



UNIVERSITY *of*
RWANDA

COLLEGE OF SCIENCE AND TECHNOLOGY
SCHOOL OF ARCHITECTURE & BUILT ENVIRONMENT
DEPARTMENT OF ARCHITECTURE

Title of Thesis

A Parking Building as Public Space in the City Centre.

Title of project

Kigali City Mixed Use Parking Plaza

By

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“A Parking Building as Public Space in the City Centre”

Kigali City Mixed Use Parking plaza

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Official Approval by School of Architecture and Built Environment

It is confirmed that this project (thesis) titled “A Parking Building as Public Space in the City Centre” by David BURIMWINYUNDO has been accepted by the jury committee in the department of Architecture on 24/12/2021 in fulfilment of the requirements for the award of the Bachelor of Architecture Degree.

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DECLARATION BY STUDENT

I David BURIMWINYUNDO hereby declare that this is my original work and has not been presented elsewhere in an institution of higher learning as a report or in any other academic format. All the sources of data used in accomplishing this report have been acknowledged or cited in the reference list.

Signed Date



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APPROVAL OF JURY

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This research report was examined by:

Signed Date

External Examiners

Signed Date

External Examiners



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I am grateful for the unwavering support, guidance and diligence of my coordinator and supervisors throughout this thesis. Special recognition goes to all department staff who offered their assistance whenever I needed it. I am also thankful for the time respondents took off to attend all interviews and complete the questionnaire.

I also thank God who helped me to achieve this by providing me a supportive family and friends.



Abstract

The following final year architecture thesis /project explores the intersection between public space and parking as part of a mixed-use development. Whereas parking is the primary problem, a mixed-use plaza is presented as a development strategy to activate a section of Kigali City.

Parking has been gaining importance due to the increasing number of car ownerships and rapid urbanization. Therefore, it is essential to have a parking strategy that encourages parking management towards reduction in congestion, usage of cars and promotion of sustainable transport modes.

All over the world, there has been a paradigm shift towards providing maximum parking requirements, rather than minimum, to reduce the number of vacant parking spaces (during off peak hours) in the city, by efficiently managing those spaces for maximum utilization by providing adequate parking spaces.

I have used interviews, questionnaires, observations, site analysis and context analysis as methods to collect data where we have established that a mixed-use parking plaza is a viable solution. By providing public spaces that activate Kigali City Centre, the project will contribute to integration of social and economic activities.



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List of Abbreviations

CoK:	City of Kigali
ITS:	Intelligent Transport Systems
RHA:	Rwanda Housing Authority
MININFRA:	Ministry of Infrastructure
MUPP:	Mixed Use Parking Plaza
MOE:	Ministry of Environment
NISR:	National Institute of Statistical of Rwanda
NLUDMP:	National Land Use and Development Master Plan
NST:	National Strategy for Transformation



Chapter 1- Architectural Problem

1-1 Introduction

Due to the increasing number of cars, there is a need for appropriate infrastructure given the arising shortage of space in especially commercial areas; one of the solutions being multi storey car parking. In addition, a key concern is how to activate the public realm while offering social, economic and environmental benefits.

Rwanda is known as the second most densely populated country in Africa with an urbanization rate that is expected to double by 2050 ((UN-Habitat), 2014). With urbanization comes the need for increased infrastructure and services. In addition, with population growth and attendant density, a need to coordinate these numbers with other infrastructure and in this particular thesis, vehicular traffic arises. A report by the Rwanda Bureau of Statistics shows that the number of private cars doubled in six years. Which brings to question how far public space is a key consideration in dealing with the problem of population growth and public infrastructure.

Public space is a space that provides many opportunities for people to come together and engage as a community in any city. Public space in particular, contributes to the quality of mobility, access to services and a sense of way finding. As such, within the city it helps to integrate social and economic activities and reduce environmental impacts as they relate to both climate change and occupant comfort and well-being.

For this study, a parking plaza especially in Kigali is explored as a potential solution to achieving a socially, economically and environmentally sustainable mixed use building facility. So, in the next section architectural problem is stated, scoped and its significance and necessity are described, in chapter 2, literature review, different parking plazas across the global attributes are listed with emphasis on attributes relevant to the project. In chapter 3 Methodology and Method Design, data and method used are detailed and in Chapter 4 Data Analysis and Result, the results of analysis are shown then in chapter 5 Findings, Design Framework and Design concept, a design is arrived at that uses results of analysis done in other chapters. In chapter 6, conclusion, the thesis outcome is summarized and reiterates the thesis work.



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1-2-Architectural Statement of Problem

Today car ownership is increasing as stated by Rwanda Revenue Authority (RRA); that reports cars doubled in six years. The National Institute of Statistics of Rwanda reported that the population of Rwanda approximately 12.9 million and currently it is approximately to 13.5 (NSIR, 2020). As a result, it is especially noted that built areas in Kigali City Center have inadequate parking due to population and cars ownership growth.

An article by Mbanda Jean in the New Times of November 12,2013 shows that the problem of insufficient parking that provides social, economic and environmental diversity in terms of travel distance, way finding. The integrative report by NLUDMP reported that the population growth target of 22.1 million is adopted from vision 2050 where 7.5 million will be in rural and 70% (15.4 million). Within those population growth and urbanization growth resulted to design a building that showcases energy efficiency and building technology.

Public spaces in Kigali are considered a key element in ensuring social cohesion and well-being with a wide range of benefits to security, public health, the environment and others (GGGI, 2020). However, this is still a problem, where in Kigali there's shortage of public spaces that foster economic, social and environmental benefits. By considering these factors, Kigali City Mixed Use Parking Plaza is explored as a potential solution to achieving a parking building that demonstrates co-existing within the urban fabric

This project could be an opportunity to solve the issues raised as part of this statement and become a business idea to investors as New Times wrote in its article (Zamu, 2013). So, for this study, a parking plaza especially in Kigali is explored as a potential solution to achieving a socially, economically and environmentally sustainable mixed use building facility.



