

KUTHAMBAKKAM TRANSIT HUB

(Integration Of Bus Terminus with Wetland)

A THESIS

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Architecture degree

By

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**DEPARTMENT OF ARCHITECTURE
SCHOOL OF BUILDING AND ENVIRONMENT**

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY) Accredited

With Grade “A” by NAAC

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May 2024



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BONAFIDE CERTIFICATE

This is to certify that Thesis Report is the bonafide work of KARTHIKEYAN A (39210035) who carried out the Thesis entitled "Kuthambakkam Transit Hub (Integration of Bus Terminus with Wetland)" under our supervision from December 2023 to May 2024.

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I, **KARTHIKEYAN A** hereby declare that the Thesis Report entitled Kuthambakkam transit hub (Integration of Bus Terminus with Wetland)" done by me under the guidance of **Dr.Devayani Gangopadhyay** (Internal Guide), **Ar.Surya Rajkumar** (Internal Review Member) and **Ar.Kishore Panikkar** (External Guide) Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Architecture Degree.

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I convey my thanks to **Dr.Devyani Gangopadhay**, Dean and Head of the Department, School of Building and Environment, Our Design Chair **Ar. Sarath C.Kanth**, Thesis Coordinator **Ar.Mohana Gopiraj** for providing me necessary support and details at the right time during the progressive reviews.

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KARTHIKEYAN A

THESIS SYNOPSIS

This thesis delves into the design and realization of a sustainable bus terminus project initiated by the Chennai Metropolitan Authority. Serving as a crucial link for west intercity buses connecting Chennai to destinations like Bangalore, Krishnagiri, and Hosur, this terminus is strategically located in Kuthambakkam, Tamil Nadu.

The primary focus lies in achieving sustainability objectives while facilitating efficient urban connectivity. Key goals encompass preserving ecological integrity, implementing effective water management strategies, and promoting green infrastructure within the terminus premises. To minimize environmental impact, the terminus adopts modern techniques and incorporates green design elements such as green roofs and stormwater management systems. These features not only enhance the aesthetic appeal but also contribute to biodiversity conservation and water resource management.

Community engagement is paramount throughout the project lifecycle, fostering a sense of collective ownership and responsibility. By promoting sustainable practices and encouraging stakeholder participation, the terminus becomes a catalyst for positive change within the local community.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Urbanization poses significant challenges to the environment, particularly concerning the preservation of natural ecosystems amidst infrastructural development. In response to these challenges, the proposal for a bus terminus above wetlands in Kuthambakkam stands as an innovative solution that harmonizes urban functionality with ecological preservation. This thesis aims to elucidate the sustainable goals and strategies adopted in the design and implementation of this project, emphasizing its potential as a model for future urban developments.

1.2 NEED OF THE PROJECT

The Kuthambakkam bus terminus project addresses the pressing need for enhanced connectivity between Chennai and key destinations such as Bangalore, Hosur and Krishnagiri etc. Amidst rapid urbanization, existing transportation infrastructure is strained, leading to congestion and delays. By providing a centralized hub for inter-city buses, the terminus streamlines travel logistics, alleviates congestion in Chennai, and improves accessibility for commuters. Additionally, it serves as a vital link between urban centers and peri-urban/rural areas, fostering economic development and social inclusion.

1.3 AIM AND OBJECTIVE

(a) To evaluate the feasibility and effectiveness of the bus terminus above wetlands in Kuthambakkam as a sustainable solution for urban transportation infrastructure, while preserving the ecological integrity of the wetlands.

(b) To create contemporary and effective transportation center, prioritizing the requirements of commuters. This includes ensuring smooth connectivity, easy access to different locations, and enhancing overall transportation services, with a particular emphasis on Non-Motorized Transport (NMT).

(c) To conduct a comprehensive study on water percolation and to design the construction of the bus terminus in a manner that conserves the existing wetland ecosystem.

1.4 METHODOLOGY

- 1) Secondary data collection on Multi Modal Transit Hubs and bus terminus, of ongoing projects and policies.
- 2) Live & literature case studies to understand the functioning & zoning of transit hubs & their integration with non-motorized transit.
- 3) Synthesizing insights from the case studies to formulate the project's program statement.
- 4) Site & SWOT analysis to take major design decisions & referring major design standards & by-laws.
- 5) To conduct research on the sponge city concept and parameters pertaining to the collection of precipitation from rooftops and landscapes.
- 6) Incorporating sustainable measures by integrating the bus terminus with wetlands.

1.5 SCOPE OF THE PROJECT

- 1) Proposing a bus terminus along with the connection between metro station through cycling and pedestrian walkways promotes NMT.
- 2) By elevating the structure above the wetlands, the project minimizes direct disturbance to the sensitive wetland ecosystem. This approach helps preserve the natural habitat, biodiversity, and ecological functions of the wetlands, which are often vital for flood control, water filtration, and providing habitat for various plant and animal species.

1.6 LIMITATIONS OF THE PROJECT

The project's development is limited to the immediate vicinity, extending only within a 1KM - radius from the site to neighboring settlements.

CHAPTER 2

LITERATURE CASE STUDIES

2.1 SABARMATI MULTIMODAL TRANSIT HUB – LIVE CASE STUDY



Location - Ahmedabad, India

Architect- Ar. Kamini Sharma

Type of development – Multimodal transit hub

Floating population - 1,14,000 Peoples per day

completion – ongoing

Figure 2.1 Image of Sabarmati transit hub

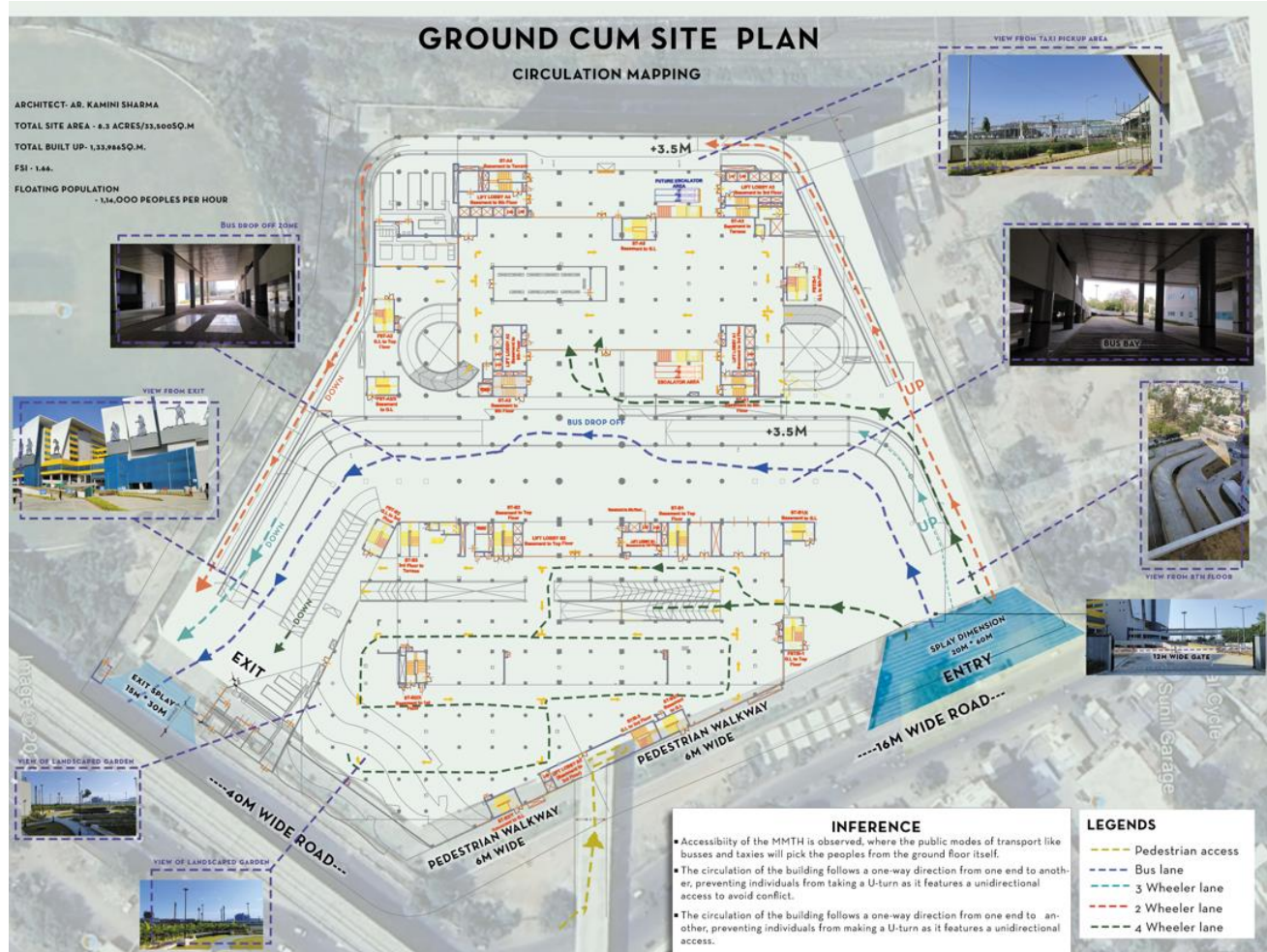
- a. The National High-Speed Rail Corporation Limited (NHSRCL) has planned to develop the Sabarmati HSR Station as a Multimodal Transport Hub. This improves the efficiency and convenience of travel for commuters who can easily transfer from one mode of transport to another.
- b. Sabarmati Multimodal transit hub have been chosen strategically to serve as a central point for transportation services, ensuring accessibility for a large number of people in the region.
- c. It is crucial for enhancing urban transportation by integrating various modes such as buses, trains, and metro services. this hub improves connectivity, streamlines transfers between different transportation modes, and reduces congestion in the city. it serves as a catalyst for economic development, promoting mixed-use zones and providing a strategic location for businesses.
- d. The Multimodal transit hub receives an average of 14,00,000 passengers per day.
- e. Modes of transport accommodated:

