the landscape, development block, and movement framework are the three main design elements of an urban project of any scale. By landscape he refers to many things; it is the open space, water, movement corridors and way-leaves; it is parks, squares, and streets; it is the street furniture; it is hard and it is soft.

The environment as a living and habitable space is the composite of the elements that gives the city its form and structure, and open space planning, its typology hierarchy, function and frequency of existing and desirable facilities. In the creation of a mixed-use environment, there should be proper open space considerations ranging from design as

enumerated by Llewelyn-Davies – such as the provision of a variety of open space types, creating a park life etc. There should also be considerations give to public access to open space as for example creating parks within walking distances. Open space networks should connect spaces as they are useful for visual amenity, recreational use and wildlife corridors than isolated and unrelated landscape elements.

It is said that plenty of open space and shared communal space makes these places feel spacious and the environment becomes worth living.



*Fig. 4 Open space promotes neighbourhood interaction*

## **2.4 ACHIEVING MIXED-USE DEVELOPMENT**

Cities are formed to allow a variety of people to come together to trade, to meet and to interact. Good urban design creates an environment that attracts a variety of users to interact with a variety of uses in a vibrant place that is successful socially, economically and environmentally. A stream of different users throughout the day and evening help to make bustling, diverse, safe places. Locating a mix of uses within a neighbourhood can



promote sustainability through encouraging walking to shops and facilities, providing a critical mass of customers for local businesses, creating opportunities for people to work locally, and making places for a wide range of people to participate in activities and meet each other. Mixed-use neighbourhoods have become the default, and city centre living has become acceptable and desirable. Despite this, there remains a need for a wider understanding of how mixed-use developments can be designed, promoted and managed effectively. To be successful, mixed-use centres must be in the right place, with the right connections. They should be designed in the light of the needs of all users in accessing and using the services. Flexibility of use should be built in so that buildings can adapt as needs change. These principles apply at a range of scales from mixed use buildings and neighbourhood centres to multifunctional landscapes. (Llewelyn-Davies)

In trying to achieve development, however, a set of principles were developed after each set of experimentation by Alison Hammer as follows;

1. Connect with all available transport infrastructure and bring in more if possible
2. Create a singular environment that possesses a unique identity and brand, providing a competitive advantages over other local areas
3. Integrate the project with its immediate surroundings, both physical and community
4. Create value for local residents through meeting their local needs and incentives
5. Act sensitively to the local environmental conditions, and remediate where possible
6. Establish a framework and programme mix that is both equitable and flexible
7. Parking and the road network must directly and conveniently link into the project

The thesis is will consider these principles as the base benchmark for the development of the Bui City which is reviewed in the case studies as follows;

## 2.5 CASE STUDIES (LOCATING USES)

The proposed Bui City master plan is reviewed based on the standards and guidelines espoused by Llewelyn Davies in the urban compendium

To locate uses within mixed-use development certain considerations need to be addressed as has been reviewed below.



**Fig 5. Showing the functional relationship of the proposed master plan**



Before Bui can be considered a city it should reach a certain population over a period of time and from Table 1 below the growth rate of the scale of expected development.

Development Stage	Population	Urbanized Area
Pre-city Period	3,000	0.5-1 km <sup>2</sup>
The First-five-year	10,000	2-3 km <sup>2</sup>
The Second-five-year	50,000	10-12 km <sup>2</sup>
The Third-five-year	100,000	16-20 km <sup>2</sup>
The Fourth-five-year	200,000	35-40 km <sup>2</sup>

*Table 1. Showing the development scale of proposed master*

### 2.5.1 Movement and land use;

It has been said, traditionally, that towns and villages evolved at the most accessible locations such as river crossings and road junctions. Their form was often dictated by the dominant route. This became possible due to the activities that revolved around these routes. This is true about the development of the Bui Master Plan as the form is shaped around the Black Volta. It became the centre of activity in the everyday life of the people. In the modern town where there are more commercial activities, the creation of the 'centre' of such activities needs therefore to be approached with the unyielding urgency to create a comfortable 'breathing space'. When designing such new places, consideration is given to locating uses which require the most footfalls (such as retail) in locations which are the best connected to the surrounding street structure. It should be noted that connectivity is different to centrality.

A site may be central, but if it is not well connected it will not have high footfall unless a 'destination' attraction is contrived. Other uses will gravitate to locations that are less well connected. These might include some residential development which seeks to offer seclusion.



**Fig 6. Black Volta shapes form of the proposed master plan**

#### **2.5.2 Multi- use Centres;**

Mixed-use developments have different land uses with various functions on each parcel of site ranging from residential, retail, open space etc. and these multi-use centres may be easily accessible and served by well-designed public spaces. To achieve this Llewelyn-Davies suggests they should be:

1. At the junctions of movement routes, or on a route to another destination.
2. Served by public transport
3. Orientated towards the street and visible from it
4. Easy to access and pleasant to use
5. Adjacent to a community facilities, if possible
6. Convenient for parking, unless in a city centre location





**Fig. 7 Multi-use centres of the proposed master plan**

Multi-use centres have the movement pattern and access to the individual parcels as the shared embodiment of the 'centre'. The Bui Master Plan has been carefully planned to meet the suggestions made. This is illustrated as below.

### **2.5.3 Multi- function Neighbourhoods;**

According to Llewelyn-Davies, most neighbourhoods will need a residential component if they are to be safe and secure throughout a 24 hour day. Even though different uses may exist in the neighbourhood these may be overlaid on this residential base and, in central locations, may dominate. Districts may therefore be characterised by uses such as shopping, local services, business to entertainment but also need to function as residential communities.

The uses within a neighbourhood are layered. The best urban design interventions identify and foster the different layers at which the neighbourhood works. There is the urgent need to identify uses which are complementary and those which may have contrasting needs, and locate them in the most appropriate locations.



***Fig. 8 Multi-use functional neighbourhoods the master plan***

#### **2.5.4 Multi- function Landscapes;**

Landscapes as part of physical elements that form the urban structure are not only present to be seen but as major components of MXDs if well managed will surely become a new centre of the town or community. With the determination of location, size and boundaries should therefore be associated with the duty of arranging new trunk routes of communication between it and the distant parts of the community existing and forecasted.



Landscapes can simultaneously serve a number of functions which may benefit from their overlap. A landscape may provide habitats, resources such as water or food production, and recreational amenity.

## **2.6 MIXED-USE CENTRES**

To achieve mixed-use development where the different land use play complementary role to each other, the mixed-use centre should be located strategically in a way that does not out distant it from the user and at the same time does not predominate over the other land use functions. This can be achieved by observing the following;

### **2.6.1 Community Facilities**

As the community grows provision of adequate communal user needs becomes inherently imminent as the joint role it plays can in no justification be underestimated. Their presence in the community symbolises equality and how gregarious and unreserved the community is and give accent to the need of sharing. This goes a long way to emphasis the sense of place and a common living among the people, that, irrespective their social class, community facilities are there for members of the community to meet regardless of their social class as for example in parks and other social places.

There is the need therefore to try and establish meeting places for the community at the heart of the mixed-use scheme, preferably at an early stage. Where the residential population is growing, temporary accommodation might be provided, such as a small shop unit, which could revert to its intended use as the neighbourhood grows.

### **2.6.2 Convenience shops and services;**

Special consideration is needed to deliver mixed-use centres in new neighbourhoods where phasing and investment on return need to be addressed. Residential density needs to be appropriate to make mixed uses viable. Among the key facilities considered for viability are education, health and community, retail, transport etc. Convenience shops and services require sufficient population within a five to ten minute walk (400 to 800 metres). Residential areas can support a significant floor area of convenience goods and services. Every effort should be made to retain as many of these uses as possible within the neighbourhood. This can be aided by ensuring that densities are compact, the quality of the services, and both the quality and convenience of the built environment, are right. The provision of a mixed-use centre can reduce car use and make it possible to provide live/work homes in the immediate area<sup>5</sup>.

### **2.7 MAKING MIXED-USE CENTRES WORK**

In a new neighbourhood, the range of facilities ultimately needed is unlikely to be viable at the early stages of the project. Here it will be necessary to consider how a mixed-use centre can begin to be provided early on. Avoid leaving premises empty and plan for both short and long-term occupation. Increasing the number of facilities or opportunities available and accessible to potential occupiers or users in a new development will increase how they perceive the quality of life that the place offers. A high quality environment will enhance property values and may lead to the place becoming a destination attracting people from outside the area. They in turn, will make the mixed uses increasingly viable.



### **2.7.1 Rentals and Cross-funding**

An initial financial appraisal may suggest eliminating low or non-revenue producing uses to increase profitability. However, providing facilities such as convenience shops, services and cafés can considerably increase the attractiveness of a location. The cost of including small commercial units at low rentals, or with rentals related to turnover for the first few years, might be cross-funded from the enhanced values of surrounding residential or office development. Specific occupiers might be targeted to kickstart a centre. In most community development essential facilities may need to be secured with the backing of legislative instruments as for example by section 106 agreements in the Housing Corporation of the English Partnerships, which require the developer to provide these facilities at agreed trigger points such as building completion. There are, however, major benefits for both developer and community in promoting mixed uses. Planning obligations should be seen as only part of the solution.

### **2.7.2 Buildings with Flexible Uses**

Live-work units which permit business or residential uses on the ground floor may help to accommodate mixed uses at a later stage if there is sufficient demand initially. This avoids the risk that ground floor commercial spaces may remain empty. A solution is to design townhouses with first floor living rooms and ground floors which have planning consent for both residential and business use. Provided that the ground floor is designed so that residential or commercial uses can be accommodated equally well, the scheme will retain the capacity for ground floors to switch to commercial use over time as the centre becomes established and footfall rises. To make this achievable there are,

however, design considerations for the building proposed by Llewelyn-Davies which may include:

- Floor-to-ceiling heights above three metres at ground level
- Generous unit sizes, with flexible floor plates
- Construction systems that allow larger window and door openings to be inserted at a later date
- Threshold relationships that allow visual openness or privacy depending on the dominant use

Buildings designed to fit a wide range of uses are likely to have a longer lifespan as they provide opportunities for incremental renewal. If flexible planning permissions are secured for these properties, the live-work designation can be sold as a positive attribute of the property, not as a constraint. Centres should be designed to be adaptable to changing demands. Flexible buildings will be capable of accommodating different uses over time.

### **2.7.3 Linking uses;**

Think about which uses depend on others. For example, a doctors' surgery may make a pharmacy feasible, or a primary school may attract a nursery school. Developments may point to the opportunity for a specialist cluster of activities that are independent yet related, benefiting from close proximity to one another or sharing facilities. Such uses may be encouraged by providing the shared amenities and the opportunity to interact.

All these creates a homogenous community where individual use of space may make the next use relevant and almost predictable for the common good and brings vitality to the centre.



## 2.8 MIXED-USE DEVELOPMENT TODAY

Mixed-use can be developed at a variety of scales, from building, to parcel, and walkable or transit area where the issues of Density, Mix of Housing, Walkability, Transit Access, Parking, Environment and Open Space are paramount in the creation of successful MXDs.

In the year 1990s–2000s, mixed-use emerged as a key component of Transit Oriented Development (TOD), Traditional Neighbourhood Development (TND), Liveable Communities, and Smart Growth principles.