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1-3-Architectural Research Questions, Goals and Objectives

Table 1 Main Question Subsidiary Questions; Aims and Objectives

Main question	What are the key architectural elements necessary to define and realize an adequate car parking plaza?	Main goal	To design a mixed-use parking plaza that has adequate car parking and activates its neighborhood.
Subsidiary question 1	What are key programmatic activities to define a risible design brief?	Objective 1	To design a parking building that provides social, economic and environmental diversity in its brief.
Subsidiary question 2	What materials and systems are needed to design environmentally friendly buildings?	Objective 2	To design a building that showcases energy efficiency and building technology.
Subsidiary question 3	How can a building demonstrate efficient technologies that promote an integrated city?	Objective 3	To design a parking building that demonstrates co-existence within the urban fabric.



1-4-Scope of Architectural Proposal

Site is located in Kigali city with an area of 9456 square meters and project brief table describes floor for each program cluster.

Project: Kigali City Mixed Use

Nyarugenge, Kiyovu cell.

Zoning: C₃ (Commercial central

Parking Plaza.

Site Location: Kigali,

District)

Area: 9456 square meters

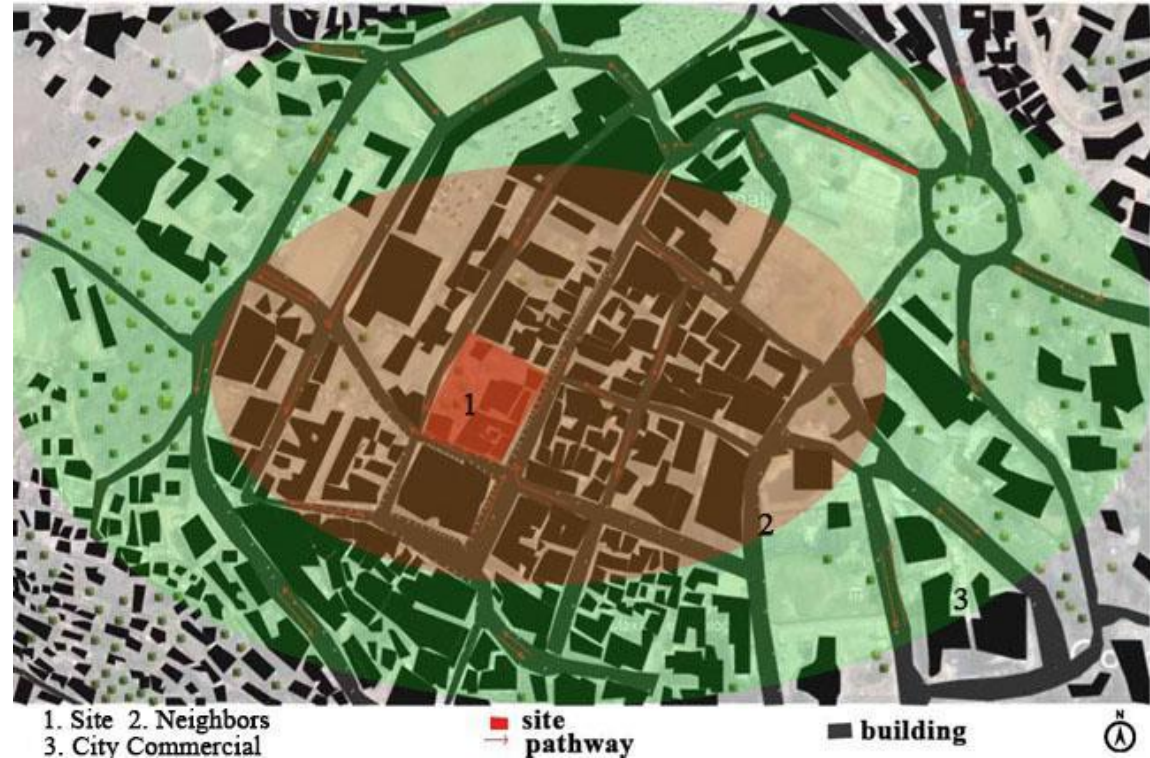


Figure 1. Location and Opportunity

Table 2 Program Brief on Project

Cluster	Program	Floor Area/ square meters	Intended outcomes
Retail	Shops, pharmacy, veterinary shop	12,000	Energy efficiency
Parking	Cars, motorcycle, bicycle parking	19;000	Building technology
Offices and public facilities	Meeting hall, offices, store, classroom	12,500	Environmental diversity



1-5-Significance and Necessity of this Architectural Thesis

◇ Significance of Architectural Thesis

A report by the Rwanda Bureau of Statistics shows that the number of private cars doubled in six years. Which brings to question how far adequate parking facilities in Kigali City Center is a key consideration.

The population is about 12.5 million by 2019, increasing at nearly 2.4 percent per annum. So, with a current annual growth rate of 2.4% (between **300 -400k new annual population**), the population in Rwanda may reach 25.8 million in 2050, with gross density approaching 1000p/sq.km, the highest in Africa. Which shows that this thesis is a viable solution to the infrastructure necessary to support the population growth.

Urbanization is growing at **4.4** percent and Rwanda has proactively embarked on a path to promote urbanization by creating agglomerations of socio-economic benefits. And Urbanization is desired by Vision 2050 to accelerate to 70% which show the role of public spaces in interactive report of NLUDMP (NLUDMP, 2020)



Figure 2 Activities in the City



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◊ Necessity of Architectural Thesis

The transportation sector is playing a vital role in the social economic development, the movement of people and goods is made possible through various transportation modes. Besides, Trade, as well as tourism activities, might not be optimized without an effective transportation system. Since Rwanda is landlocked, land transportation remains the predominant mode which requires adequate car parking facilities especially in Kigali as the central commercial zone. So, Kigali City Mixed Use Parking Plaza is a potential solution to achieving a Socially, economically and environmentally sustainable mixed use building facility.

So, with a current annual growth rate of 2.4% (between 300 -400k new annual population), the population in Rwanda may reach 25.8 million in 2050 and will be engaged in social economic activities. According to this thesis, it will be an opportunity for the people to have a coworking place that shows energy efficiency, building technology and social economic diversity. So, Kigali Mixed Use Parking Plaza (KMUPP) helps to integrate social and economic activities and reduce environmental impacts as they relate to both climate change and occupant comfort and well-being.