High speed rail, Metro rail and BRTS – Bus Service



Figure 2.2 Circulation from site in Master Plan level

- f. Accessibility of the MMTH is observed, where the public modes of transport like busses and taxis will pick the peoples from the ground floor itself.
- g. The Hub building is being constructed as a twin structure having storey's with space earmarked for Office G+7 & G+9 s, commercial development and retail outlets for passengers.
- h. Proposed Hub building provides connectivity to HSR Station, both sides of Western Railway Stations, Metro Station and BRTS via FOBs.
- i. Details of FOBs are as follows:
 - FOB 1 connects Hub building with the Sabarmati (Meter gauge) Railway station and HSR Stations. Travellators will be installed in the FOB for ease of passengers.
 - FOB 2 provides connectivity between Unpaid concourse of Hub building and unpaid concourse of Metro Station and the BRTS stand
 - FOB 3 connects the Unpaid concourse of HSR stations with Railway Platforms of Sabarmati broad gauge railway station.
- j. The circulation of the building follows a one-way direction from one end to another, preventing individuals from taking a U-turn as it features a unidirectional access to avoid conflict.



- k. For easy access to the Hub building, dedicated pick up and drop off bays along with ample parking space have been created for private cars, taxis, buses, autos, two wheelers. This shall ensure smooth movement of passengers and traffic in the influence area of HSR station.
- l. Hub building has a dedicated Concourse Floor (at third Floor level) for passengers with other amenities such as waiting areas, retail and restaurants.
- m. For passenger interchanging between Indian Railways and HSR a Ticket Counter facility for Indian Railways will be provided in Hub concourse.

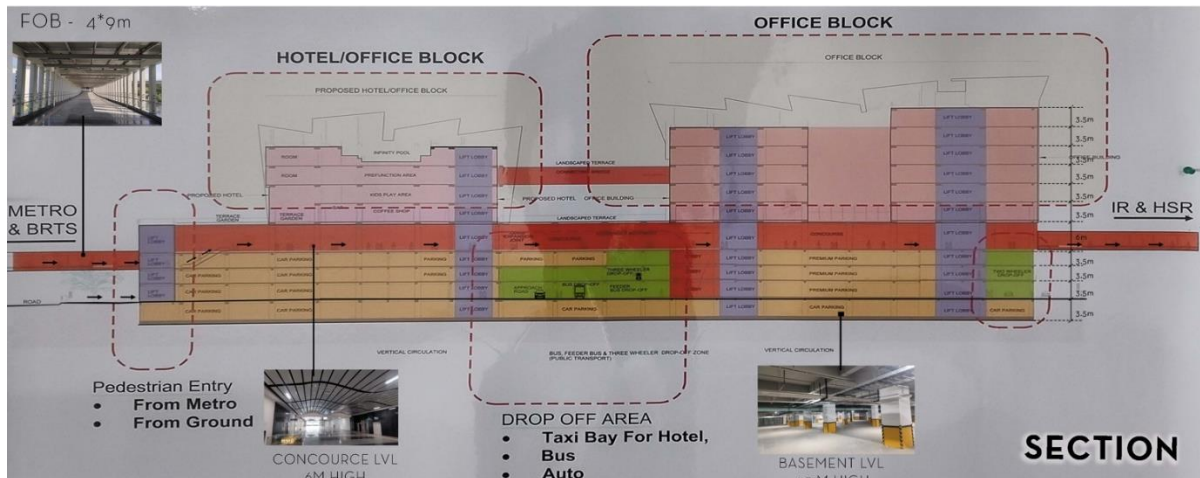


Figure 2.4 Figure showing the schematic section

- n. The building blocks above concourse floor are segregated into two separate block A & B with interconnecting terraces at 2 levels. Block A has 6 floors above concourse reserved for future office space. Block B having 4 floors has been planned with a view to house a hotel facility having rooms, banquet halls, conference rooms, swimming pool, restaurant etc.

BLOCK-A		BLOCK-A		BLOCK-B	
SPACE DESCRIPTION	AREA IN SQM	SPACE DESCRIPTION	AREA IN SQM	SPACE DESCRIPTION	AREA IN SQM
SHOP-01	100.00	WAITING & PASSAGE AREA	4835.00	FOOD COURT -01	1030.00
SHOP-02	87.00	HSR LOBBY 1	57.00	FOOD COURT -02	1050.00
SHOP-03	95.00	HSR LOBBY 2	59.00		
SHOP-04	95.00	OFFICE LOBBY 1	63.00	TOTAL AREA FOR RENTAL = 2080.00 SQM	
SHOP-05	87.00	OFFICE LOBBY 2	60.00		
SHOP-06	100.00	ESCALATOR LOBBY	125.00	BLOCK-B	
SHOP-07	66.00	GENTS TOILET-01	87.00	SPACE DESCRIPTION	AREA IN SQM
SHOP-08	105.00	LADIES TOILET-01	63.00	CONCOURSE	963.00
SHOP-09	110.00	GENTS TOILET-02	47.00	OUTDOOR RECREATION	525.00
SHOP-10	110.00	LADIES TOILET-02	43.00	LOBBY-01	52.70
SHOP-11	100.00	AHU ROOM-1	72.00	GENTS TOILET-01	32.00
SHOP-12	115.00	AHU ROOM-2	70.00	LADIES TOILET-01	37.00
SHOP-13	105.00	AHU ROOM-3	45.00	GENTS TOILET-02	33.00
SHOP-14	110.00	ELEC ROOM-1	25.00	LADIES TOILET-02	33.00
SHOP-15	138.00	ELEC ROOM-2	21.00	ELEC ROOM-1	17.00
SHOP-16	145.00	ST-1 (STAIR CASE)	40.00	SERVICES ROOM-1	47.00
SHOP-17	45.00	ST-2 (STAIR CASE)	40.00	AIR WASHER & SCRUBBER-1	60.00
SHOP-18	72.00	ST-3 (STAIR CASE)	40.00	AIR WASHER & SCRUBBER-2	54.00
SHOP-19	72.00	ST-4 (STAIR CASE)	45.00	ST-5 (STAIR CASE)	40.00
SHOP-20	72.00	ST-7 (STAIR CASE)	40.00	ST-6 (STAIR CASE)	45.00
SHOP-21	72.00	ST-8 (STAIR CASE)	40.00	ST-9 (STAIR CASE)	35.00
SHOP-22	47.00			ST-10 (STAIR CASE)	40.00
SHOP-23	40.00			ST-11 (STAIR CASE)	40.00
SHOP-24	270.00			ST-19 (STAIR CASE)	40.00
TOTAL AREA IN SHOPS = 2360.00 SQM		TOTAL AREA	= 5920.00 SQM	TOTAL AREA	= 2100.00 SQM