It's worth mentioning that in 'Defining Mixed-used Development' the three approaches to Mixed-use Development today as identified by Nancy A. Miller and Jeff Miller are;

1. Increase intensity of land uses
2. Increase diversity of land uses
3. Integrate segregated uses

Albeit the focus of this design thesis on the mixed-use facility for the Bui site development, the potentials that the site brings, as for example its strategic location with respect to transportation on the north-south transport corridor of Ghana makes it advantageous and a possible transit oriented development.

### 2.8.1 Transit Oriented Development - Mixed-use Approach

Various terms have surfaced over the years to convey the idea of TOD, such as 'transit villages', 'transit-supportive development', and 'transit-friendly design'<sup>6</sup>.

TOD is the most widely used term, however, and is thus what we will use here. Some authors use the term TOD quite liberally, referring to any form of 'transportation-oriented development,' including bus and rail-oriented development as well as

development along freeways (Lefaver 1997). This thesis takes a narrower definition, with the mixed-use centre defined in the thesis' scope.

While there is no single, all encompassing definition that represents the TOD concept in its many forms, most definitions of TOD nonetheless share common traits.

The following represents a sample of TOD definitions:

1. "The practice of developing or intensifying residential land use near rail stations" (Boarnet and Crane 1998A).
2. "Development within a specified geographical area around a transit station with a variety of land uses and a multiplicity of landowners" (Salvensen 1996).
3. "A mixed-use community that encourages people to live near transit services and to decrease their dependence on driving" (Still 2002).
4. "A compact, mixed-use community, centred around a transit station that, by design, invites residents, workers, and shoppers to drive their cars less and ride mass transit more. The transit village extends roughly a quarter mile from a transit station, a distance that can be covered in about 5 minutes by foot. The centrepiece of the transit village is the transit station itself and the civic and public spaces that surround it. The transit station is what connects village residents to the rest of the region...The surrounding public space serves the important function of being a community gathering spot, a site for special events, and a place for celebrations—a modern-day version of the Greek agora" (Bernick and Cervero 1997, p. 5).
5. "Moderate to higher density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping



opportunities designed for pedestrians without excluding the auto. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use" (California Department of Transportation 2001).

6. "A place of relatively higher density that includes a mixture of residential, employment, shopping and civic uses and types located within an easy walk of a bus or rail transit centre. The development design gives preference to the pedestrian and bicyclists, and may be accessed by automobiles" (Maryland Department of Transportation 2000).
7. "A mix of residential, retail and office uses and a supporting network of roads, bicycle and pedestrian ways focused on a major transit stop designed to support a high level of transit use. The key features of TOD include (a) a mixed-use centre at the transit stop, oriented principally to transit riders and pedestrian and bicycle travel from the surrounding area; (b) high density of residential development proximate to the transit stop sufficient to support transit operations and neighbourhood commercial uses within the TOD; and (c) a network of roads, and bicycle and pedestrian paths to support high levels of pedestrian access within the TOD and high levels of transit use"<sup>7</sup>

While such definitions vary in scope and specificity, most TOD definitions share several common elements:

1. Mixed-use development
2. Development that is close to and well-served by transit
3. Development that is conducive to transit riding

Transit-oriented development (TOD) has gained popularity as a means of redressing a number of urban problems, including traffic congestion, affordable housing shortages, air pollution, and incessant sprawl. Several factors have heightened the public interest in TOD<sup>8</sup>.

Recently in most parts of the urban world TOD has been made a receptive policy environment, marked by legislation and grant funding—at all levels of government—committed to promoting “liveable communities” and “smart growth.”

Over the past few years in the United States for example, several federal initiatives have explicitly sought to leverage TOD: new transit joint development policies, including a more permissive interpretation of the federal common-grant rules; “new starts” criteria that explicitly weigh attention given to coordinated transit and land use in evaluating proposals for major capital investments in transit; and the location efficient mortgage (LEM) program, underwritten by Fannie Mae, that makes it easier to qualify for a loan to purchase a home situated near transit<sup>9</sup>.

In the Research Results Digest, “Transit-Oriented Development: and Joint Development in the United States: A Literature Review

### **2.8.2 Why Plan for Land Use around Transit Stations?**

Transit Oriented Development (TOD) is a walkable, mixed use form of development focused around a transit station. Concentrating higher density development near the station makes transit convenient and encourages ridership<sup>10</sup>.

TOD is a synergism between land use and transit with the following key characteristics:

1. Compact Mixture of Uses;
2. Pedestrian Friendly and Walkable; and



### 3. Supportive of a Variety of Transit Options.

It has been noted that TOD provides access to a full range of transportation options:

1. Walking
2. Bicycling
3. Rail Transit
4. Bus Transit
5. Automobile <sup>11</sup>

As a thoughtfully designed community spaces TODs have exciting, pedestrian friendly areas for live, work and play with vibrant mix of uses including:

1. Residential
2. Retail
3. Office
4. Commercial
5. Institutional

Transit stations are at the centre of TODs and an area within  $\frac{1}{4}$  mile (or a five minute walk) of these stations forms the TOD core. The incentive for planning mixed-use developments around transit stations has also been as a results of proven evidence of a host of demographic factors which have also worked in favour of TODs—e.g. in the U.S where there has been increasing shares of childless couples, influxes of foreign immigrants (many of whom come from countries with a heritage of transit-oriented living), and growing numbers of empty nesters seeking to downsize their living quarters. It has been observed that these groups form ready-made consumer markets for housing situated near transit nodes.

Steadily worsening traffic congestion has also spurred TOD initiatives. In many parts of the

United States, traffic woes have created a cohort of individuals who are drawn to the idea of living near transit and enjoying a less stressful commute to work. More and more businesses are also locating near rail stops (e.g., the Discovery Channel's new headquarters adjacent to the Silver Spring Metrorail station; BellSouth's new headquarters under construction above the Lindberg station), in part to open up more commuting and housing options for their work forces. To some, TOD equates with good business<sup>12</sup>.

### 2.8.3 Multi-use Buildings

Transit Oriented Development has been planned around transit stations in most parts of cities in the world. A hand full of these is discussed below;

- **Most uses are compatible side-by-side**

Many of the old justifications for the separation of uses are no longer valid. With the advent of clean technologies and the rise of the services sector in the post-industrial economy, uses can once again be 're-mixed'. Many traditional urban building forms, the terrace in particular, have lent themselves easily to conversion. Conversely, most current standard products, whether houses, shops or offices, have not yet even if injecting non-residential uses is not viable immediately, buildings which are inherently flexible will facilitate change over time.



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10. The City of Calgary Land Use Planning and Policy. January 2004. *Transit Oriented Development*. Best Practices Handbook.
11. Virginia Transit Association. *The Transportation/Land Use Connection*.  
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## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 INTRODUCTION**

In order to test the hypothesis about the insertion of a Mixed-use Development (MXD) on the Transit Oriented Development dais into the Bui Dam site (a rural context), a series of massing and conceptual diagrams were developed to be simulated and deployed at the test site.

These massing and conceptual diagrams aim to maximise density, integration and transit experience not only specific to the site but in a general manner that could be used in other contexts or sites where with minor adjustments would produce results akin to the test site.

The thesis is conducted purely on the survey approach where documentation and analysis are conducted using primary data from the site visits and interviews. The 'Bui Dam Site Development' at the outset suggests a proposal for a 'development' to bring the 'Rural Bui' to a satisfactory suburban/urban standard. The thesis is, however, conducted with supplementary case studies for the purposes of achieving benchmark results to be able to evaluate the proposal based on standard key performance indicators (KPIs) in preceding developments akin to the thesis.

Yielded responds from interviews conducted are used as supportive information to bring the policy led-approach of the political/project administrators in synchrony with the academic purpose of the project to a more realistic outcome. The selective, however, semi-structured interviews included respondents;

1. The CEO of the Bui Power Authority



2. The Resident site engineer
3. The assistant resident site engineer

The content analyses of the interviews are casually mapped to check if it acts sensitively to the local environmental conditions of Bui to be able to remediate where possible. The final validated findings together with the literature survey (theoretical model) are compared to provide recommendations and conclusions.

### **3.2 STUDY AREA**

Bui shares boundaries with other settlements but the prominent among them are the major towns as Banda Ahenkro, Bamboi, Bungasi, and Banda Nkwanta.

Albeit the Bui Settlement extends far beyond the Dam Site the main encircled area of study will be the city centre where TOD is to be experimented to the its fullest potency. The exiting proposal of the Bui City in the course of the findings would be reviewed and remediated where possible. The Bui City proposal has initially been developed within a 1.2km radius to consume settlements such as Bontoru, Mundaleble, Dibere, Malimi, Agbelikame (north) and Agbelikame (south), Brewohodi, and Agbegikuro.

This thesis, however, will only cover the city centre of the proposed Bui City extending ¼ mile radius with the Black Volta as a major resource

### **3.3 PRELIMINARY SURVEY**

The thesis is conducted with a number of case studies where the concept of MXD (TOD) is deeply engrained. Among the model cities for TOD is Shenzhen in China. A brief study on Shenzhen is carried out to with secondary data from the internet to understand how MXD manifest itself in the form of TOD. The main data collection will be from secondary sources to review texts concerning the thesis subject through a series of

literature surveys to bring the project up to speed with the current global standard. Notwithstanding, the historical aspects of MXDs and TOD will also be reviewed to enable the thesis track precedence in order to make informed decisions. The interviews conducted are consciously conducted in a semi-structured manner to allow respondents express their own feelings about the subject matter.

Graphical representations wherever needed will be used to illustrate site conditions through photographs, sketches, etc. and all necessary measurements taken. The methodology is sequentially carried as follows;

1. Literature survey for background knowledge
2. Site study and observation
3. Sketches and photography to analyse site conditions
4. Semi-structured interviews to sort views of project administrators
5. Suggestions from supervision (supervisor's opinion)

### **3.4 LIMITATIONS**

The proximity and easy access to site for both urgent and scheduled visits has been the major drawback to information collation. The secretariat of the Bui Power Authority situated in Accra made contacting the authorities for information difficult and expensive. Shuttling between Kumasi-Accra and Kumasi-Bui became cumbersome and in the case when they were around, were sometimes met unready for interviews.