Rwanda is a natural resources-based economy and Urbanization is growing **at 4.4 percent** whereas Urbanization is desired by Vision 2050 to accelerate to 70%. So public spaces will be integrated in urban fabric as public space is a space that provides many opportunities for people to come together and engage as a community in any city. Public space in Kigali in particular, contributes to the quality of mobility, access to services and a sense of way finding.



Chapter 2- Literature Review

A review of different parking plazas across the global and summaries their attributes as related to the project and finally use them to inform our choice of the best attributes to add to parking plaza proposed in the project.

2-1-Literature Review

Table 3 Literature on Parking considerations/guidelines

Objectives	Source (Author/ Title (Book, Journal, Article))	Attributes
1.To design a parking building that provides social, economic and environmental diversity in its brief.	1. (Gruen, 1953) Impact of regional shopping center. 2. (Hamlet, 2011) Inclusive design	1.Activate the public realm while offering social economic and environmental benefits. 2. Activate its Neighbourhood infrastructure.
2.To design a building that showcases energy efficiency and building technology.	1. (Hashemi, 2015) environmental impacts and embodied energy of construction methods and constructions. 2. (HUB, 2020) Valet Parking Solutions.	1. Energy Efficiency and building technology. 2. Modern technology to enhance way finding.
3.To design a parking building that demonstrates co-existence within the urban fabric.	1. (GGGI, 2020) Mapping of Public Spaces in Kigali: Towards City-Wide Public Space Strategy 2. (Roadside development design, 2006) Roadside development design manual. 3. (UN-Habitat, 2020) Public Space Site-Specific Assessment: Guidelines to Achieve Quality Public Spaces at Neighbourhood Level.	1. Integration of social, economic activities. 2. space comfort, Access, mobility and wayfinding. 3. Environmental impacts as they relate to both climate change and occupant comfort and well-being.



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Precedent studies/Analysis

The following table high-rate precedent studies attributes in Performance Rating where:

Very Good: 4 Good: 3 Some What Good: 2 Poor: 1 Very Poor: 0

Table 4 Precedent Studies

Precedent	Activate its Neighborhood	Building Technology	Visible /Prominent	Environmentally Friendly	Diverse Activities	Centrally Located	Underground Architecture
1.Lammermarkt Parking Garage / JHK Architekten	4	3	4	3	4	4	2
Parking Garage Cliniques Universitaires Saint-Luc / de Jong Gortemaker Algra + Modulo architects	4	4	4	4	3	4	3
Underground Parking Katwijk aan Zee / Royal HaskoningDHV	2	3	3	4	2	3	4
Parking Garage Facade P22a / wulf architekthe	4	4	4	3	3	4	2
Miami parking by Zaha Hadid	4	3	3	3	4	4	0
Kigali City Tower Parking	2	1	1	2	2	3	1



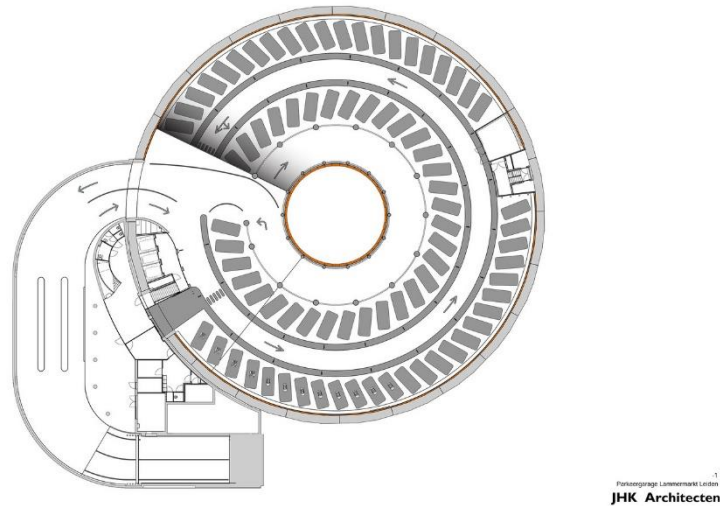
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Precedent Analysis

1-Lammermarkt Parking Garage / JHK Architecten

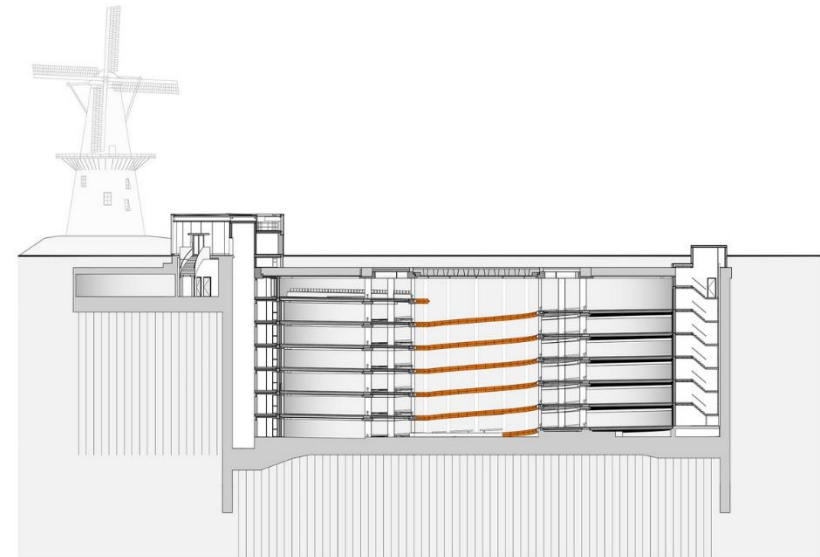
The Lammermarkt parking Garage, it is located in Netherlands and is under the Lammermarkt, JHK Architecten design this garage as cylindrical form



Parkeergarage Lammermarkt Leiden
JHK Architecten

Figure 3: Activate its neighborhood, building technology

Source (Stahl, 2017)



Parkeergarage Lammermarkt Leiden

Figure 4: Centrally Located and Prominent



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2-Parking Garage Cliniques Universitaires Saint-Luc / de Jong Gortemaker Algra + Modulo architects

This project which is located in Belgium and was built in 2016



Figure 5: Activate its Neighborhood, Centrally Located and Visible

Source (ansen, 2016)