Figure 2.5 Spaces and Area statement

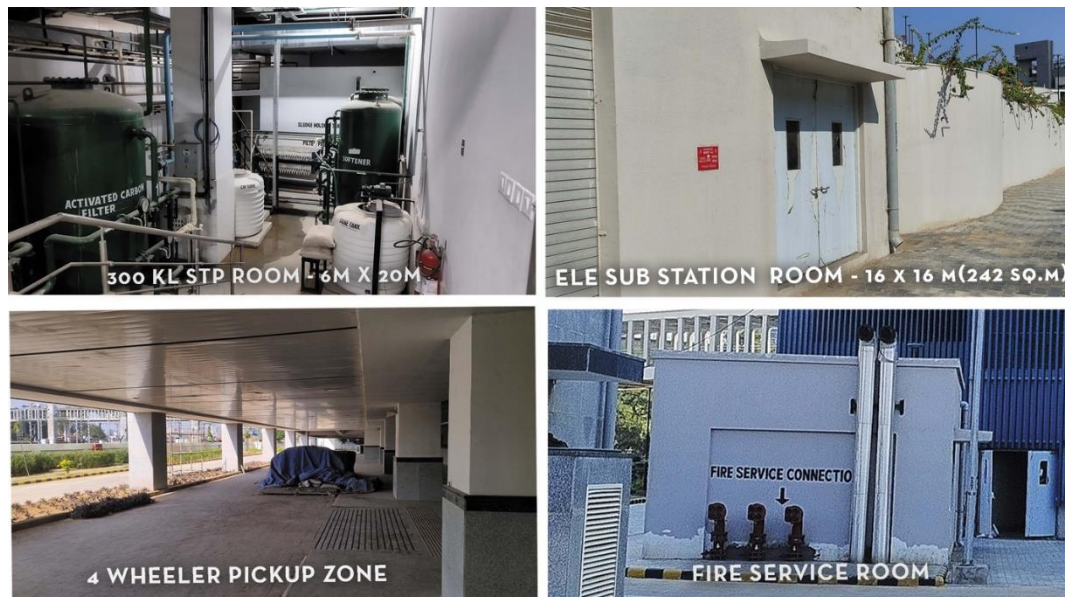
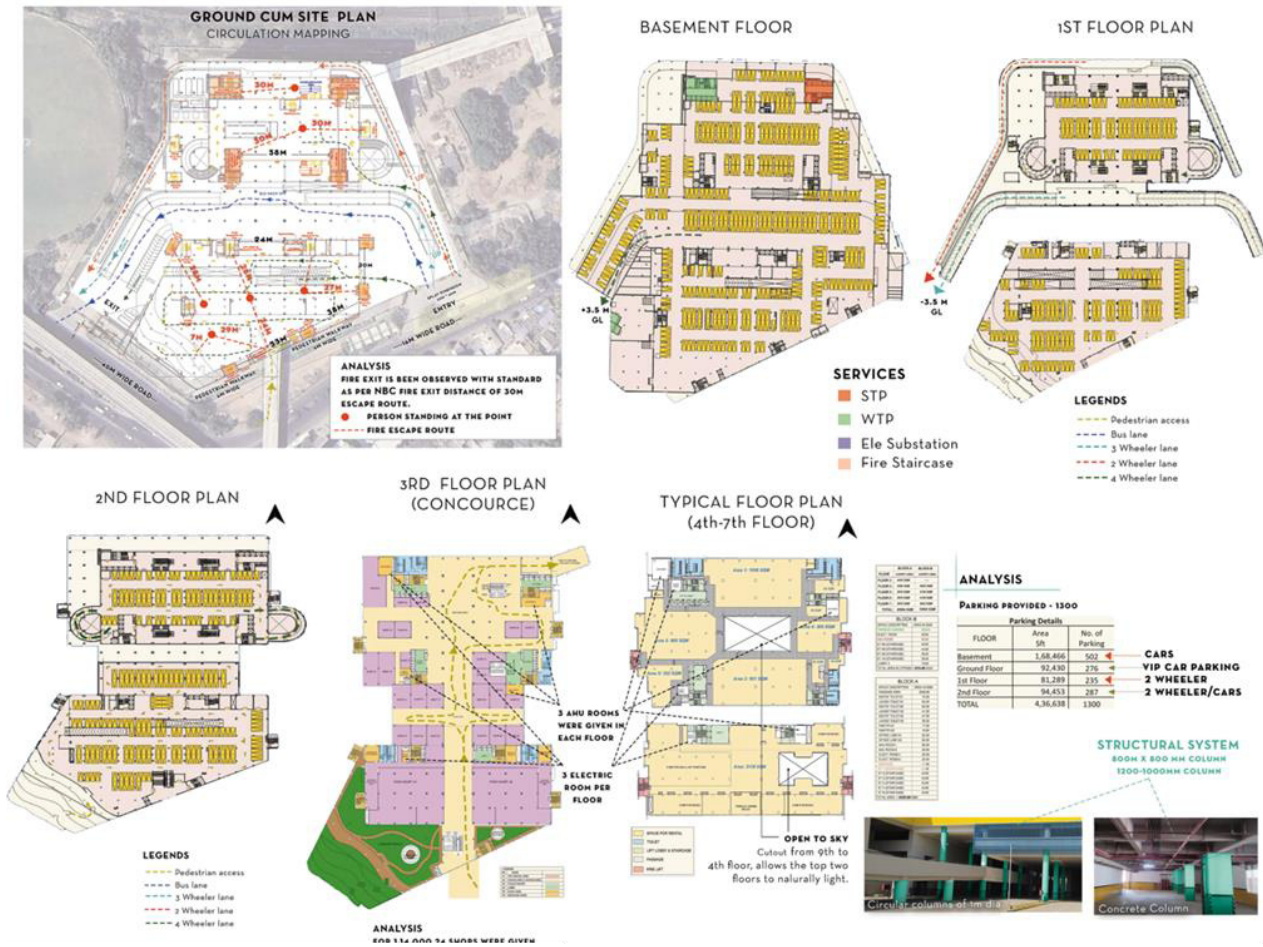


Figure 2.6 Mapping of Circulaion, Fire and Services in floor plans



Figure 2.7 Materials and Landscape

2.2 KILAMBAKKAM BUS TERMINUS – LIVE CASE STUDY



Location – Chennai, India

Architect- CMDA

Type of development – Bus Terminus

Floating population - 1,00,000 Peoples per day
completion – 2023

Intake – Bus Terminus Standards, Spatial requirements, Scale, and Circulation.

Figure 2.7 Image of KCBT

2.3 KARKADOOMA TOD – LITERATURE CASE STUDY



Location – Delhi, India

Architect- CP Kukreja Architects

Type of development – Transit Oriented Development

Floating population - 1,00,000 Peoples per day
completion – ONGOING

Intake – Skywalk connecting metro station and circulation network.

Figure 2.8 Image of Karkadooma

2.4 Transbay Transit Hub – LITERATURE CASE STUDY



Location – Sanfransisco, USA

Architect- Pelli Clarke Pelli Architects

Type of development – Transit Oriented Development

Floating population - 1,00,000 per day
completion – 2010

Intake – Roof Parks in transit hub.

Figure 2.9 Image of Transbay Transit hub

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 DEPARTMENT OF ANALYTICAL

10

3 KARKARDOOMA TOD, DELHI TRANSBAY TRANSIT HUB, SAN FRANCISCO

STUDY INTENT

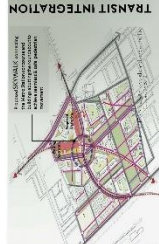
Project has tried to implement various TOD principles and design strategies.

To understand the integration of development with the existing and proposed MRTS line, is similar to the project.

SITE PLAN



Total Area of Land Under TOD scheme	287,504 sq.m
Land area under mix use block	153,285 sq.m (54%)
Land Area under Utilities	11,533 sq.m (4%)
Land Area under Roads & Circulations	64,560 sq.m (22%)
Recreational/open spaces	58,046 sq.m (20%)



INFERENCE

1. The TOD is a mix of land use, which is a mix of residential, commercial, and recreational. This mix of land use is a key feature of the TOD. 2. The TOD is a mix of land use, which is a mix of residential, commercial, and recreational. This mix of land use is a key feature of the TOD. 3. The TOD is a mix of land use, which is a mix of residential, commercial, and recreational. This mix of land use is a key feature of the TOD.



INFERENCE

Road networks were developed by providing proper secondary roads which leads to cycling and walking (NMT).

Retail and commercial spaces are given in the ground floor to increase the revenue and to provide eyes on streets.

Skywalk which connects the metro station with various blocks can be incorporated in design to connect the mix used development. (NMT Development).

Mode of connection - Bus to skywalk 200m which connects to the metro station

STUDY INTENT

To understand the connectivity of Transports.

To study about the roof park.

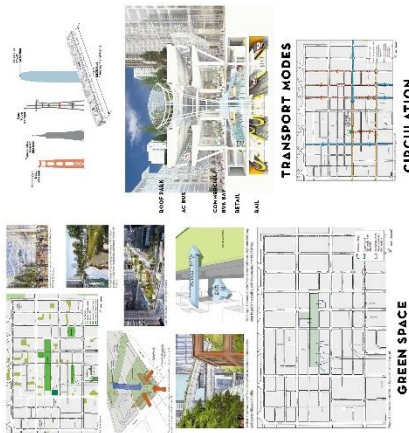
To analysis about Bus transportation.

INTRODUCTION

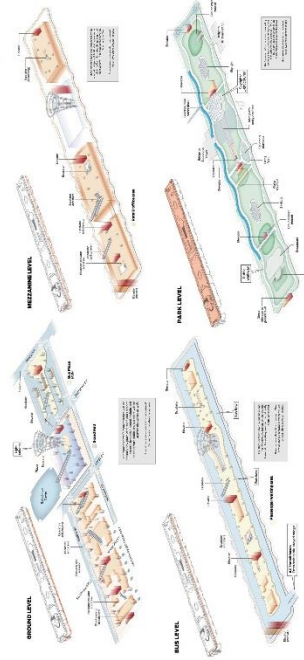
The expansive 5-acre rooftop park is a standout feature, offering green spaces adorned with a variety of native Bay Area plants. It includes a 1,000-person amphitheater, a café, a playground, and an art and educational cultural center.

The park also boasts cycling and pedestrian paths. Historical light permeates the halls of the transportation hub below through skylights within the park, creating a well-lit and invigorating atmosphere.

The Transbay Transit Center represents a multifaceted urban space that goes beyond its primary function as a transportation facility.



SITE PLAN



INFERENCE

The transit center houses a state-of-the-art bus terminal, accommodating a large number of regional and long-distance buses.

All regional buses are connected in ground floor, whereas all intra state AC buses are connected through a bridge.