The rural dwellers of the Bui settlement are basically farmers and fish folks and were unavailable for most part of the day to be interviewed. Those that were available could not appreciate the research partly because of their literacy level. Some were non-cooperative due to their displeasure of the resettlement package and could not trust the



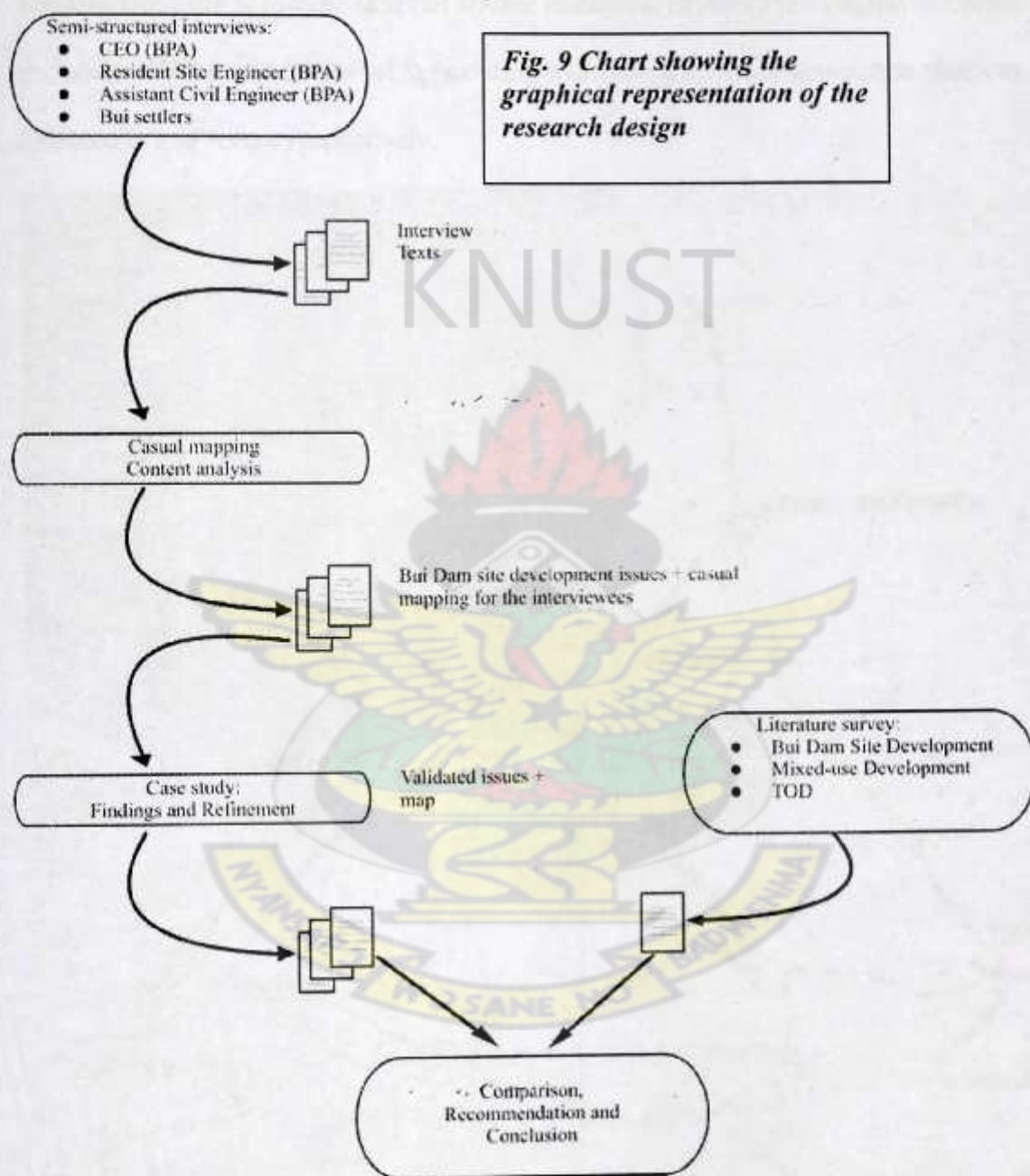
interview for academic purposes; they preconceived the interview to be from authorities of the project whom they are already discontented with. Persistent persuasion to engage their participation proved futile. In an instance where a person was willing to participate in the interview, the responses were implicit rather than explicit which were characterised by their economical and social status to the detriment of yielding the desired response. Their understanding of mixed-use development did not reflect the general body of the knowledge of the subject matter (the problem of espoused theories versus theories-in-use). This was due to the fact that most of the settlement dwellers have not experienced city life before and could not appreciate what mixed-use really meant.

Notwithstanding all these limitations the most of the needed information necessary to carry out the thesis were acquired. The proposals of the Bui City was secured from GTV in a digital AV format with the only difficulty been the price charge.

The use of the AV format of the Bui City documentary will be a source of information and used as an explanatory case study to emphasis the unity of mixed-use development as an espoused and theories-in-use. Albeit the information gathered will be used to generalise the whole concept of mixed-use development, it will also be confined to the aspects that are relevant thesis problem at the same time.

As has already been outlined the major limitation to the gathering of information has been the responses from the settlers and its use as a basis for conclusion and recommendation will render the thesis defective. For this reason the interviews from the Bui Power Authority and an in-depth literature survey will form major part of the thesis

by mapping the validated issues to the theoretical model as shown the research design below;



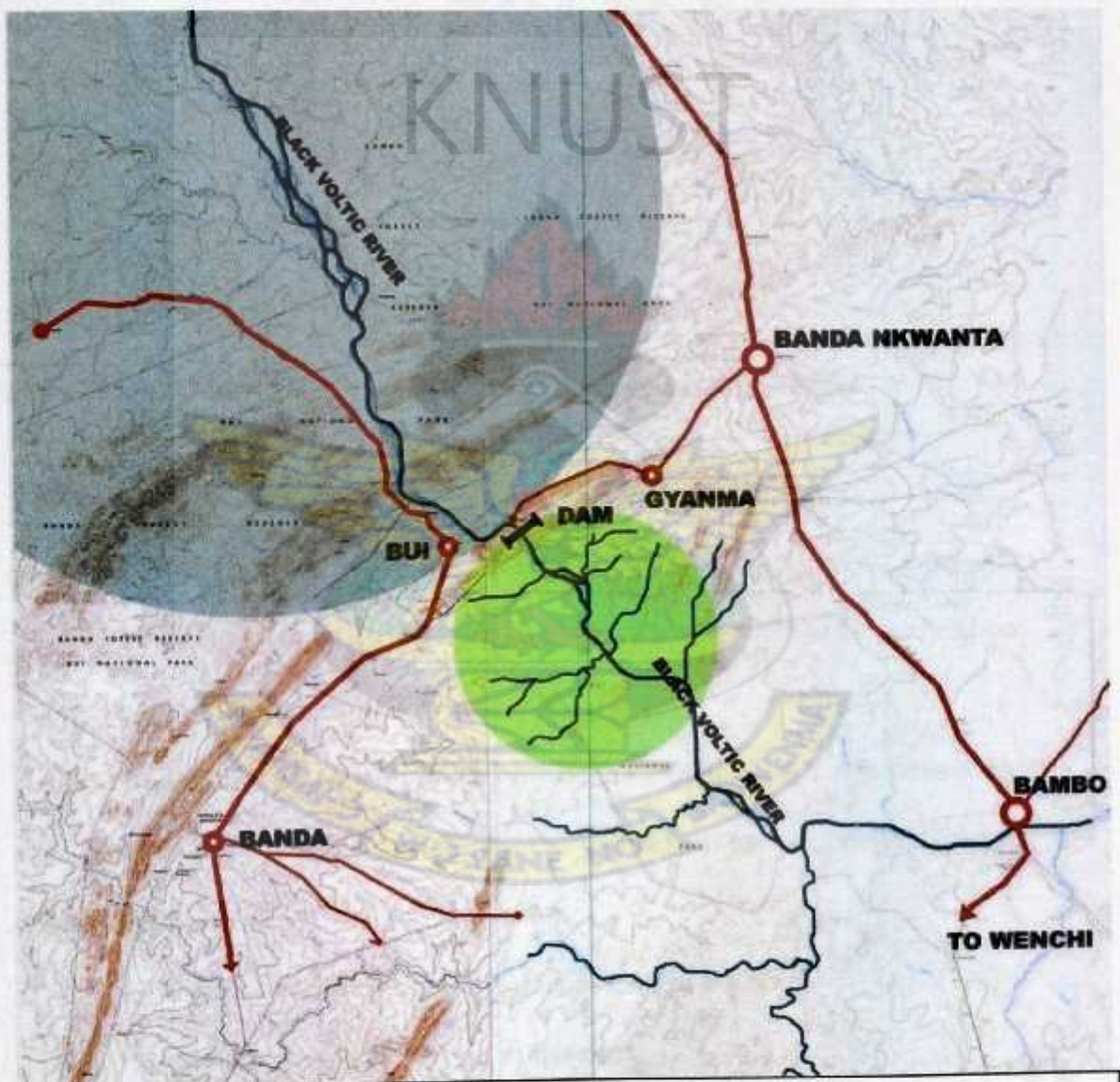


## CHAPTER FOUR

### 4.0 FINDINGS

#### 4.1 SITE LOCATION

The Bui Dam site is located at about 400km northwest of Accra the Capital of Ghana and about 300km and 330km of the existing hydroelectric power generation plants at Akosombo and Akuse respectively.



*Fig. 10 Map showing the location for dam site development (green shaded)*





**Fig. 11 Map showing the location for mixed-use development (red shaded)**

## **4.2 SITE SURVEY**

### **4.2.1 Site Access**

1. The existing road network from Banda Nkwanta to the Bui Gorge has been upgraded and easily motorable.
2. Additionally, a new bridge has been built across the Bui Gorge downstream which links the main dam site to other settlements as for example Gyama.

### **4.2.2 Site Boundaries**

1. The site is bounded by the Bui National Park to the north
2. Gyama settlement is to the east of the site
3. Bungase village is located on the west
4. The south is basically vegetation with riparian features



#### **4.2.3 Site Orientation**

1. The site has the Black Volta flowing in the north west to the south east direction dividing the site into these cardinal points
2. The developable land is formed on both sides of the river.

#### **4.2.4 Existing Land use**

1. Apart from the Bui National Park, land in the project area is mainly used for farming and animal husbandry
2. Immigrant fishermen from southern Ghana, who have settled along the river fish commercially along the navigable stretches of the Black Volta.
3. The major plantation land use within the area is cashew nut plantation.

#### **4.2.5 Site Climate and Rainfall**

1. Hot equatorial-tropical climate
2. The climate in the project area is characterised mainly by a single rainy season (maxima in July-August).
3. Double-peak wet season (maxima in May-June and October) or a single rainy season (maxima in July-August)
4. The average yearly rainfall in the project area is 1140 mm

#### **4.2.6 Hydrology and Evaporation**

1. Flooding occurs annually along the black Volta River between September and November
2. There is limited possibility for groundwater development in the alluvial and stream valley deposits.

3. The Bui Dam site has a mean annual pan evaporation of 1781 mm. This is considerably less than that recorded in the neighbouring Wa and Navrongo areas and is believed to be due to its more southerly position.

#### **4.2.7 Temperature and Humidity**

1. The equatorial air masses affecting the project area are warm and moist, and wind velocities are generally low.
2. Monthly temperatures range from around 26 °C in August to around 30 °C in March. The hottest months are February to May, and in November.
3. There is a mean annual relative humidity of 75%, with a maximum mean monthly value of 87% in September and a minimum of 58% in January.

#### **4.2.8 Geology and Soil**

1. Overlying bedrock are various types of loose deposits and accumulations resulting from erosion of the upstream and local bedrock formations.
2. Site is underlain by Schist and Greywackes of the Birrimian and Tarkwaian formations.
3. Alluvial gold mining has taken place within the site in the past.