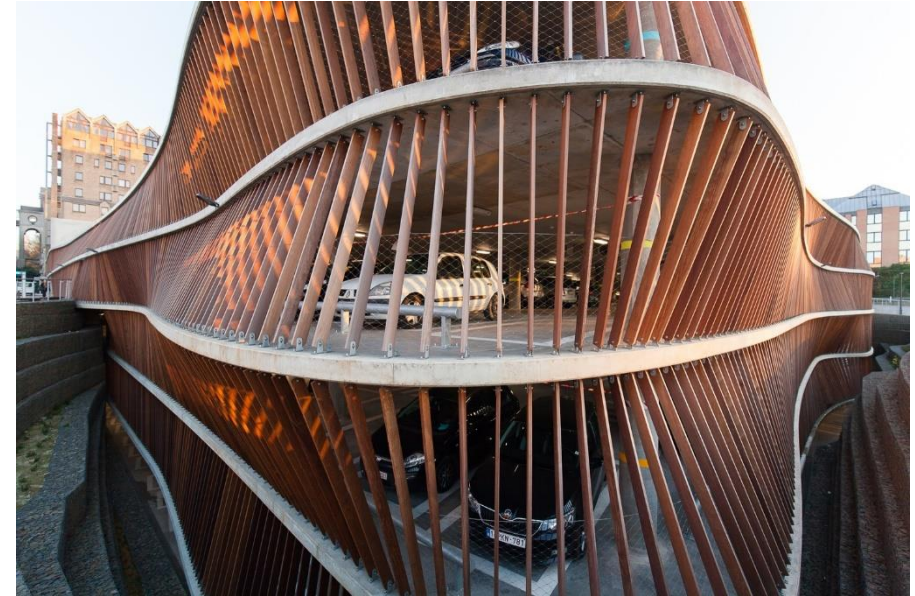


Figure 6: Building technology and environmentally friendly



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3-Underground Parking Katwijk aan Zee / Royal HaskoningDHV

located in the Netherlands built in 2016 as parking.



Figure 7: Environmentally friendly and Building Technology

Source (FRANKE, 2016)



Figure 8: Underground Architecture and Centrally Located



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4-Parking Garage Facade P22a / wulf architekto

This project is located in Germany and built in 2017, where the façade is built with shell.



Figure 9: Centrally Located, Prominent and Activates its Neighborhood
Source (González, 2017)

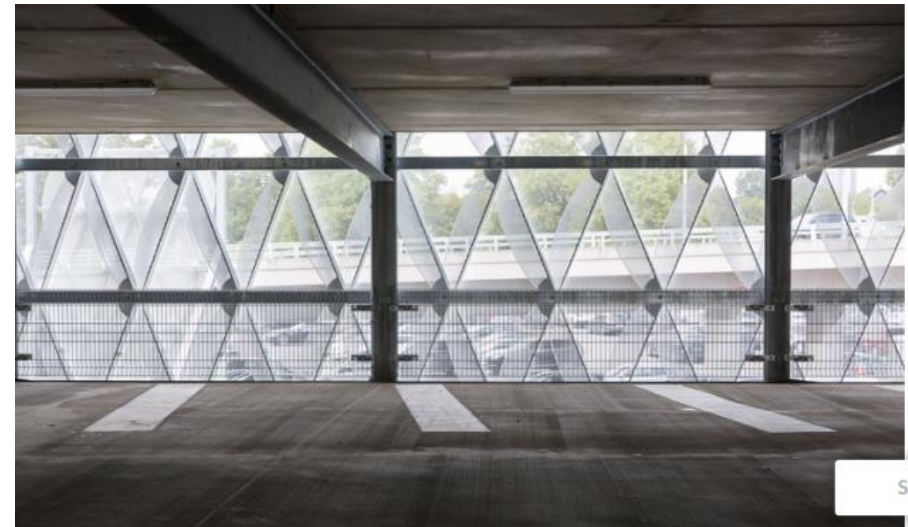


Figure 10: Building Technology and Environmentally Friendly



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2-2-Theoretical Framework

From literature review of mixed used parking plazas in previous section, the following key elements were selected for project’s mixed parking building based on the best attributes from parking plazas selected for review

- ★ A building which allows free movement and activates its neighborhood’s infrastructure.
- ★ Buildings must reflect the surroundings in terms of activities, materials and design showcases about energy efficiency and building technology.
- ★ For mixed use parking plaza, materials and technology must be used in association with environmental consequences.
- ★ According to project location, natural light and slope must be used as an opportunity for energy efficiency, mobility and accessibility.
- ★ A plaza that allows mobility, access and wayfinding to increase productivity to urban fabric.



Chapter 3-Methodology and Method Design

3-1-Methodology

The Methodology part had helped us in distinguishing the data that could be integrated to our design. Those data could be qualitative or quantitative. The qualitative data have been collected from Interview, site analysis, and even observation in order to have clear information about the design. The quantitative data have been collected using interviews, questionnaires in order to have a great opportunity to learn about the user’s information. According to topology as an architectural component, site analysis was used to get information about site morphology as other researchers used this technique (Kothari, 2011). According to materials, interviews and observations were used to get more behavior information of the users and their experiences.

3-2-Methods

Table 5 Methods for Data Research

Main question	What are the key architectural elements necessary to define and realize an adequate car parking plaza?	Main goal	To design a mixed-use parking plaza that has adequate car parking and active its neighbors.	Interviews, Observations, Questionnaires, site context analysis
Subsidiary question 1	What are key programmatic activities to define a risible design brief?	Objective 1	To design a parking building that provides social, economic and environmental diversity in its brief.	Questionnaires; Interviews, Observations
Subsidiary question 2	What materials and systems are needed to design environmentally friendly buildings?	Objective 2	To design a building that showcases energy efficiency and building technology.	Observations, Interviews, questionnaires
Subsidiary question 3	How can a building demonstrate efficient technologies that promote an integrated city?	Objective 3	To design a parking building that demonstrates co-existence within the urban fabric.	Site & context analysis, Interviews



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Chapter 4-Data Analysis and Result

Data analysis done is summarized in a table below where precedent analysis, urban/context analysis, site analysis, literature analysis is included as columns and then results of the data analysis as the last column. Each question is described in a row with a description of its precedent analysis to results related to the question.