KUTHAMBAKKAM HUB - TOD AT THIRUMAZHISAI, CHENNAI

FINAL YEAR THESIS BATCH 2019-21

AKASH KHA-YAN 5 SATHYABAMA

Plate 2.2 Karkardooma TOD and Transbay Transit Hub

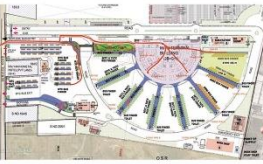
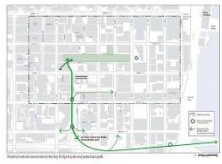
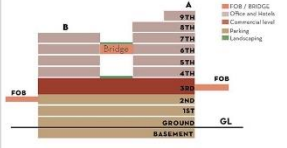
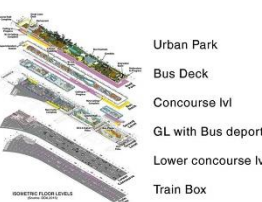
	EAST DELHI HUB, KARKARDOOMA	SABARMATI MMT HUB, AHMEDABAD	KCBT,CHENNAI TAMILNADU	TRANSBAY TH, SANFRANSISCO
LOCATION	Delhi, India	Ahmedabad, India	Chennai, India	Sanfransisco, California
TYPE OF DEVELOPMENT	Transit Oriented Development	Multi Modal Transit Hub	Bus Terminus	Transit Oriented Development
SITE AREA	30 Hectare/3,00,000 Sq.m	3.2 Hectare/32,374 Sq.m	35 Hectare/3,58,200Sq.m	12Hectare/1,22,000Sq.m
BUILT UP AREA	57 Hectare/5,70,000 Sq.m	5.38 Hectare/53,881 Sq.m	1.18 Hectare/1,18,492Sq.m	58Hectare/5,86,800Sq.m
FSI	1.9	1.66	0.33	4.7
PARKING SPACE	7,680 Cars	1,300 Vehicles	3582 Two wheelers & 275 Four wheeler	----
PEDESTRIAN MOVEMENT	 Block dimensions have been controlled to reduce the walking distance.	 FOB were introduced to give proper connectivity from various modes of transport.	 Dedicated Pedestrian path to Intercity and Intracity commuters	 Pedestrian pathway are given in bridges and skywalks.
VEHICULAR MOVEMENT	 Roads and pedestrian pathways run parallel to each other, and the entire site is divided into blocks by secondary roads.	 Vehicular paths are properly dedicated for each modes of transport.	 Vehicles are led down to the basement floor parkings.	 Bi-cycle and Bus routes are observed.
MASS TRANSIT NETWORK	 There are two metro lines which crosses the site.	 There are four modes of transportation lines which connects to the site.	 There is only one mode of Transit i.e EMU station of Urupakkam - 1.7 km away.	 Train, Intercity Buses and Intra city buses are various modes of transportation.
DETAILED PROGRAM AND PRODUCT MIX	- Commercial - 1,25,400 Sq.m (22%) - Institutional - 1,36,800 Sq.m (24%) - Residential - 3,07,800 Sq.m (54%) The mix has been derived as per Delhi TOD policy 	- Commercial (15%) - Office (25%) - Recreational (5%) - Hotel (25%) - Parking (30%) The mix of spaces as per circulation. 	- MTC zone (15%) - Dormitory (8%) - Intracity bus zone (25%) - Main building (17%) - Parking (35%) The mix of spaces is based on commuting. 	- Urban park (20%) - Lower concourse (20%) - Bus Deck (25%) - Train box (25%) - Concourse (25%) The mix of spaces are equally zoned 
ORGANISATION OF PROGRAMME	 The area is segmented into blocks, where those near metro stations are more commercially oriented, while those farther away are predominantly residential.	 The area is segmented as main concourse level in 3rd floor as commercial hub and main revenue generator.	 The area is segmented as main terminal building, SETC bus zone, Omni Bus zone, and MTC Bus Zone.	 Urban Park Bus Deck Concourse I/II GL with Bus deport Lower concourse I/II Train Box

Figure 2.10 Comparative Analysis

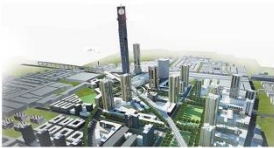
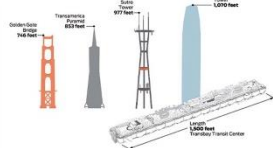
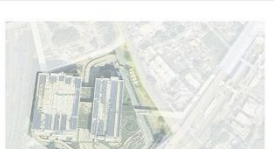
	EAST DELHI HUB, KARKARDOOMA	SABARMATI MMT HUB, AHMEDABAD	KCBT, CHENNAI TAMILNADU	TRANSBAY TH, SANFRANSISCO
MASSING	 Ground coverage is kept low, with highrise buildings, one iconic building to become the identity of East Delhi.	 Two Solid Brutal mass connected by bridge with landscape in 3rd and 6th floor.	 Horizontal huge masses and spaces which are oriented based on lighting and ventilation.	 Huge single masses supported by columns below in the middle of tall buildings.
BUILT - OPEN RELATIONSHIP	 The ground coverage is kept less to 30%, with lots of green cover. Development is medium grained.	 The building has cover 70%, and remaining area is covered by concrete pathways. The landscape as given in the setback of 3m from site offset region.	 The building has cover 80%, and remaining area 10% for OSR and 10% future Expansion.	 The building has cover 100% vegetation from top view, where the buildings actually shares a 25% of roof top garden in total built-up.
OPEN AND PUBLIC SPACES	 A proposal suggests allocating 35% of the green space to establish connections in the green network, promoting sustainability.	 The building incorporates 25% green space, including a roof garden and landscaping over the connecting bridge.	 A building incorporates 5% for Assembly point as a green space.	 Green volumes of Transbay and surrounding were observed-Transbay contributed maximum green to the society.
MATERIAL PALETTE	 The materials used include a combination of man-made materials and natural plantations for vertical green installations. Additionally, the facades incorporate 2-3 layers of jaali, a traditional lattice from north India.	 The materials used in the Facade is Aluminium Composite Panel for the murals and MS Box sections in vertical fins.	 The materials used in the Facade is Aluminium Composite Panel and transparent toughened glass.	 Elevated on substantial steel supports and enveloped in a translucent white metal veil, the center features the Grand Hall entrance and a rooftop park.
STRUCTURAL SYSTEMS				
ACTIVE	75 Phytotris system for waste water recycling is proposed.	Solar pannels were installed.	---	Perforated metal fascade with white metal veil which allows natural lighting.
PASSIVE	Biogas plant for biodegradable solid waste treatment.	STP of 300 KLD and WTP of 12000 LPH	STP of 600 KLD and No Ac were used	Greenery in the urban park increase the oxygen lvi in society.
GREEN RATING		5 star rated green building and RESCO certified		LEED gold certified building
FEATURES	The formulation of the area program resulted from a thorough analysis of the neighborhood and precinct, identifying the most suitable mix for the site. This provides clear guidance on achieving the optimal combination.	Can handle 1,14,000 peoples floating population and will be the future iconic building of Sabarmati and Ahmedabad.	Can handle 1,00,000 peoples floating population and will be 3,50,000 peoples in future. Asia's largest bus terminus.	Shares a Urban park as a main recreational green space of the city.

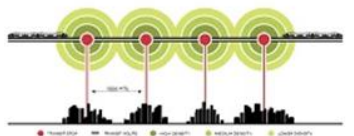
Figure 2.10 Comparative Analysis

CHAPTER 3

DATA COLLECTION AND STANDARDS

3.1 Transit Oriented Development

Transit-oriented development (TOD) integrates land use and transport planning and aims to develop planned sustainable urban growth centers, having walkable and livable communes with high density mixed land-use. Citizens have access to open green and public spaces and at the same time transit facilities are efficiently utilized.



TOD focuses on creation of high density mixed land use development in the influence zone of transit stations, i.e. within the walking distance of (500-800 m).

The TOD planning process includes:

- 1) **Travel Connections:** Convenient and direct pedestrian connections, pedestrian scale blocks, interconnected street network including bicycle circulation and parking.
- 2) **Building Scale and Orientation:** Building placement is a powerful tool in reinforcing streets as public amenities. The quality of "out of vehicle" experiences is influenced by the placement of buildings in relation to the street and other buildings, as well as their height and scale.
- 3) **Public Spaces:** This would include pedestrian-friendly streets including adoption of traffic calming measures, parks and Plazas as community gathering spaces to enable social interaction, quality facilities for transit users.
- 4) **Parking:** Parking structures/shared parking lots are two ways to reduce the amount of space occupied by parking facilities.

TOD focuses on compact mixed use development around transit corridor such as metro rail, BRTS etc. International examples have demonstrated that though transit system facilitates transit oriented development, improving accessibility and creating walkable communities is equally important.



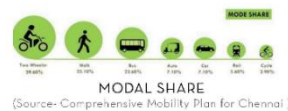
Figure 3.1 TOD components

Chennai, the capital city of Tamil Nadu is a rapidly developing Metropolitan region. The Chennai Metropolitan Area (CMA) comprises of the city of Chennai, 16 Municipalities, 20 Town Panchayats and 214 Village

Panchayats in 10 Panchayat Unions. Chennai is known as the "Detroit of India" for its automobile industry.

The Urban Agglomeration of Chennai metropolitan area has a spatial extent of 5,904 sq.km and a population of 11,981,478 as of 2022.

Annual Growth:
CMA-2.4%
City - 0.8%



S.No	Travel Mode	2008	2018
1	Walk	28.0%	25.1%
2	Bicycle	6.0%	2.9%
3	Auto-rickshaw	4.0%	7.1%
4	Car/van	6.0%	7.1%
5	Two-wheeler	25.0%	29.6%
6	Bus	26.0%	22.6%
7	Train	5.0%	5.6%
	Total	100%	100%

MODAL SHARE OF 2008 TO 2018
(Source- Comprehensive Mobility Plan for Chennai)

Figure 3.2 Modal Share

1

oil. Nigeria's capital city is heading towards a potential drought like situation in 2010 with the northeast monsoons bringing in very little rainfall. Chennai is now staring at a dry deficit in rainfall and lakes surrounding the city, which are important sources of water, are drying up. In the following maps, the dark blue regions represent the water body while the light blue portions



2015 Chennai floods was with regard to water release at the Chembarambakkam Lake. With a total capacity of 5645.00 mcf and a full tank of 85.4 ft, Chembarambakkam Lake is one of the biggest reservoirs near Chennai. In 2015, the 'indiscriminate discharge of water from Chembarambakkam Lake' burdened the Adyar River, leading to floods in Chennai, found a Comptroller and Auditor General of India (CAG) report.

Diagram illustrating traditional stormwater management, showing a central pipe network with multiple inlets and outlets, leading to a single outlet on the right.

PROTECT



Stormwater runoff from reaching drains, canals, and rivers.