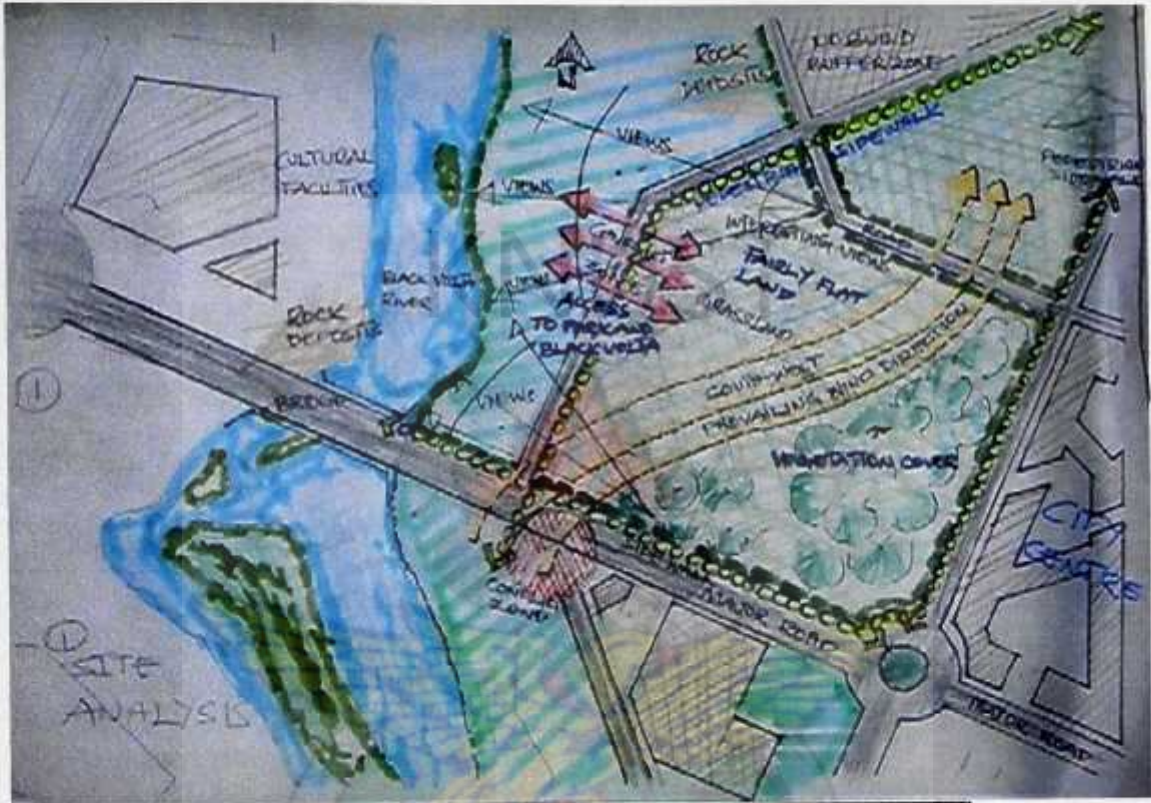
#### **4.2.9 Site Vegetation**

1. There are 3 major vegetation types on site - the savannah woodland, riparian forest and grassland.
2. The dominant type, savannah woodland, is generally characterized by scattered trees of medium height (5-20 m)



3. Gallery forest, the second most widespread habitat type, borders the black Volta River and its tributaries and is generally characterized by trees of medium and tall height (10-30m)

#### 4.3 SITE/SWOT ANALYSIS



**Fig. 12 Map showing the site analysis**

##### 4.3.1 Strength

1. Rich vegetation and water resource (the Black Volta)
2. Attractive natural landscape features
3. Hydroelectric power base
4. The land is relatively flat where contours are non-hilly
5. The site has fertile and a stable soil structure to support gardens & heavy structures

#### **4.3.2 Weakness**

1. Intermittent poor road conditions has unnecessarily increased transport time and cost making site access very difficult
2. Uneasy site navigation due to hill interceptions
3. Reduced total land area due to water inundation upstream and has therefore made the downstream as the only viable site for the development of the 'Bui City'

#### **4.3.3 Opportunities**

1. Near the national boundary to la cote d'Ivoire
2. Mid-way of transport between the northern and southern parts of Ghana
3. minimum travel distances to major towns like Techiman, Kintampo and Wenchi
4. The Bui National Park offers great tourist potential to Bui City
5. the Black Volta can be used for pleasure navigation
6. Close to proposed western line railway network which passes through bole
7. The prevailing wind direction from the south west will carry cool breeze to the site as it blows over the Black Volta

#### **4.3.4 Threats**

1. The west African plate, an ancient and very stable geological unit, underlies the site
2. Seismic load stability design and analysis may increase construction cost of city
3. Some ousters yet to be resettled may take legal action against the project in protest of their dissatisfactions.



## CHAPTER FIVE

### 5.0 PLANNING AND DESIGN

#### 5.1 BRIEF DEVELOPMENT

As already pointed out mixed-use development occurs at various scales from a single building block where all activities occur in the vertical to a larger urban horizontal scale with the development spread on different parcels of site serving different but complementary uses.

For a successful mixed-use development, the use of one individual parcel of site should create a joint demand for the other.

The literature has revealed housing creating joint demand for other developments such as retail, open spaces (e.g. Parks, plazas etc.), mass transport, commercial, industrial etc.

The design thesis topic 'Bui Dam Site Development' is not to be limited to the 'period and place where dormancy of construction begins and ends'. The scope extends beyond that. The 'site' as in the topic refers to the extents of the boundaries defining 'Bui' with the 'Dam' as its point of recognition for all necessary concomitant 'developments' that follows its construction.

To achieve mixed-use development within the scope of the design thesis therefore involves the process of brief development. As revealed in the literature mixed-use may come in different forms at different scales. It was identified that MXDs that are developed at larger scales may include smart growth principles, Transit Oriented Development etc. For the advantageous reason the design thesis would come up with a MXDs around a transit station which may include the design of a layout master plan

accompanied by three dimensional architectural expressions that would be produced with the issues in the brief addressed.

The major user needs identified in the developed brief for TOD in the design thesis are;

- a. A transit station
- b. A transit mixed use tower
- c. High density Housing
- d. Boat basin and Park (Pleasure navigation and recreation)
- e. Multi-story car park
- f. Civic administration building
- g. Cultural centre
- h. Hotel accommodation

#### 5.1.1 Accommodation Schedule

TRANSIT TOWER (PRIMARY SPACES)	AREA (m <sup>2</sup> )
Department store/supermarket	2021.2
Police station	311.5
Bank/financial institution	832.9
Retail business	1550.8
Conference hall	419.1
Restaurant/cafeteria	776.6
Clinic/specialty	710.8
Office spaces to let	5830.5
Security	49.1
Reception/waiting area/check-in	313.2
Atrium	106.5
General service ducts	126.3
Kitchen/pantry	79.1
Corridors	106.5
Staircase/elevators	1216.3
Toilets/washrooms	1530.6
<b>TOTAL</b>	<b>13648.3</b>



<b>MULTI-STOREY CAR PARK (PRIMARY SPACES)</b>	<b>AREA (m<sup>2</sup>)</b>
Parking spaces	12000
Security	30
Control/check-in	100
Elevators	9.2
Egress stairs	100
<b>TOTAL</b>	<b>239.2</b>
<b>TRANSIT STATION (PRIMARY SPACES)</b>	<b>AREA (m<sup>2</sup>)</b>
Ticketing / information counter	11.1
Manager office	11.1
Café / seating area	30.5
Covered waiting area	55.7
Waiting room for 100 passengers	300
Toilet rooms (men and women)	23.2
Transition space	92.9
Storage	27.8
Security	30
Building mechanical room	60.2
Vending / ATM	25.5
<b>TOTAL</b>	<b>640.2</b>
<b>BOAT BASIN &amp; PARK (PRIMARY SPACES)</b>	<b>AREA (m<sup>2</sup>)</b>
Esplanade	3800
Pleasure navigation berth	1800
Spa/health club centre	1000
Eating area	27.8
Ticketing and information counter	11.1
Waiting room for visitors	278.7
Seating area	55.7
Storage	50.7
Security	30
Egress stairs	27.8
<b>TOTAL</b>	<b>7031.1</b>
General ancillary spaces	500

*Table 2 showing the accommodation schedule of the developed brief*

The mixed-use tower, however, will be the facility to be detailed in three-dimension within the planned mixed-use development.

## **5.2 CONCEPT AND PHILOSOPHY OF DESIGN**

### **5.2.1 DESIGN PHILOSOPHY**

The creation of the whole mixed-use development can be represented with the guiding principle of creating a **'design that will be a symbol for openness and change'**. This ensures clarity of intent in all design decisions thereby maintaining consistency and coherence throughout the design process.

### **5.2.2 DESIGN CONCEPTS**

Albeit, the philosophy of design is consistent throughout the project, certain design concepts may evolve to accommodate the varying conditions affecting the project as for example brief, site and environmental conditions.

The concept will provide a design that will seek to prioritize views of Black Volta and the Bui City as a whole. The design will also will harness and boost the tourism potential at Bui by making the city a holiday destination.

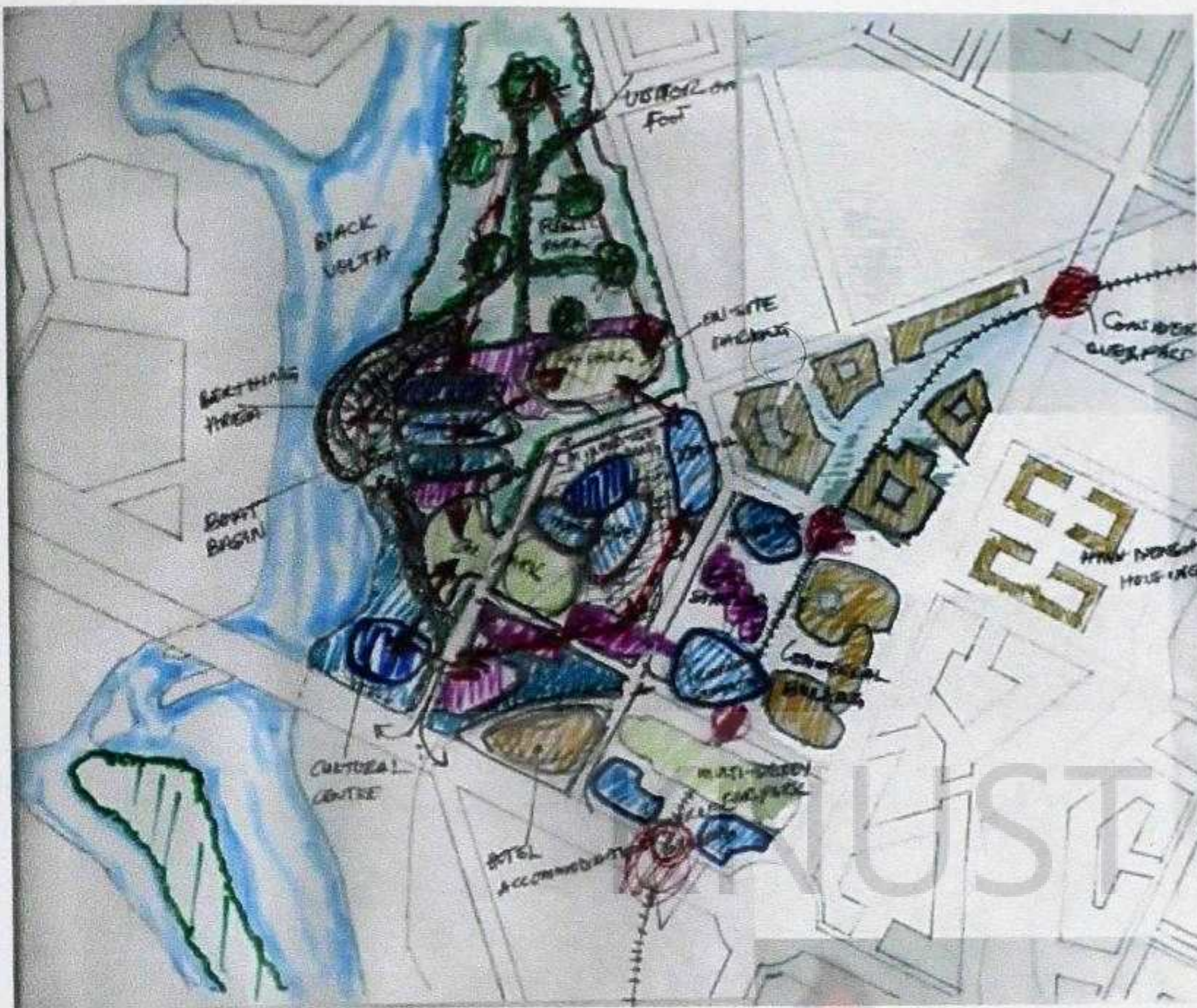
Provide a space of convenience and, opportunities for leisure where there will be a number of transport choices. In the mix of uses the mixed-use facility would be designed to hold different meaning for different people.