Table 6 Data Analysis and Results

Questions	Precedent	Urban /Context	Site Analysis	Content	Results
Objectives	Analysis	Analysis		Analysis	
What are key programmatic activities to define a risible design brief?	-Centrally located	-Centrally located	-social, economic	-Integration of	-Promotion of
To design a parking building that provides social, economic and environmental diversity in its brief.	-social, economic and environmental diversity	-social, economic and environmental diversity	and environmental diversity	society. Economic and environmental in the City	social, economic and environmental diversity.
What materials and systems are needed to design environmentally friendly buildings?	-Environmentally friendly	-Visible/Prominent	Visible/prominent	-Proximity	Promote
To design a building that showcases energy efficiency and building technology.	-Building technology	-Adequate parking and proximity	-Proximity	- Building technology	prominent and proximity through technology
How can a building demonstrate efficient technologies that promote an integrated city?	-Environmentally friendly	-Visible/Prominent	Visible/prominent	-energy efficient	
To design a parking building that demonstrates co-existence within the urban fabric.	-Building technology	-Adequate parking and proximity	-Proximity		
	-Centrally located	-Centrally located	-Prominent	-Diverse activities	Integrate
	-Prominent	-Prominent	- Activate its neighbors	-Visible	social;
	- Activate its neighbors	- Activate its neighbors	-social, economic and environmental diversity	- Activate its neighbors	economic and environmental, comfort and well being



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Chapter 5- Findings, Design Framework and Design concept

5-1-Findings

As data analysis from chapter four which were delivered from all techniques used from site analysis, context analysis and content analysis which come from interviews, observation for architectural components and subcomponents. And the following is the outcome findings that is key essential to design Kigali Mixed Use Parking Plaza.

◇ Interpretation of Data as Findings

◇ Programmatic Activities that define a risible design brief and promote social, economic and environmental diversity

These activities consist of vibrant activities and silent activities. From the data analysis we found that the good project could activate its neighbors. That is why the following activities have been proposed: Parking, Retailers shop, Conference room, Offices, Storage, Cinematic, Training rooms, Restaurant, and Toilets and public space will be provided to activate its neighbors.

◇ Material and System to design environmentally friendly Mixed Use Parking Plaza which show energy efficiency, building technology

According to data analysis we found that a MUPP that could use a light material, built with energy efficiency and use Valet technology would be used with integration of roofs made by Solar energy shells which are environmentally friendly.

◇ Efficient Technologies that promote integrated City within Urban Fabric

In order to integrate the city, public space is required as space that provides many opportunities for people to come together and engage as a community in any city. Public space in particular, contributes to the quality of mobility, access to services and a sense of way finding. Will be integrated into MUPP in the way that promotes Kigali City.

For this study, a parking plaza especially in Kigali is explored as a potential solution to achieving a Socially, economically and environmentally sustainable mixed use building facility.



5-2-Design Framework

According to the projects the following are the programs that are found on site and new one integrated in order to balance the existing with needs of people in the city center. Offices, shops, stores, accessibility and circulation, meeting hall, parking, toilets and bath.

◇ Program Hierarchy

Table 7 Program Design Brief

Cluster	program	Retail			Parking Cars, motorcycle parking	Offices and Public Facilities				Servant spaces Toiles and bathroom
		Shops	Veterinary shop	Pharmacy		Meeting Hall	Offices	Store	Classro om	
Retail	1. Shops									
	2. Veterinary Shop	●								
	3. Pharmacy		●							
Parking	Cars, motorcycle parking	●●●	●●	●●						
Offices and Public Facilities	Meeting Hall	●	●	●	●●					
	Offices	●	●	●	●●	●				
	Store	●●	●●	●●	●	●	●			
	Classroom	●	●	●	●●	●●	●	●		
Servant spaces	Toiles and bathroom	●●	●●	●●	●	●●	●●	●	●●	



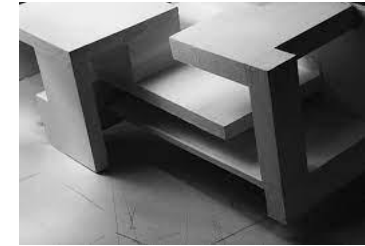
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5-3-Design concept

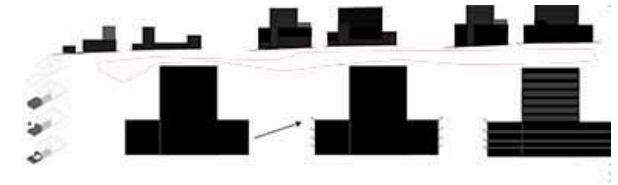
◇ mass and void

This kind of concept is delivered from the site, where the built area makes mass and unbuilt make void, so a concept is applicable to my project in order to have ventilation, light and sun protection.



◇ horizontal and vertical growth

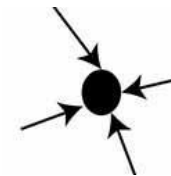
According to the project about the plaza, these concepts of addition in both vertical and horizontal in order to achieve our objective of free flow of people and cars into shopping centers by easy accessibility and walkability. By allowing social economic activity diversity.



◇ centralization

According to the location of the project, this kind of concepts could be used to make accessibility in both side but allowing free movement for different kinds

Centralization and vertical growth concepts were selected as main concepts.