Rainwater in barrels, cisterna, holding needs food and medicines

Rainwater into the aquifer to recharge groundwater

- No planning regulations to limit sprawl & protect green-blue ecological systems
- No upgrades to stormwater infrastructure
- No restoration efforts towards Adyar River, Buckingham Canal, Pallikarnai Marsh or Chembarambakkam Lake

PROTECT upstream green-blue assets through regulations. Minimize sprawl through transit-oriented development

STORE rainwater within the urban fabric through harvesting & storage structures, parks & open spaces, and holding ponds or detention basins



PROTECTED SPONGE LANDSCAPES +
IMPLEMENTED SPONGE LANDSCAPE INFRASTRUCTURE NETWORK

SCALE 1:2000

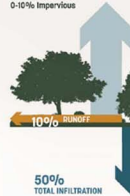


EXPANSION OF WATER CHANNEL

Widening the water channel from Nemam tank could indeed lead to better absorption of water and potentially increase aquifer recharge.

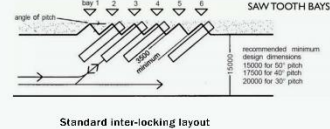
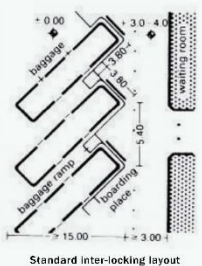
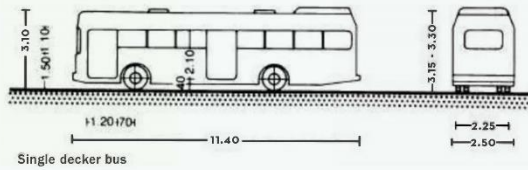
Piers are introduced instead of an existing retaining wall to allow the water channel to pass beneath without hindrance.

Low-lying floodplains adjacent to water channel

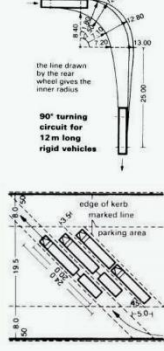
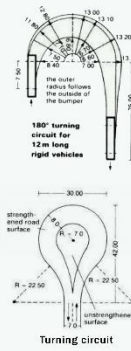
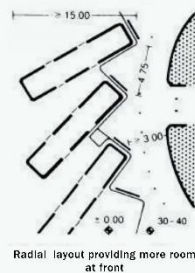


A well integrated and decentralized Sponge Network is more resilient to flooding and increases the livability and value of neighborhoods. This increases property values or encourages new development which in turn brings in more revenue for the city essentially subsidizing investments towards the landscape.

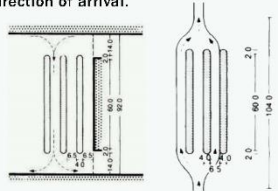
STANDARDS FOR BUS TERMINUS



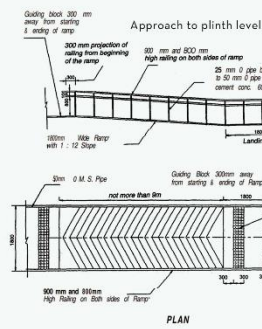
- Efficient-Employed Where Lot is Comparatively Narrow and Deep.
- Passenger Has Direct Approach To Loading Door.
- Baggage Truck Can Operate Between Buses For Side Loading.



Departure at 90 degree and departure at oblique angles.



Long platforms with passing lanes.



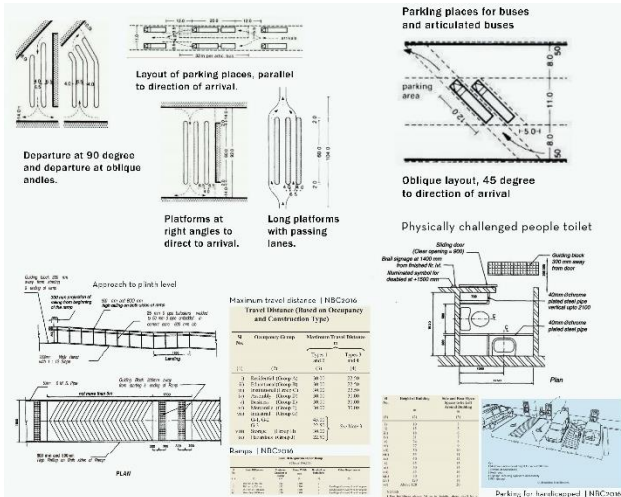
Maximum travel distance | NBC2016
Travel Distance (Based on Occupancy and Construction Type)

Sl. No.	Occupancy Group	Maximum Travel Distance (m)	
		Type 1 and 2	Type 3 and 4
(1)	(2)	(3)	(4)
i)	Residential (Group A)	30.00	22.50
ii)	Educational (Group B)	30.00	22.50
iii)	Institutional (Group C)	30.00	22.50
iv)	Assembly (Group D)	30.00	30.00
v)	Business (Group E)	30.00	30.00
vi)	Mercantile (Group F)	30.00	30.00
vii)	Industrial (Group G)	45.00	30.00
viii)	Storage (Group H)	22.50	30.00
ix)	Hazardous (Group I)	22.50	30.00

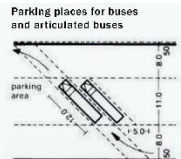
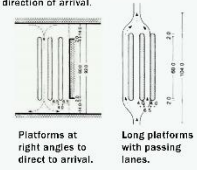
Ramps | NBC2016

Sl. No.	Construction Type	Maximum Travel Distance (m)	Other Requirements
i)	Residential (Group A)	30.00	See Note 3
ii)	Educational (Group B)	30.00	See Note 3
iii)	Institutional (Group C)	30.00	See Note 3
iv)	Assembly (Group D)	30.00	See Note 3
v)	Business (Group E)	30.00	See Note 3
vi)	Mercantile (Group F)	30.00	See Note 3
vii)	Industrial (Group G)	45.00	See Note 3
viii)	Storage (Group H)	22.50	See Note 3
ix)	Hazardous (Group I)	22.50	See Note 3

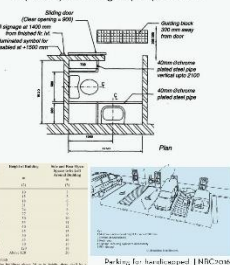
Figure 3.4 Fire and ramp standards



Departure at 90 degree and departure at oblique angles.



Physically challenged people toilet



Sl. No.	Place	W.C. for Males	W.C. for Females	Urinals for Males only
1.	Junction Stations, Intermediate Stations and Substations	3 for first 1000 persons, add 1 for subsequent 1000 persons or part thereof.	8 for first 1000 persons, add 1 for every additional 1000 persons or part thereof.	4 for every 1000 person, add 1 for every additional 1000 persons or part thereof.
2.	Terminal Stations and Bus Terminals	4 for first 1000 persons and 1 for every additional 1000 persons or part thereof.	10 for every 1000 persons and 1 for every additional 1000 persons or part thereof.	6 for every 1000 person and 1 for every additional 1000 persons or part thereof.

Figure 3.5 Sanitary Requirements

Figure 3.3 Bus parking and turning radius

CHAPTER 4

URBAN SITE AND ANALYSIS

4.1 METHODOLOGY OF SITE ANALYSIS

a) Land use Mapping:

1. This Study was conducted to understand the land use patterns and the settlements that had happened around the SIDCO and SIPCOT industry over the years in Thirumazhisai, Chennai, Tamilnadu.
2. The study was conducted by walking down the streets with a map of 1km radius and marking the area with six major categories, that are:
 - Residential
 - Commercial
 - Institutional
 - Industrial
 - Marsh Land &
 - Waterbodies
3. Through conversations with local residents and learning about their stories, I gained a fundamental understanding of the area's development, starting from the construction of highways to present times. Additionally, I gathered insights into the local experiences of floodwater rise in their respective areas.

b) Road Networks, Nodes & Land Marks Mapping:

1. This study was done to understand the road networks and the important nodes around the 1km radius of the site.
2. Proper study and understanding of road networks were done through the study of maps, frequent site visits and traversing around the site through walks and vehicle rides.
3. Important landmarks and distinctive features for the 1km radius of the site was studied to understand the role it played and its contribution on an urban context.
4. **Limitation:** Given that the project is newly proposed and there are no existing developments near the upcoming bus terminus, conducting a traffic analysis in the immediate vicinity of the site is considered superfluous
5. A new separate road is being constructed from the main road to the proposed site. These roads are wide enough to facilitate smooth movement of buses at the node intersecting the highway.

4.2 RATIONALE BEHIND GOVERNMENT SELECTION OF PROPOSED SITE

Easy connection for the buses from the site to North west (Thirivallur and Andhra) and West (Karnataka, Hosur, Krishnagiri).

The Bus terminus lies on the Chennai-Bengaluru national highway and the Chennai-Tiruvallur state highway. This busiest highway caters to business and leisure travel between two of the top IT hubs in India. The terminus is nearer to the outer ring road at 4.6 km and Poonamallee at 5.7 km. The project includes metro rail connectivity and township nearer to the Mofussil bus stands, allowing for seamless travel to any part of Chennai.

TRANSPORTATION INTEGRATION: Integrating Kuthambakkam Bus Terminus with a satellite township's transportation network can enhance connectivity and accessibility for residents. This integration might involve establishing feeder bus services, shuttle services, or dedicated pathways connecting the bus terminus to key destinations within the township.

ECONOMIC DEVELOPMENT: The relationship between Kuthambakkam Bus Terminus and a satellite township can contribute to economic development by facilitating access to employment opportunities, commercial activities, and amenities. Strategic planning and development initiatives can leverage the presence of the bus terminus to stimulate local economic growth and attract investments to the township.