To create a design from the brutalist modernist architectural style will mean that the design will have sense of belonging and uphold certain traits in its structure.

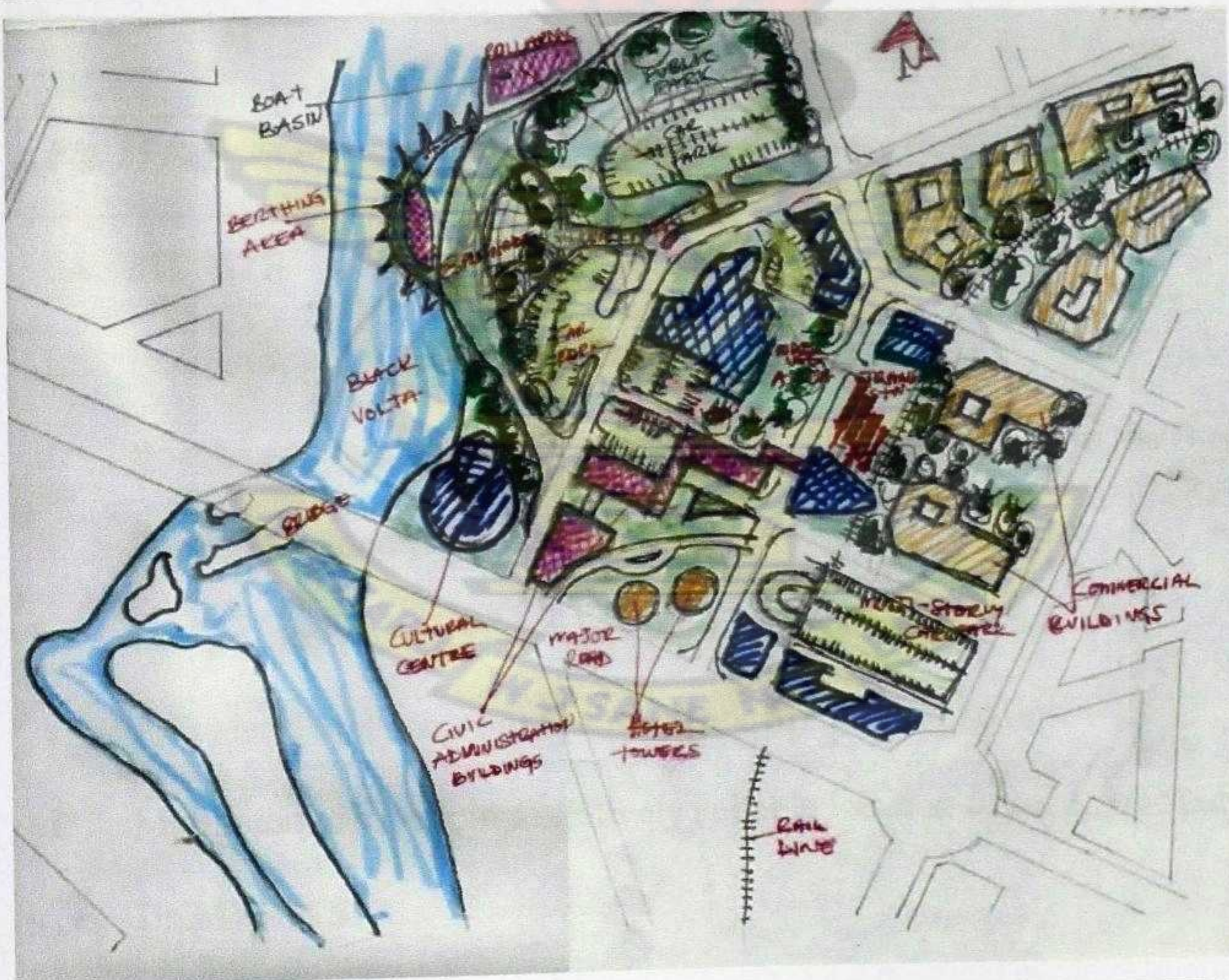
## **5.3 CONCEPTUAL PLANNING AND DESIGN DEVELOPMENT**

The site was planned and designed to accommodate the varying use of the parcels of site but in a way that maintains it in a 'chorus line' in order not to lose its potency.





**Fig. 13 Functional relationship between mixed-use facilities**



**Fig. 14 Conceptual planning between mixed-use facilities**







## **5.4 DESIGN CONSIDERATION AND APPROACH**

The design approach at the outset is based upon the master plan developed by the China Academy of Urban Planning and Design (CAUPD) for the proposed 'Bui City'. The design brief will be planned to accommodate a mixture of uses with ¼ mile to enforce to make the TOD concept more viable. Among the facilities will be the Transit Mixed-use Tower that will be designed as a vertically mixed-use typology with multi-purpose function.

The development of the other facilities on the horizontal scale will include the civil administration building, retail, hotel, multi-storey car park, cultural centre, park, and boat basin. The horizontal planning approach is discussed subsequently.

## **5.5 PLANNING THE HORIZONTAL**

Albeit, the thesis will detail the vertically mixed-use typology (the Transit Tower), the horizontal parcels need to be carefully planned using the standard guidelines for new and redeveloped construction in land use areas designated Mixed-use developed in the Chapter 7 of Design Standards and Guidelines Mixed-Use by the City of Livermore.

Planning all the uses on the different parcels begins with the setting up of;

1. Goals
2. Site Planning
3. Building Design
4. Landscaping Design
5. Signs
6. Lighting

The general guidelines provided for the design of parcels on which the mix of uses is developed horizontally are done by first setting out the goals as discussed below;

### **5.5.1 GOALS**

The goal statement sets forth the basic design intent implicit in the objectives set out in the preamble of this report and can be summarised as follows;

- a. To create a creative, modern and a model city that will not only be a hydro power production base but also a regional tourism base
- b. To develop a city that would serve as an industrial and SEZ that would facilitate the development of a mixture of neighbourhood-serving businesses and residences.
- c. The expectation is to industrialise and with time transform Bui from manufacturing to a service base hub within Ghana by providing the necessary educational and research infrastructure.
- d. To provide opportunity for a rail network as an alternative means of transport to the conventional vehicular transportation for the Bui City that can capitalise on the ready access to commercial and tourist establishments by linking the city to the rest of the trading towns such as Techiman, Wenchi and Kintampo and for that matter the whole country.
- e. To take advantage of the geographic position of Bui by turning it to a transit centre on the northern-southern transport corridor of Ghana.
1. To encourage a variety of housing types by providing for flexibility in the design and development of residential subdivisions.



## 5.5.2 SITE PLANNING AND CONCEPTUAL APPROACH

### A. Building Siting and Orientation

*Intent:* The siting and orientation has been done with the intention to employ the existing, geographic and topographic conditions to create new development that mixes transport, commercial, retail, civic and residential uses in a manner that is unique and specific to Bui.

The development has been sited at the eastern boundary of the Black Volta with outstanding views of the gorge (dam) to the north-west and the hills to the east and high density housing within the city to the immediate east.

#### i. Location and Orientation

- Anywhere possible, buildings have been located adjacent to the street at the front setback line with the transit tower immediately behind the semi-public space.
- There is an outdoor-seating area for a restaurant at the 3rd floor of the transit tower providing a view into the public space shared by the Civic Administration.
- Retail uses with entrance doors and windows has been fronted onto the street at the ground-floor level as for example the supermarket in the Transit Tower
- The main tower mass, with its rectangular floor plan oriented in the north eastern axis is positioned to capture the dramatic views to the east and west.

#### ii. Building Mass

- Even though the design has made provision for the development of a large mixed-use transit tower, preferably the varied massing of civic, cultural centre and the retail buildings posses the complexity for the opportunity of providing visual interest and human scale.

- To enhance the mixed-use nature of the tower building and public access to it, the podium massing takes broad control of the site with its vast front open space, which is then directed through the dynamic forms of lower scale elements in the open space.
- The spaces created between the various buildings creates a courtyard which provides the opportunities for parking, pedestrian promenades, and other outdoor gathering areas in occasional periods especially the semi-public space between the transit tower and the civic administration.

### iii. Corner Sites

- The street corners have been developed with the cultural centre, civic administration, first class high density residential towers and hotel buildings. They have either been sited on the corner property lines or set back from the corner to provide a public open space that provides direct internal access.
- Attractively landscaped areas have been provided in front of the civic administration because siting of a building or public open space at its corner is not feasible. Trees and shrubs have been planted to create a buffer zone for both visual interest and the break of monotony along the main road.
- The cultural centre building located on the river bank corner has a design proposal to include special architectural features, such as a tower element, monument or a sign, which help to anchor the intersection with the major road.
- A modest articulation of the building mass has been proposed and provided at corner sites.



#### iv. Loading and Service Entrances

- Loading and service entrances to the basement of the transit tower has been planned and designed so as to not intrude upon the public view or interfere with pedestrian and vehicular flows within the project area.

#### B. Neighbourhood Context

*Intent:* To ensure that the new development will bump up the character and design of existing provisions in the Bui City master plan.

##### i. Location

- The location of site uses has been coordinated with adjoining properties to avoid creating nuisances such as noise, light intrusion and traffic impacts, particularly with presence of hotel development alongside the Civic Building adjacent.
- The Transit Tower is almost centrally located to attract all the other land use facilities making it the focus and centre of attraction for all other activities.
- The hotel facility located along the street is oriented along the long axis of the branch road to obtain the broader maximum view of the Black Volta to the west and the hills to the east. It also provides an edge for the street.
- The boat basin is located along the banks of the Black Volta which is preceded by a public open space with public outdoor facilities and pedestrian needs.
- The Cultural Centre, Civic Building the Transit Tower and the Boat Basin share a common semi-public open space creating strong bond between them.

## **ii. Compatibility**

- The commercial mixed-use Transit Tower development has been designed to be compatible with the other surrounding land uses from both a functional and aesthetic standpoint.
- The buildings' designs made considerations for compatibility with the height, massing, setback, and design character of surrounding uses. The intent is to contribute to the visual quality and cohesiveness of its setting but need not imitate or mimic adjacent development proposal of the master plan.

## **iii. Adjacent views**

"Commercial development should not create unattractive views from neighbouring uses by orienting blank building walls toward neighbours. Any visible building walls should incorporate architectural elements to create visual interest". (*Design Guidelines Mixed-Use, Chapter 7, City of Livermore*).

All the facades of the buildings within the project area have been provided with architectural elements to avoid visual hostilities towards the neighbouring facility, notwithstanding, special attention is given to the view towards the Black Volta.

## **iv. Coordination with Adjacent Properties**

- Even though the land uses are within their individual property lines facilities such as driveways, parking areas and pedestrian walkways are developed as shared public facilities.