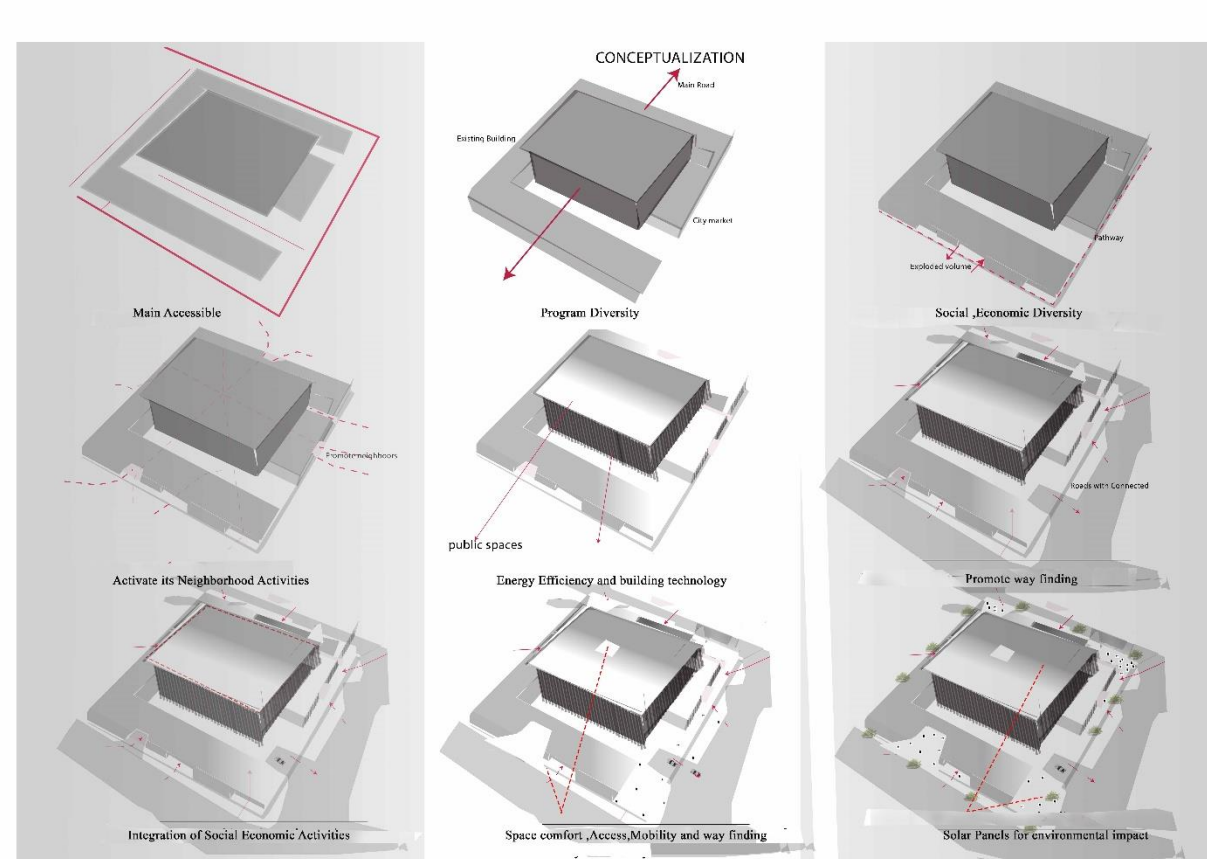
The centralization of parking is chosen as all other programs are linked to parking and are affected by parking [see Program Hierarchy] and urban fabric will help activate the city center by its central location. All other programs are dependent on parking plaza, and helps with accessible by making all other programs in reach or close to parking.

Vertical growth concept, building technology and efficient use of space necessary to counter increasing population growth that put pressure on available land for horizontal parking.



5.3 Design concept outcome

Answering to Research Questions/
Obtaining to Research Objectives During research this part is showing the relationship between question, objectives and goals towards the findings of the research,



Drawing 1 Concept: Social Economic Diversity, Building technology and Energy efficiency



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◇ Site Plan



Drawing 2 Site Plan: Neighborhood Activation, Energy efficiency and programs diversity