COMMUNITY ENGAGEMENT: Engaging residents and stakeholders in the planning process is crucial for fostering a sense of ownership and promoting inclusivity. Conducting community consultations, stakeholder meetings, and participatory work- shops can help gather input, identify priorities, and address concerns related to the relationship between Kuthambakkam Bus Terminus and the satellite township.

FUTURE DEVELOPMENT: The project is situated between the fourth- coming Parandur airport, located 47 kilometers away, and Central Chennai, which is 27 kilometers away.



Figure 4.1 Connectivity between Proposed Bus Terminus Site and District Links

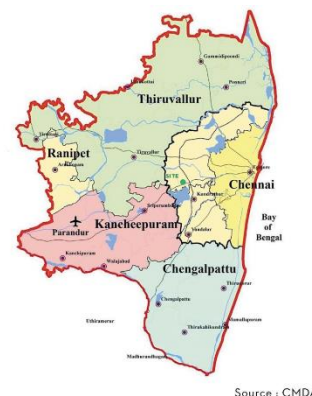


Figure 4.2 Connectivity between Proposed Bus Terminus Site and Parandur airport.

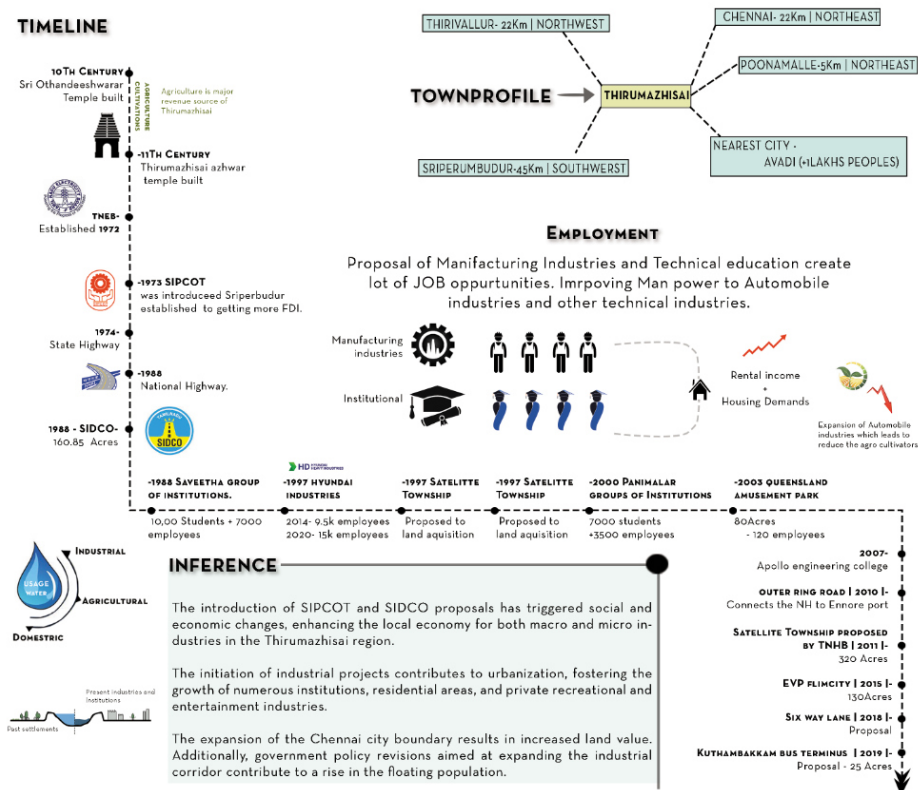


Figure 4.3 Development Timeline: From Inception to Implementation

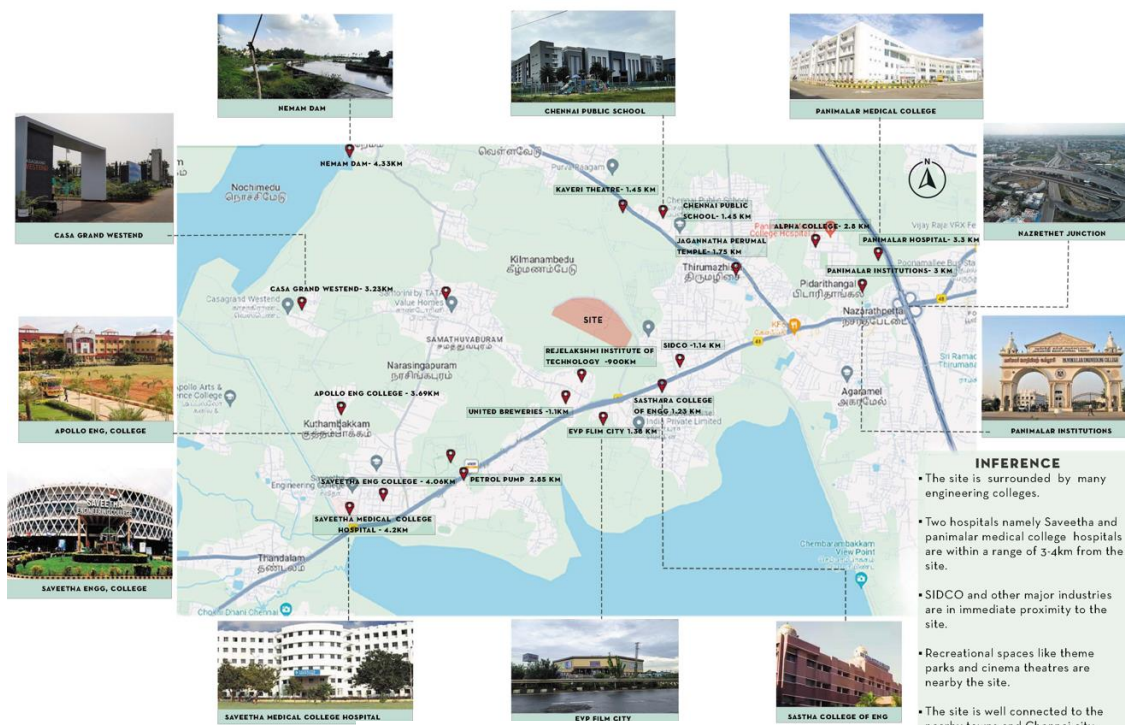


Figure 4.4 Landmark map



Figure 4.5 Visual Characters roads and focal point

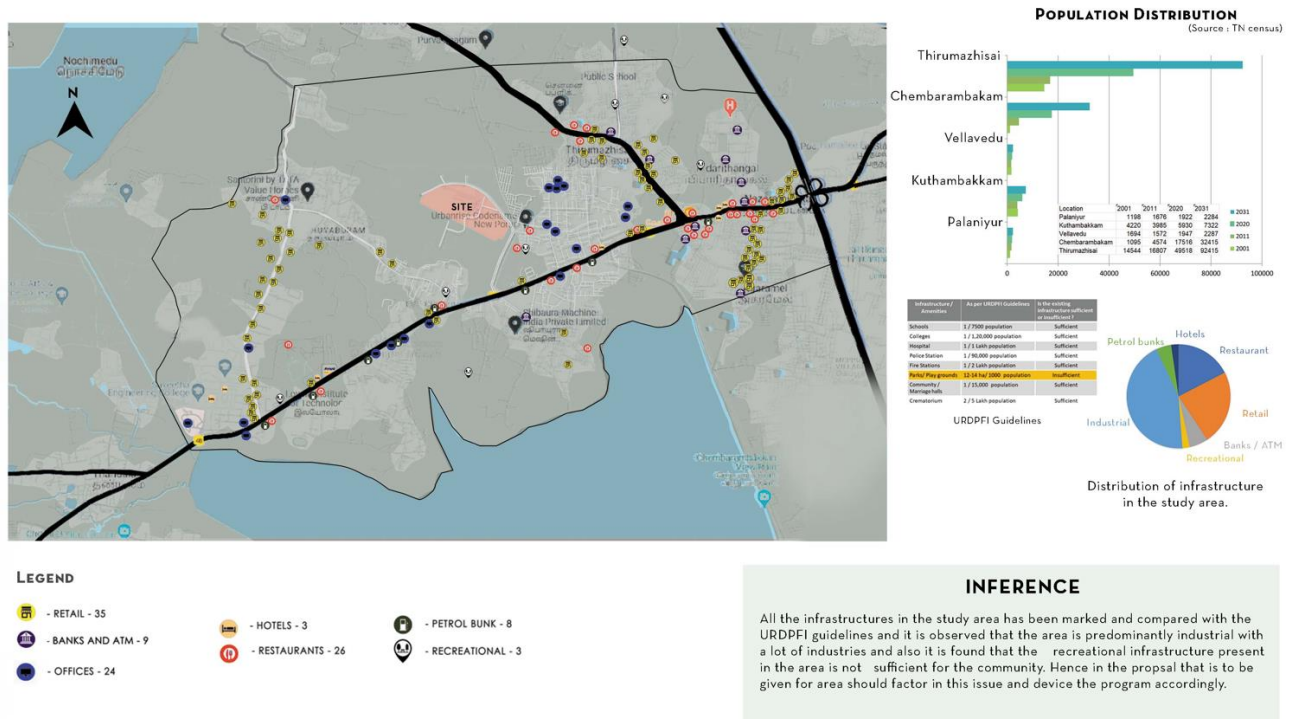


Figure 4.6 Economic Infrastructure



Figure 4.7 Social Infrastructure

4.3 LAND-USE MAP

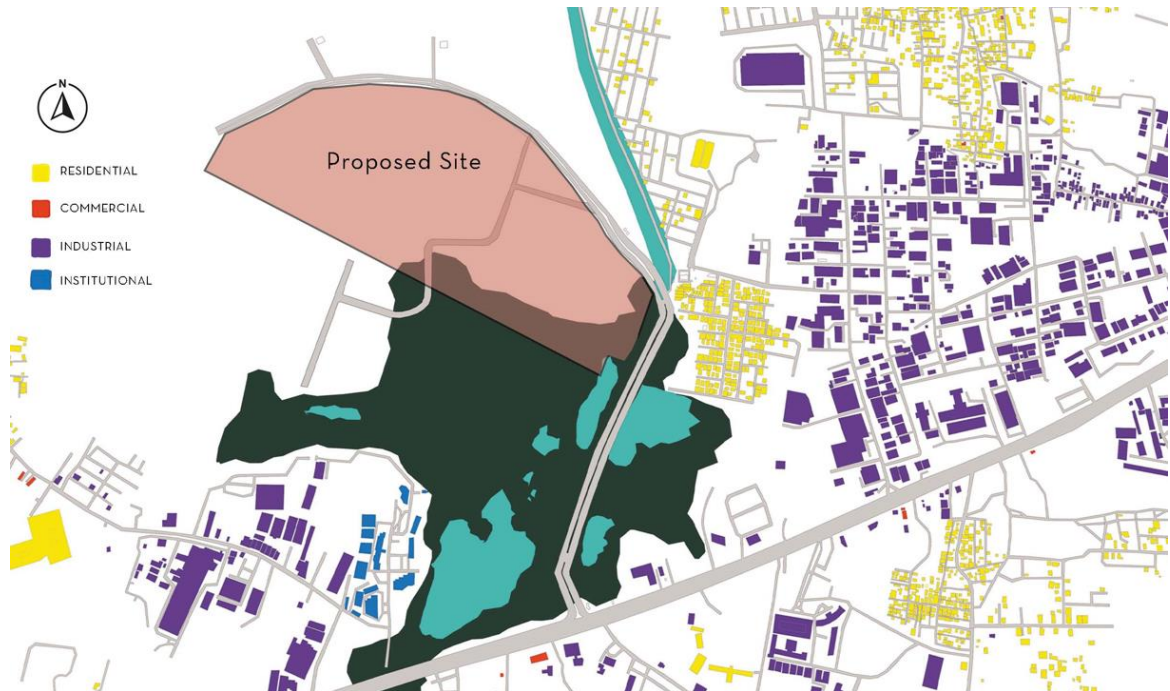


Figure 4.8 Landuse map (1km -radius)

- Manufacturing Industries- Generate more opportunities of employment which leads to Housing demands. Industries triggers to develop the Institutional and Intense of commercials Which also leads to Demand for Affordable Schools.
- Retail Shops- Provide basic essential services which create more revenue But proximity is too long.

4.4 NODES, ROADS, & LANDMARK MAPPING

ROAD HIERARCHY

The primary road is the main NH48 which connects Chennai with Bangalore High way.

The Secondary Roads are one which leads to the industrial zone.

The Teritary road is the one which leads to the residential community.

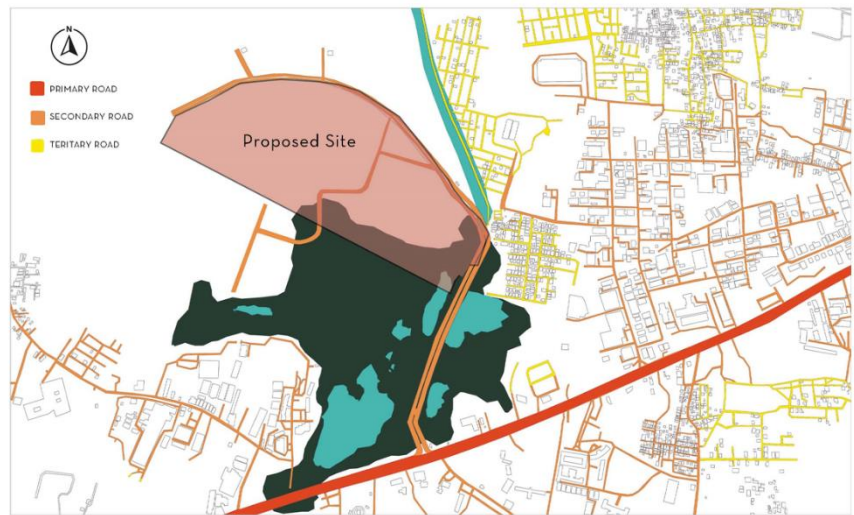


Figure 4.9 Road network (1km -radius)

4.5 SWOT ANALYSIS:

STRENGTH:

- Site is located with in the walkable distance, this facilitating the use for public transportation from the residential zone.
- Presence of industrial zone allows the footfall inside the site.

WEAKNESS:

- Site is far from the primary road which will be a challenge to design for NMT.