### **C. Pedestrian Orientation**

*Intent:* To provide development features that facilitates greater pedestrian amenities and activity in mixed-use development.

#### **i. Pedestrian Spaces**

- The mixed-use development have been designed to emphasize pedestrian orientation by utilizing features such as recreational parks, interior walkways, ornamental gates, trellises, lighting, plant materials, seating, monument, fountains and other similar elements.
- The outdoor pedestrian spaces have been landscaped to include appropriate street furniture and other elements to facilitate pedestrian activity.

#### **ii. Pedestrian Connections**

- Attractive well-marked pedestrian links between parking and buildings has been provided. The connections have been designed as safe, clearly marked and attractive pedestrian walkways across traffic lanes, landscaped areas and parking lots more especially between the Transit Tower and the Civic Building.
- All the buildings have been provided with paved sidewalks to make them all publicly accessible.
- Where pedestrian paths or walkways cross the parking areas or driveways, the paths have been designed to utilize decorative paving to define the pedestrian space.
- The design features employed include: raised and textured pavement, curb extensions to narrow the travel lane and low-level lighting, such as a bollard light.

- Pedestrian connections have also been provided between the tower building and the adjoining civic, hotel and cultural sites with most of the walkways landscaped and shaded with trees.
- Pedestrian connections have design cues to help demarcate the transition between public and private spaces. Design cues employed include a change in colours, materials, landscaping or the dimensions and the hierarchy of the space.
- For the most appropriate lighting levels in the nights, illumination of walkways have been concentrated along the pedestrian paths leading to parking areas and in the specific areas where cars are parked around the civic and transit station.

### iii. Materials

- Main pedestrian walkways to and from buildings and the parking areas are made from materials that create a flat, even surfaces, and do not create a tripping hazard, particularly for strollers and wheelchairs. The paving material is mainly concrete and brick pavers.

### D. Parking

*Intent:* To minimize the impact of large areas of surface parking on the aesthetic character desired for quality mixed-use development in the project area.

#### i. Location

- The parking areas are located such that they do not create a separation between adjacent land uses and buildings as in the case of parking in front of the civic building and the one in front of the Transit Tower. Both parking areas do not create barriers in the physical relationship of the adjacent land uses.



- Building siting and parking have been designed to maximize opportunities for pedestrian and vehicular circulation between adjacent sites, thereby providing a joint access easements and common driveways such as between the tower, retail and civic building.
- Parking areas has been located on the sides and rear of the buildings with pedestrian connections between the parking areas of the buildings.
- Parking within the project area is integrated and visually de-emphasized except the multi-storey car park that has vertical space and structure.

## **ii. Distribution**

- The outdoor parking areas have intentionally been divided into smaller units to decrease visual impacts associated with large expanses of pavement and vehicles, and to facilitate safe and efficient pedestrian movement between parking and mixed-use development.

## **iii. Screening**

- Surface parking areas facing the public streets has been buffered by landscaping.
- For security purposes, openings have been incorporated into the landscape design to provide clear views into the site.

## **iv. Access Drives**

- Access driveways have been sufficiently provided to ensure safe and efficient movement of traffic to and from the project site.
- The main access drives are from the main road down south and the other from the northern part of the project area with the main entries into sites enhanced with decorative paving.

- Building siting and parking design should maximize opportunities for shared parking, access entries and driveways in order to minimize the number of curb cuts. This will limit possible conflicts between pedestrians and vehicles entering and leaving the parking area.
- Access has been provided from the side of the streets to limit the number of driveways along the main thoroughfares matched by the offset of the tower building, apparently onto the street, thereby creating segments to reduce traffic impact.
- The driveway access on the corner lots are located as far as possible from intersections especially in the civic area of the project.

#### **v. Internal Circulation**

- On-site pathways separated from vehicular traffic have been provided for pedestrians and bicyclists thereby providing connections between building the entries and public sidewalks.
- A long a pedestrian pathway has been provided through the parking area of the recreational park to the main entrances of the other facilities.
- The pedestrian walkways and spaces within the mixed-use development include elements such as special paving materials, raised curbs, trellis structures (connects the civic buildings), landscaping, pedestrian-scaled lighting, seating and trash receptacles.
- Paths with durable, all-weather surfaces have been provided on medians and other landscaped areas to provide convenient pedestrian routes and reduce wear on landscaped areas.



- Primary circulation paths such as the long pavement from the recreational park is devoid of excessive steps or level changes in order to reduce potential tripping hazards and facilitate circulation for all potential users, including strollers and wheelchairs.
- The parking areas should provide bicycle racks that are located close to the buildings and do not impede pedestrian or auto circulation. Whenever possible, bicycle areas have been covered and located in areas which are clearly visible to site users in order to avoid security problems. The design and chosen materials are coordinated with the site and building design.

#### **E. Service Areas, Refuse Areas and Backflow Preventers**

*Intent:* This is to minimize the impact of service areas and site-related infrastructure on the aesthetic character of development in the mixed-use development.

##### **i. Service Areas**

- Lighting of outdoor service, loading and storage areas should be minimum which is necessary for security purposes. It is designed and directed so as not to create glare or lighting impacts at the street or on surrounding properties.
- Service areas, garbage receptacles, utility meters and mechanical and electrical equipment should be screened from public view and located for convenient access by service vehicles.
- The screening of these areas has been integrated into the overall building and landscape design such within the boat basin.
- On-site spaces for stacking vehicles that will be waiting to load or unload have been provided as required.

## **ii. Refuse Areas**

- Trash enclosures of sufficient sizes have been provided to house the number and size of trash bins and containers needed to accommodate the waste generated by the building user and pedestrian along the street.
- Trash bins shall be located within a trash enclosure at all times.
- Surface trash enclosures shall be integrated into the site plan to minimize enclosure visibility and accommodate truck access.
- Durable materials are used for the construction of trash enclosures with the colour, texture, and architectural detailing being consistent with the overall site and building design.
- The indoor refuse collection especially of the towers shall be by chute design to be collected at the basement of the buildings.

## **iii. Utilities and Backflow Preventers**

- The design will utilize less obstructive, alternative designs for backflow prevention devices. Backflow devices should be located inside the building where possible.
- Backflow device components to be painted to match the adjacent landscaping.

## **F. Horizontal Mixed-Use**

This section includes design guidance for development that proposes a mixture of retail, office, commercial and civic land uses that are adjacent to each other on the same parcel. The opportunities for interplay between these uses will primarily be in the relationship of the open space and parking components of the adjoining uses.



### **i. Site Development**

- The proposals for the design of the open space areas and parking facilities in the horizontally mixed-use development follows the land use pattern provided.

### **ii. Open Space**

- The project has developed a comprehensive open space network that uses parks and other open space elements to connect uses. Open space areas and the paths that link them facilitate the integration of adjacent land uses on the site.
- Plazas and building forecourts should are developed so as to maximize circulation opportunities between adjacent uses.
- The residential development has been provided with private open space and outdoor areas for residents. These areas are configured and designed so as to ensure privacy for residential uses while also providing linkages to the public open space components of the project.
- Seating areas are being provided, coordinated with shaded areas, landscaping, lighting and views to focal points, as for example to the Black Volta.

### **iii. Parking**

- The parking areas are located on the periphery of projects with pedestrian connections to the projects.
- Opportunities for shared use of parking facilities have been explored. The peak parking demand times will differ for the various land uses. The residential guest parking in particular can take advantage of surplus parking space that the commercial areas will have during evening and overnight periods.

### 5.5.3 TOWER BUILDING DESIGN

This section applies to the design of the Transit Tower building which is a vertical mix of uses and to the retail buildings in the horizontally mixed-use project.

#### A. Building Organization

- The vertical Transit Tower mixed-use building is designed with retail and commercial storefronts on the ground floor and office uses above.
- The ground floor supermarket (retail) use should have been provided with floor-to-ceiling height of 4200m which is about standard minimum requirement.

#### B. Building Rhythm

*Intent:* This is aimed at ensuring that buildings, particularly the Transit Tower (large structure), are designed with elements that relate to a human scale.

##### i. Articulation

- The building has been articulated to reflect a small-scale street frontage rhythm, with building podium/base segmented to provide widths of approximately 7.6 to 15.2 metres.

##### ii. Multiple-Tenant Spaces

Where multiple-tenant spaces are incorporated into the building, individual tenant spaces have been located within the segmented base. This is achieved by any of the following:

- Using different façade elements.
- Applying diagrid patterns recessed between façade elements.
- Providing variation in plane along the building wall.
- Varying the building wall by recessing the storefront entrance or creating a niche for landscaping or pedestrian area such as between the supermarket and cafeteria.





*Fig. 16 Conceptual massing and design overview of Transit Tower*

## **C. Façade**

Intent: To ensure that the building façades viewed from the public streets are articulated to add visual interest, distinctiveness and human scale.

### **i. Articulation**

- The tower building primary entries have been accented with strong architectural definition.
- The building has a clearly defined base and roof edge so that the façade has a distinct base, middle and top to make the scale appear less imposing.

### **ii. Horizontal Mass**

The following design considerations have been made to achieve a horizontal subdivision of building façades:

- From one façade to the next, has been combined a change in depth or vertical plane with a change in material and character. Changes in façade material or colour should be which is associated with a change in plane or separated by a material.
- Ground-floor façades is designed to give individual identity to each retail establishment.
- The building is characterised by the horizontal sun shading strips providing a visual human scale to the building.

### **iii. Scale of Detailing**

- Building façades shall have elements that relate to the scale of a person.
- All façades emphasize three dimensional detailing such as curtain wall, sun shading and reflections to cast shadows and create visual interest on the façade.



**iv. Entries to Ground Floor Areas**

- Entries to ground floor retail areas are accessed from main streets, and shall be accented with features such as landscaping, lighting, etc.

**v. Entries to Upper Levels**

- At tower mixed-use building, office and other upper story uses have been clearly distinguishable in form and location from retail entrances.

**vi. Openings (Doors and windows)**

- Doors at the retail fronts have curtain wall assembly that permit views into the outside.
- Large expanses of the glass have been shaded with horizontal sun shades.

**vii. Building Materials**

- The chosen design theme, have variety of durable materials and textures including both traditional materials, such as wood, concrete, structural steel, and other high-quality durable metals.
- The choice of the materials is harmonious with the adjacent buildings.

**viii. Color**

- Exterior building colours shall not become signs for the building or tenant.
- Variety of colours is used to avoid monotony among the colours throughout the project site.

**D. Roof**

*Intent:* To ensure that the design of roofs contributes to the overall building design.

### **i. Form**

- The form, colour and texture of the roof is created to be an integral component of the building design.
- The narrower higher levels of the tower building is crowned by the design of the 'diamond' roof the piercing the sky.

### **ii. Detailing and Materials**

- The high-pitched roof of the tower building has been ornamented with shaped pergolas and roof gardens.
- The roofing is incorporated with solar panels to supplement energy supply
- Reflective roofing materials have been avoided as their surfaces are visible from either ground level or elevated viewpoints, such as freeways.

### **iii. Rooftop Equipment**

- The external communication equipment (satellite mast), is architecturally integrated into the building design.

## **5.5.4 LANDSCAPING DESIGN**

The standards and guidelines in this section give design guidance for the landscaping components of projects in the mixed-use areas of the City.

### **A. Coverage**

*Intent:* To provide adequate landscaping materials that enhances the appearance of the mixed-use project.

- Altogether, the landscaping required in setback areas, required open space areas, recreational and parking areas represents the minimum acceptable landscape coverage for the parcels.