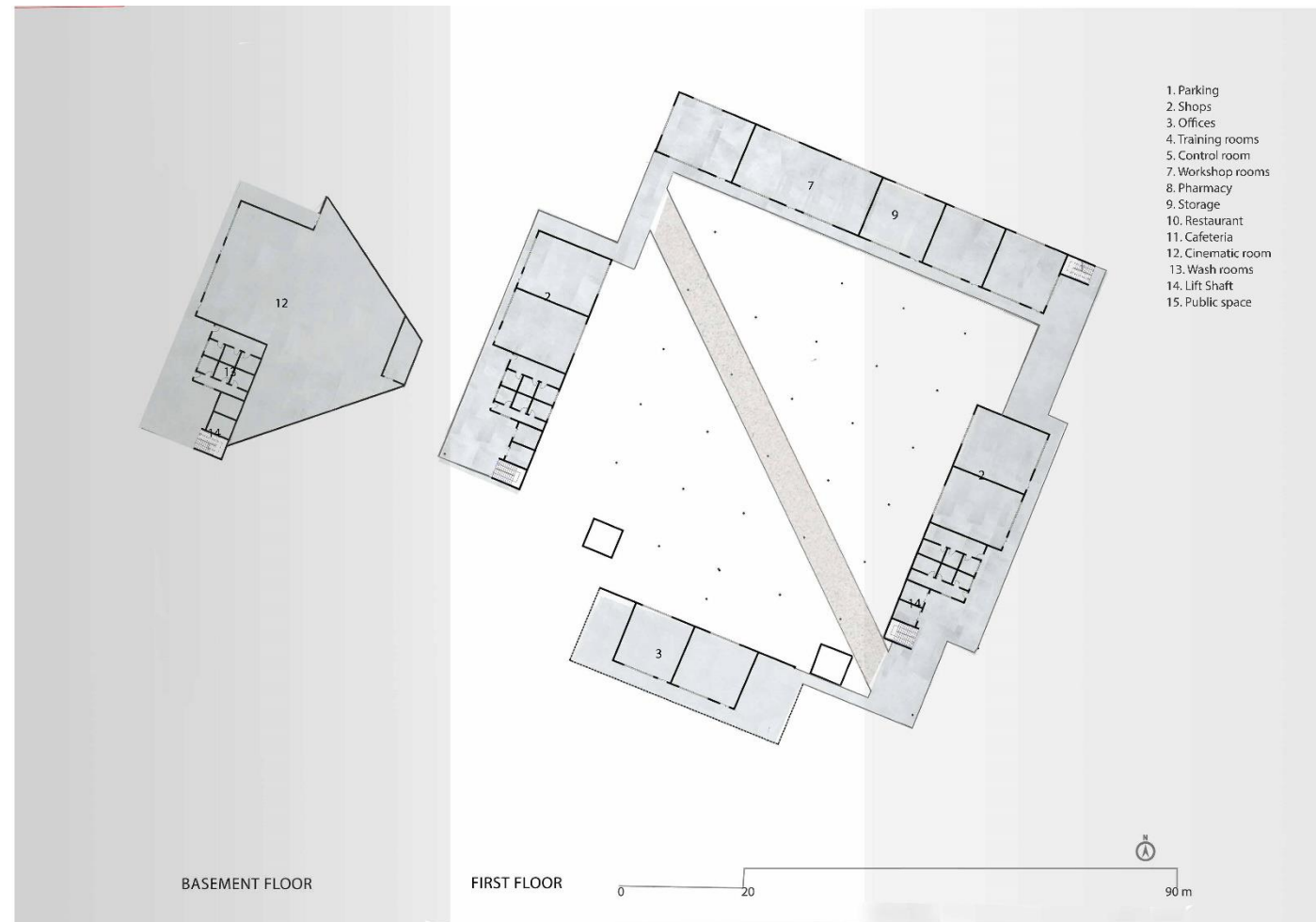


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Basement and First Floor



Drawing 3: Basement and First Floor: Social Economic Diversity, Building Technology, Program Diversity

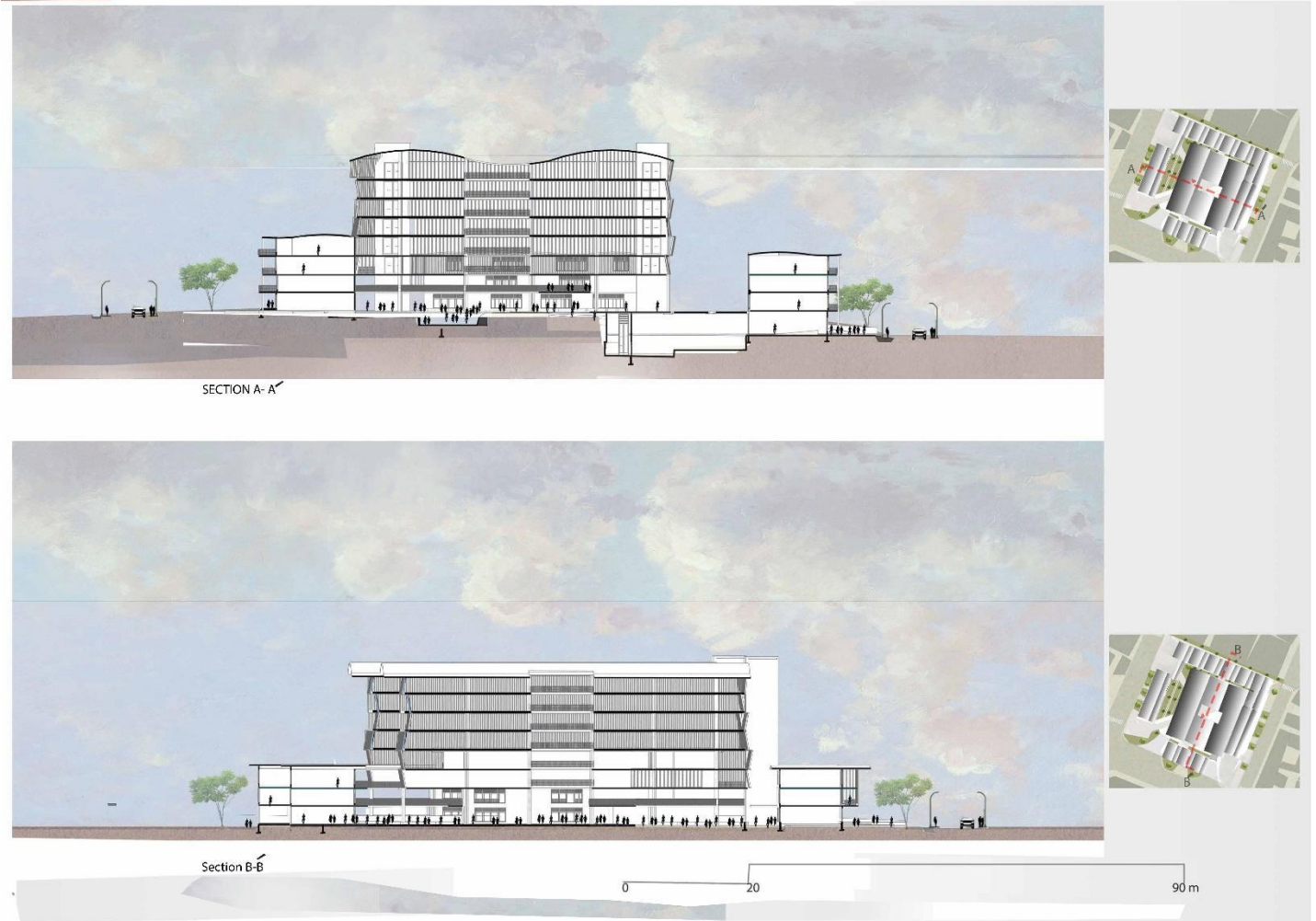


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Section



Drawing 4 Sections: social economic and building technology with energy efficiency.