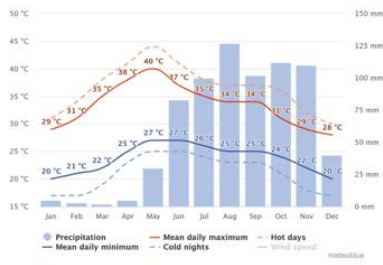
OPPORTUNITIES:

- Opportunity to design TOD along the wetlands present.
- Increase in footfall leads to growth of Satellite city.
- Potetial to become the icon of the city.

THREATS

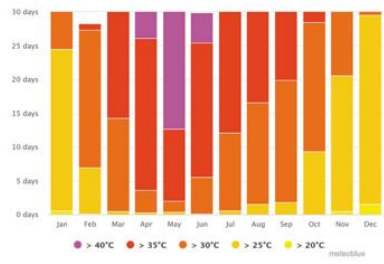
- There might be the Traffic issue, since it has only one primary road.

4.6 CLIMATE ANALYSIS:



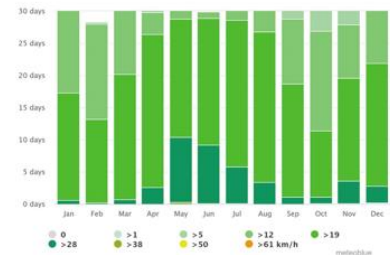
AVERAGE TEMPERATURES AND PRECIPITATION

The highest average temperature of the Chembarambakkam area is 40°C in the month of May and the lowest temperature is 20°C during December- January. Precipitation is highest at 125mm during the month of August and the lowest during March.



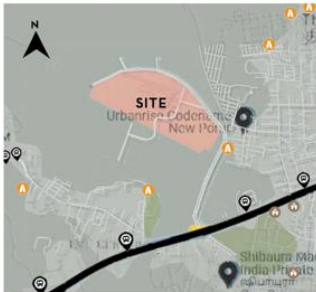
MAXIMUM TEMPERATURES

The graph shows that the hottest days are during the month of May which goes beyond 40°C for 15 days and during December and January the temperature remains at 25°C for about 25 days on both.



WIND SPEED

The speed is at an average of 12 to 38kmph throughout the year which denotes that the air is not stale and a comfortable breeze prevails throughout the year.



PROPOSED SITE

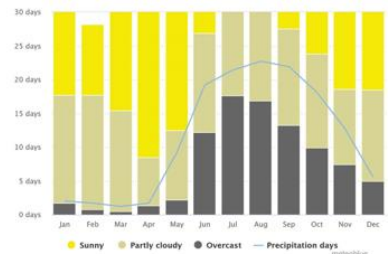
The proposed site is situated about 1.2km from the Bengaluru Chennai Highway and is connected through the newly laid road for the TNHB satellite township. The site is surrounded by agricultural fields on the North, residential plots on the East, TNHB acquired lands and parts of Chembarambakkam lake on the South and barren lands on the West. The site is well connected to the Chennai city and other major towns such as Thiruvallur, Kanchipuram, and Vandalur.



SUNPATH AND WIND DIRECTION

Appropriate sun shading devices can be provided on West and South sides to prevent direct sunlight and heat gain in the interiors.

The prevailing winds for the Chembarambakkam area is from the Southeast to Northwest throughout the year. The buildings can be oriented in such a way that they do not obstruct the wind path for good air circulation within the site.



PRECIPITATION DAYS

The Chembarambakkam area stays dry during most of the months and the wettest days are during June, July, August and September.