## **B. Function**

*Intent:* To provide adequate pedestrian amenities and attractive environments between public streets and the mixed-use development.

- Landscaping has been used to provide an attractive setting for development; soften hard building contours; shade walkways, parking areas and other large expanses of pavement; buffer and merge various uses; mitigate building height; and screen unsightly uses.

## **C. Layout**

*Intent:* To incorporate appropriate landscape materials that provides an aesthetically pleasing transition between the building and adjacent sidewalks or pedestrian paths.

### **i. General**

- Planting plans for building setbacks include a hierarchy of plantings in terms of size and types of plant materials that mark the transition between the horizontal ground plane at the sidewalk or parking area and the tall, vertical façades of buildings.
- Landscaping close to the sidewalks provides shade on the sidewalk, while also allowing views into the site. Denser plant materials are located closer to the building.

### **ii. Street Frontage**

- Street trees shall be included along all street frontages of the mixed-use development.
- Street trees shall be a minimum 600mm box size and are to be selected from a list of appropriate trees.

### iii. Setbacks

- Parking areas adjacent to street frontages have a minimum 3 metre landscaped setback between the sidewalk and the on-site parking spaces.

### iv. Parking Buffer

- All parking lots are separated from the street by a landscape buffer.
- At access points to off-street parking lots, landscape buffers are provided between the curb and the parking area with a minimum of 3 metres.

### v. Focal Elements

- The use of trees for purposes of creating focal elements, including tree clusters, is promoted to augment rather than replace required street tree planting.

### vi. Swales

- Drainage swales are incorporated into landscape designs

## D. Materials

*Intent:* To ensure that the landscaping materials are of an appropriate age and size that enables the materials to be fully functioning site amenities.

### i. Plant Selection

Street trees and other plant materials within a public right-of-way shall be consistent with adopted City plans and regulations.

## E. Boat Basin and Open Space (e.g. park)

*Intent:* To ensure that outdoor areas for residents, employees and commercial patrons are aesthetically pleasing and promote greater activity in mixed-use areas.

### i. Public Open Space and Parks

Publicly-accessible plazas and open spaces are provided in the mixed-use developments.



- Parks and open space are landscaped and incorporated with high quality paving materials, such as stone, concrete or tile.
- Outdoor pedestrian spaces include appropriate outdoor furniture, such as seating, walls, trash receptacles, bike racks and other elements especially around at the recreational park.

## **ii. Protected Seating Areas**

- Paving, planting and other landscape materials are provided to coordinate with the design of the buildings and project site.

## **F. Fences and Walls**

*Intent:* To ensure that fencing contributes to the overall design of commercial buildings and development.

### **i. Fence and Wall Design**

- All screening has been designed as an integral part of the overall building design.

### **ii. Height**

- Overall height of screening fences and walls do not exceed 2 metres in height.

### **iii. Articulation**

- The length of screening fences and walls adjacent to public rights of way should be minimized to the maximum extent feasible.
- Design elements are used to break up long expanses of uninterrupted walls, both horizontally and vertically. Walls over 1 metre in height includes design elements such as textured concrete block, interlocking 'diamond' blocks, formed concrete with reveals or similar materials. Landscape materials are also used to provide surface relief.

## **G. Parking Area Landscaping**

*Intent:* In a hot humid climate such as Bui's, shading is extremely important to reduce glare and heat buildup as well as to provide an attractive, functional and comfortable environment.

- All parking areas are provided with interior landscaping for shade and aesthetic enhancement.
- Parking lots are landscaped with broad branching shade trees at a minimum ratio of three trees per 10 parking spaces for single loaded stalls, six trees per 20 parking spaces for double loaded stalls and one tree for every three parking spaces for smaller parking bays.
- Curbed planter areas have been provided at the end of each parking aisle to protect parked vehicles from the turning movements of other vehicles.

### **5.5.5 SIGNS**

#### **A. Function**

*Intent:* To ensure that signs in mixed-use areas enhance the built environment and do not contribute to visual clutter.

##### **i. Purpose**

- The primary purpose of signs will be to identify a business or businesses and residences located at a specific site.

#### **B. Architectural Context and Placement**

*Intent:* To ensure that signs are an integral component of the design of a project.



**i. Context**

- Bands, trim or colour which is used to establish a corporate identity and does not relate to the architectural style or colors of the building shall be considered a sign.
- Standardised or corporate that do not relate to the building architecture shall not be permitted.

**ii. Placement**

- Signs shall are not permitted on top of any roof, and no sign attached to a wall or eave shall project above the eave line of the building.

**5.5.6 LIGHTING**

This section contains the design criteria for exterior lighting in the mixed-use area of the Bui City. The intention for these guidelines is to ensure that the design of fixtures and the light provided contributes to the character of development and does not impact adjacent development.

**A. Design**

- Exterior lighting is designed as an integral part of the building and landscape design.
- Illumination levels are provided to address security concerns, especially for parking lots, pedestrian paths, outdoor gathering spaces, at building entries and any other pedestrian accessible areas.

**B. Lighting Height**

- The height of luminaries shall be in scale with the building and site design and in no case shall the height exceed 5.6 metres in height from ground.

### C. Area of Illumination

- The light source for externally illuminated signs must be positioned so that light does not shine directly on adjoining properties, to cause glare, or shine in the eyes of motorists or pedestrians.

### D. Parking Area Illumination

- Illumination are planned to be concentrated along the pedestrian paths leading to parking areas and in the specific areas where cars are parked.
- Illumination should achieve a lighting level of 1 foot-candle on the parking lot surface.

### E. Prohibited Lights

- No outdoor lights shall be permitted that blink, revolve, flash or change intensity.

### 5.5.7 COSTING

The US\$ 622 million loan may kick-start the Bui Project but the cost per square metre of construction of the mixed-use development is estimated at the current market value of GH 300 Cedis to arrive at the figure as shown in the Table 3 below;

Facility	Area (m <sup>2</sup> )	Area x cost per m <sup>2</sup>	Total cost
Transit Tower	13648.3	13648.3 x 300 Cedis	4,094,490
Multi-storey car park	239.2	239.2 x 300 Cedis	7,1760
Transit Station	640.2	640.2 x 300 Cedis	192,060
Boat Basin and Park	7031.1	7031.1x 300 Cedis	2,109,330
General Ancillary	500	500 x 300 Cedis	150,000
<b>APPROXIMATE TOTAL COST OF THE ENTIRE PROJECT</b>			<b>6,617,640</b>

*Table 3. Costing for the project*



## 5.6 CONCLUSION

With the Bui Dam acting as the catalyst, the set objectives of the thesis project can be achieved where 'Bui City' will certainly become the new economic zone to bring the development of Bui and the northern regions up to speed through Mixed-use (transit-oriented) development.

Not only will a mixed-use development add economic value but also can help to produce a range of social and environmental benefits by creating areas where people want to spend time, live and work in, places people feel safe to walk around, and places with good access to open space, public transport, facilities and job opportunities.

## 5.7 RECOMMENDATION

To achieve the set goals, however, the government will need make the policy led approach a communal responsibility by involving the contributions of community members and to achieve this requires;

- Proper resettlement of the affected communities of the project
- Commitment to achieving high standards of design
- Understanding of how good design can add value
- Establishing mechanisms to support good design
- The right tools to select investors and developers able and willing to create successful places
- The recent discovery of oil has come at an opportune time and I will recommend the central government to set up a special fund from the oil revenue to make the financing of the project sustainable.

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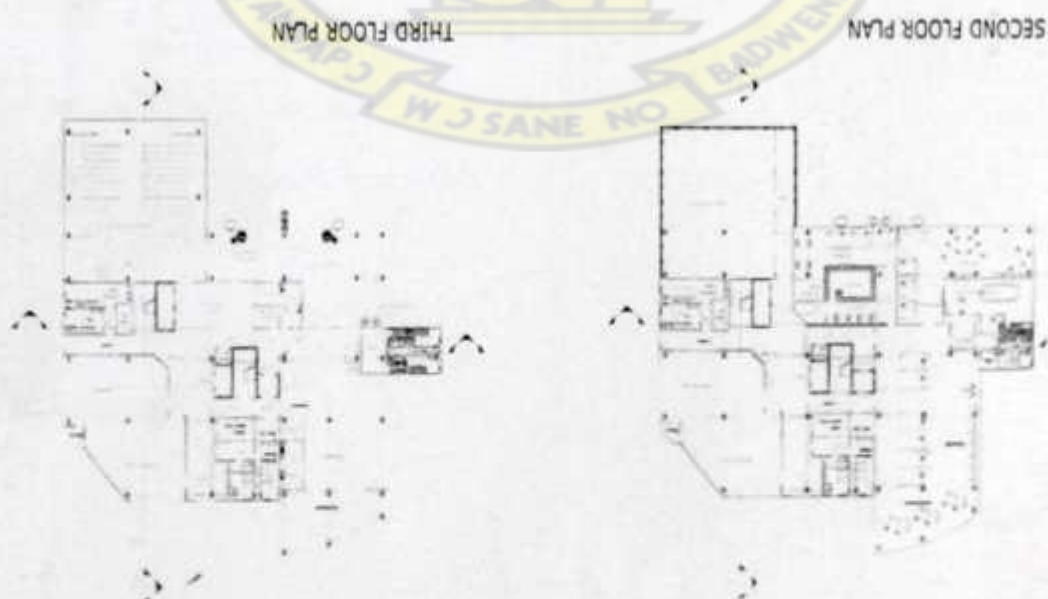
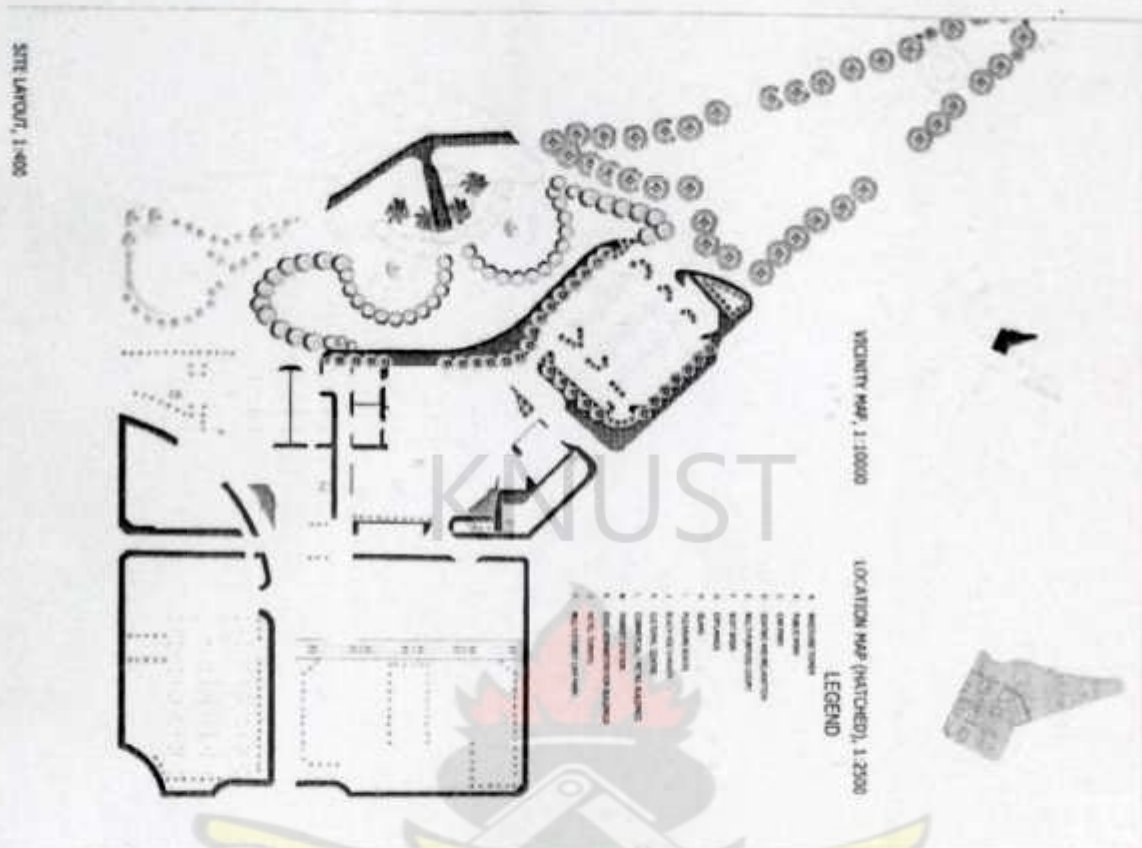