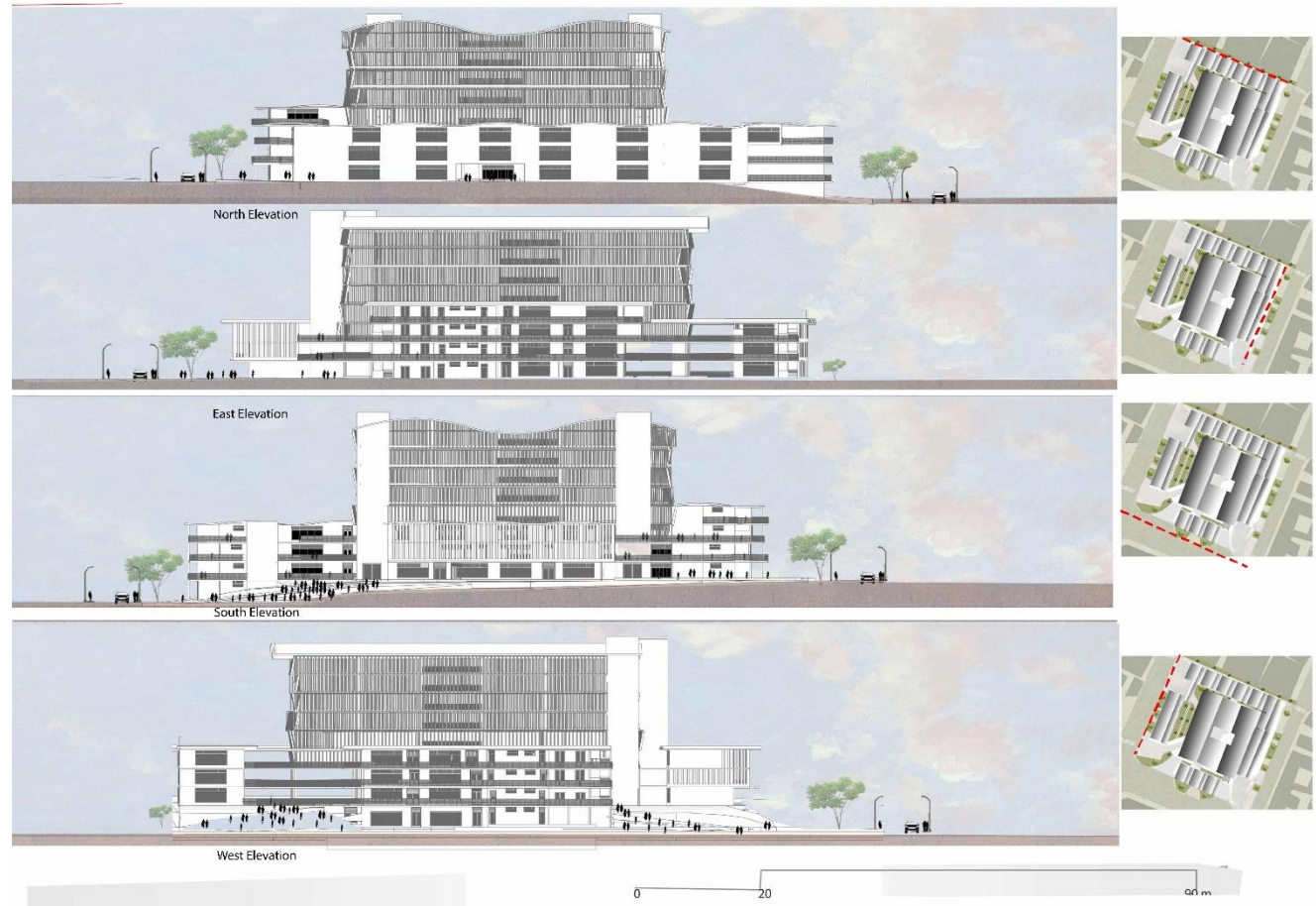


“A Parking Building as Public Space in the City Centre”

Kigali City Mixed Use Parking plaza

UNIVERSITY OF RWANDA

◆ Elevations



Drawing 5 Elevations: Adequate parking, Energy Efficiency and programs diversity



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◇ Realistic Render



Drawing 6: Realistic Render: mobility, wayfinding, and promotion of social economic activities.



Chapter 6-0-Conclusion

◇ Summary of research

As the research was based on urban architecture, chapter one was about introduction to the topic and defined architectural problems and questions according to the component and subcomponent. The architectural question was about inadequate parking/facilities in the city center due to car ownership rate, population growth and urbanization. where there is poor access, mobility which causes roam and time wastage, poor integrated social and economic activities which cause forestall activities. In chapter two, the research was about the literature reviews about theoretical framework, where human beings were connected with nature. Good City allows social, economic and environmental diversity.

While the researcher collected the information about the other researchers, we got techniques and methods in chapter three that we could use in getting data from the site. it found that the data would be collected using interviews, questionnaires, site analysis and observation. On the interviews was carried in walking interviews by extracting information that is not observed from the site, questionnaire was designed for the users, who are currently use the space and have the time to reflects to the question that was composed and most are the workers from the site, the site analysis was used to get information about the site like slope and building coverage in order to have clear understanding about the research and better result.

During the research the data obtained using different techniques and methods was difficult but in chapter four was about data analysis and result in order to have a solution to the research question. The data analyzed provide findings from chapter five, which were about the contradiction and new meaning about the research. where we found that this site needs programmatic activities that activate its neighbor, materials and building technology that reflect environmentally friendly.

We come up with a design from design concepts that resulted from the research done and proposed or made a design that integrated the design concepts that were arrived at as the best designs to satisfy the project requirements /desirability or deliverability. see recommendation actions.



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◇ **Conclusion/ Contribution/ Generalization**

Table 8 Conclusion/ Contribution/ Generalization/Recommendation

Questions Objectives	Conclusion	Contributions	Generalization	Recommendation
<p>What are key programmatic activities to define a risible design brief?</p> <p>To design a parking building that provides social, economic and environmental diversity in its brief.</p>	-Programmatic activities that defining a risible design brief and promote social, economic and environmentally diversity	-Designer and all stakeholders could define a programmatic activity accordingly	-Believes and culture not developed -Zoning and Masterplan	-Commercial spaces in underground
<p>What materials and systems are needed to design environmentally friendly buildings?</p> <p>To design a building that showcases energy efficiency and building technology.</p>	-Light materials and building technology that showcases energies efficiency for clean environment	-Readers, government, stakeholders could use this research in terms of materials and building technology	- Skills on construction materials is not developed - Solar energy is cheap -human activities destroy nature	-Local materials -Natural ventilation - trees on the road for greenery, shading and soil erosion.
<p>How can a building demonstrate efficient technologies that promote an integrated city?</p> <p>To design a parking building that demonstrates co-existence within the urban fabric.</p>	-buildings that promote an integrated city and demonstrate co-existence within the urban fabric. -Activate its neighborhood infrastructures	- Readers, government, and stakeholders could use this research in terms of promoting integrated cities and demonstrating co-existence within the urban fabric.	-Public spaces planned but not designed and use -infrastructures comes first	-veranda for shading, circulation and marketing -outdoor space for sitting



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