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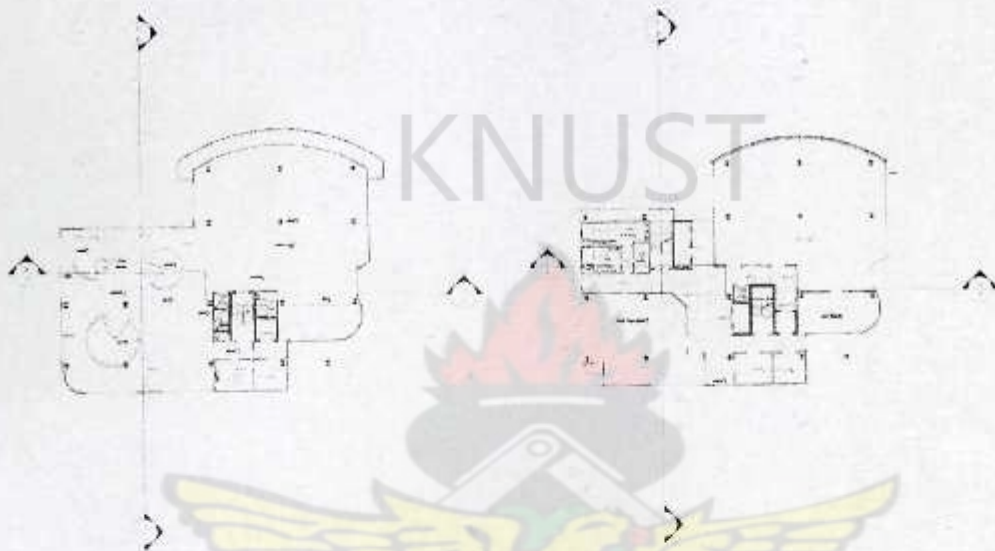


# APPENDICES

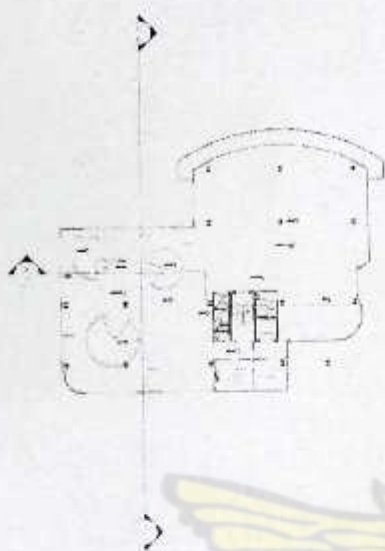




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ROOF GARDEN PLAN



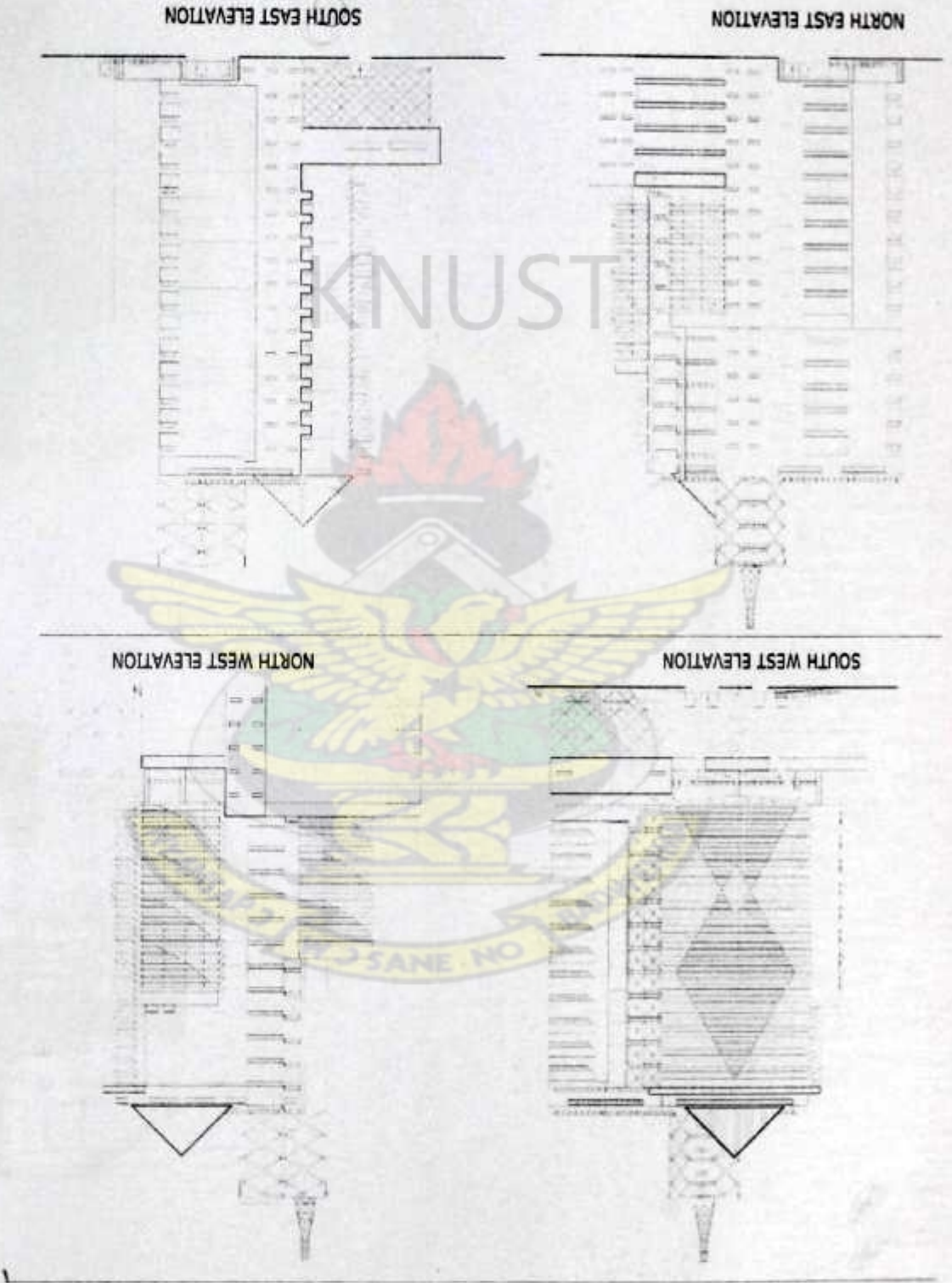
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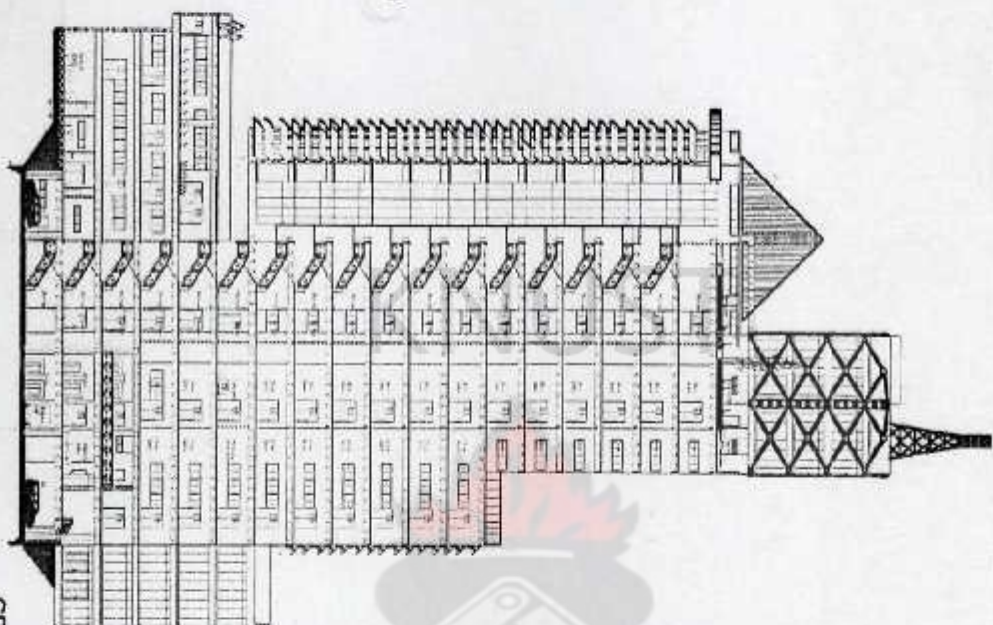


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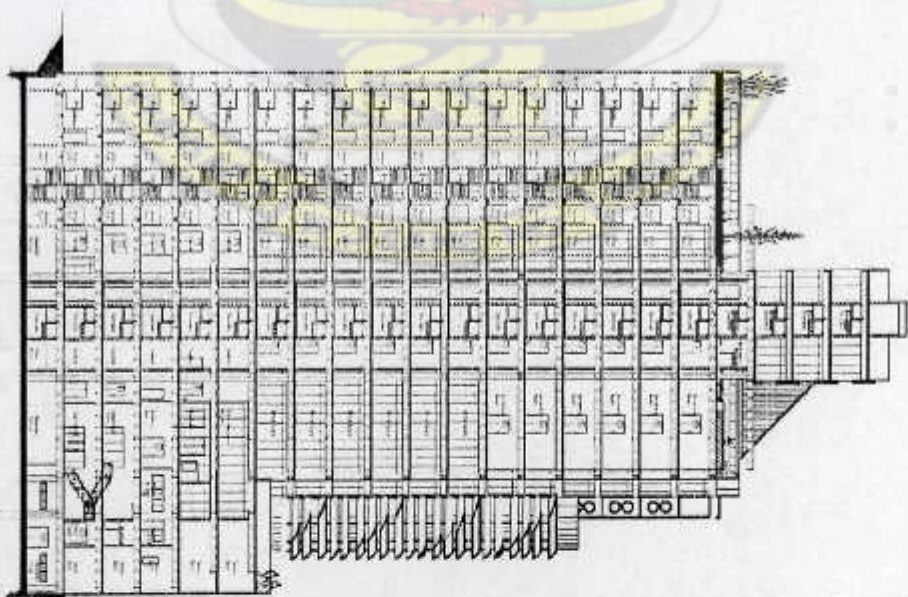








SECTION Y-Y



SECTION Y-X