Figure 4.10 Climate Graph

4.7 VIEWS AND VISTAS



Figure 4.11 Views of access road to Satellite town 30M wide road

VIEWS AND VISTAS

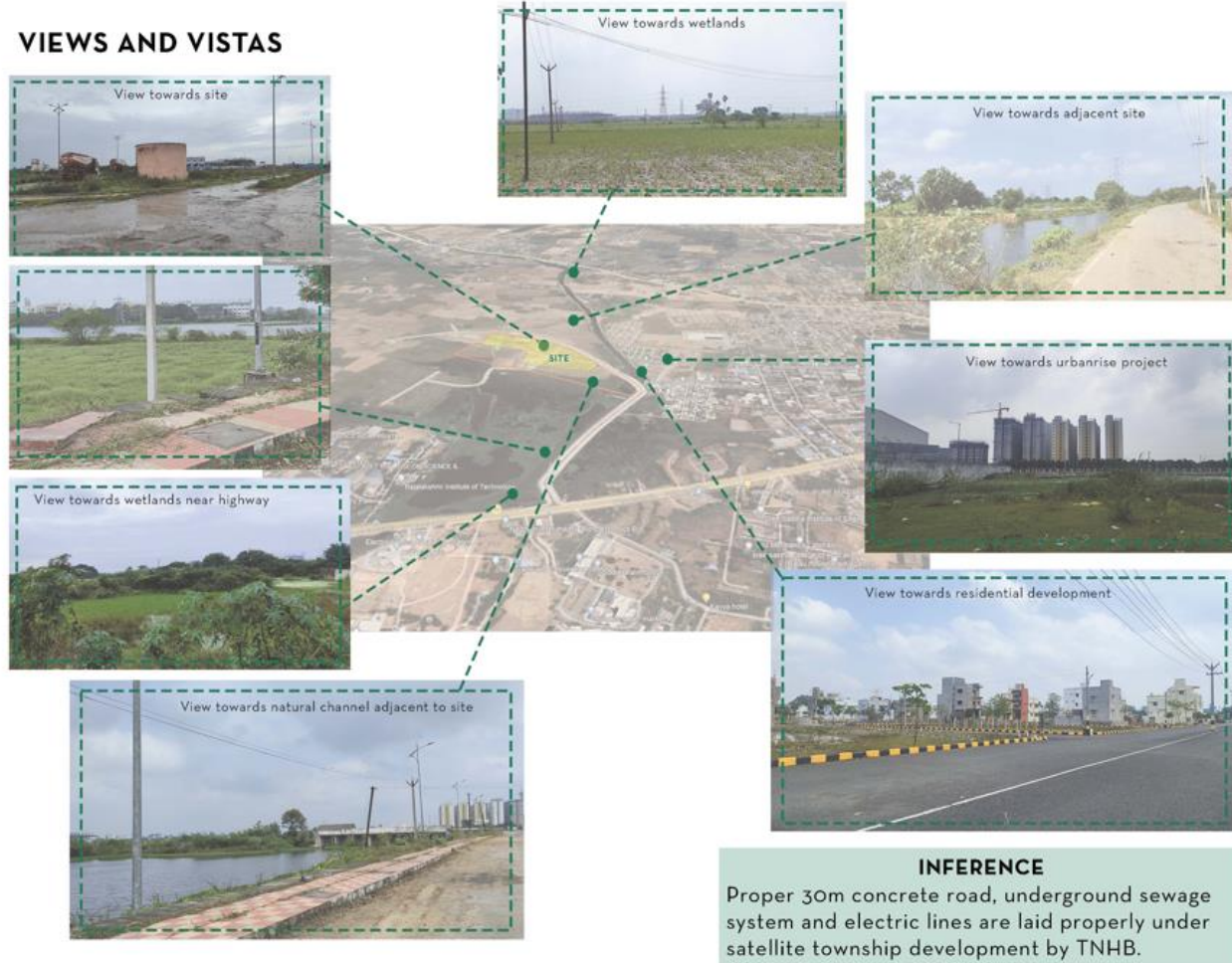


Figure 4.12 Views from the neighborhood

4.8 INFERENCE AND KEY POINTS

a) Landuse Mapping

- The site contains numerous wetlands that must be conserved to ensure proper water drainage.
- The channel near the wetlands should be preserved, as it serves as the main drainage pathway, connecting Nemam Tank to Chembarabakkam.
- Currently, the locality lacks green spaces or recreational areas available for public use.
- A survey of local residents indicated a strong desire for green spaces where they could take their children and spend time in the evenings and on weekends.
- Providing skybridge connectivity to the metro and the surrounding neighborhood community introduces diverse land use and enhances Tod.

b) Road Networks, Nodes, & Landmarks Mapping :

- Creating a bridge with pedestrian and cycling connectivity from the metro station to the bus terminus significantly enhances the imageability of the location. This bridge not only provides a direct and safe route for commuters but also transforms the area into a more cohesive and accessible transit hub.
- Proper roads have been laid by the government from the bus terminus to the main NH48.
- The traffic patterns and behavior of the main terminus road can be interpreted once the terminus is operational.

C) Wetlands and Contour Mapping :

The wetlands, granary, and surrounding ecosystem should be mapped and compared with the DEM to develop a proposal that follows a sustainable approach, minimizing ground intervention.

Area Program:

S.no	Area Programme	Unit area (sq.m)	Unit No.	Area (sq.m)	Total Area (sq.m)	TOTAL
Ground floor						11,845
1	Parking for Busses		100	10,182		
2	waiting lounge	3	100	300		
3	Bay Toilets	172	2	344		
4	Retail	28	8	224		
5	Kiosk	9	6	1500		
6	Ticket counter	11.5	6	69		
7	Cloak Room	41.3		41.3		
8	CMDA office	36		36		
9	Hospital	35		35		
10	Staff room	26		26		
11	Staff toilet	46		46		
12	Terminus toilet	104	2	390		
First Floor						2641.5
1	Food counter	5.5	3	16.5		
2	Restaurants	200	2	400		
3	Terminus toilet	80	2	208		
4	Food court (stalls)	23	12.25	281		
5	Kitchen			221		
6	Entertainment Room	50	1			
7	Mezzanine Dining			1000		
8	Entry Security Check	25	2	50		
9	Transit heaven - lounge			465		
SERVICES						4988
1	Staircase	47	10	470		
2	Workshop	1155	1	1155		
3	AHU	66	3	140		
4	STP	1219	1	1219		
5	Substation	1088	1	1088		
6	BusWash			22		
7	Fuel	872		872		
8	Pump room with UG sump			22		
HOTELS AND DORMITORY						1634
1	Mens Dormitory			111		
2	Mens Sleeping Pod			277		
3	Womens sleeping pod			60		
4	Womens Dormitory			173		
5	Small sleeping pod			113		
6	Toilet and bath	450	2	900		
MULTI LEVEL PARKING						25,872
1	2wheeler (1740)			12,936		
2	4wheeler (240)			12936		
OTHER SPACE						3100
1	Roof Garden			2000		
2	Sponge Deck			1100		

Figure 4.13 Area Program

CHAPTER 5

DESIGN PROPOSAL

The primary strength of the design is rooted in the comprehensive planning of the urban area within a 1km radius of the transit hub. The design's main objective is to meet the needs of various commuters while fostering neighborhood development. A thorough study of the site, detailed in Chapter 4's Urban Site Analysis, provides a solid foundation for identifying the design requirements and necessities.

The Concept

The idea is to elevate a bus terminus without causing harm to existing wetlands and incorporating green spaces into the design. This approach not only addresses the need for efficient transportation infrastructure but also prioritizes environmental conservation and urban greenery.

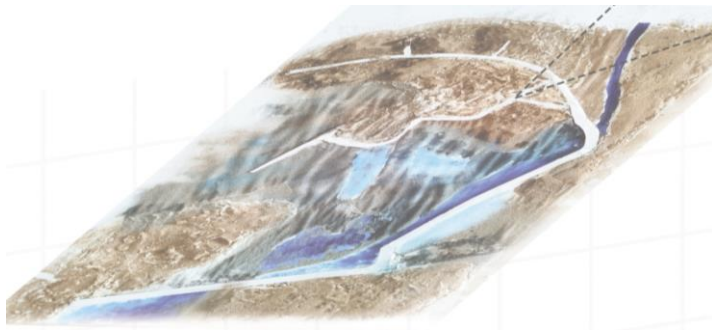


Figure 5.1 Physical contour model to understand slope.

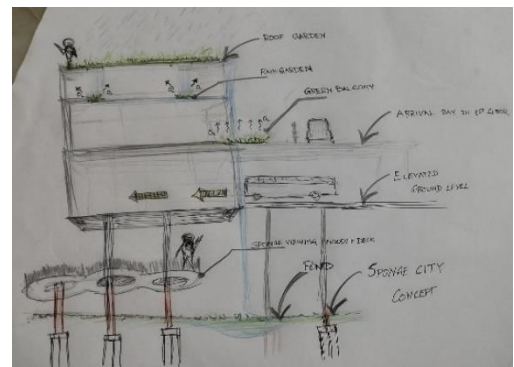


Figure 5.2 Conceptual sketch.

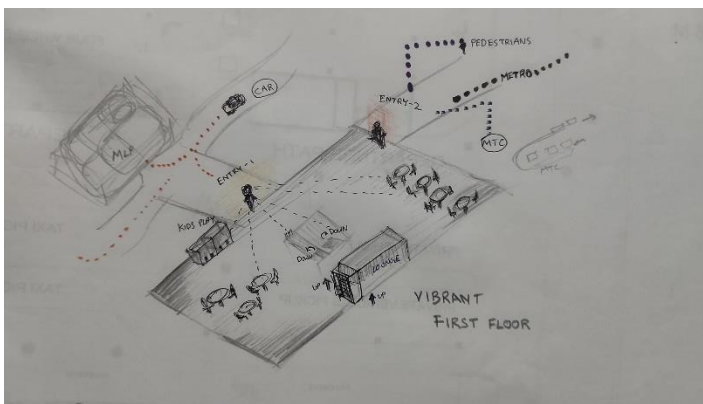


Figure 5.3 First floor conceptual sketch

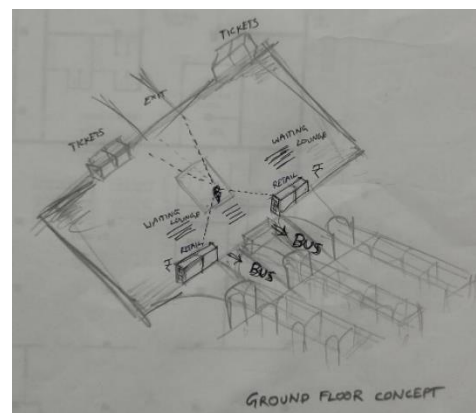


Figure 5.4 Ground floor conceptual sketch

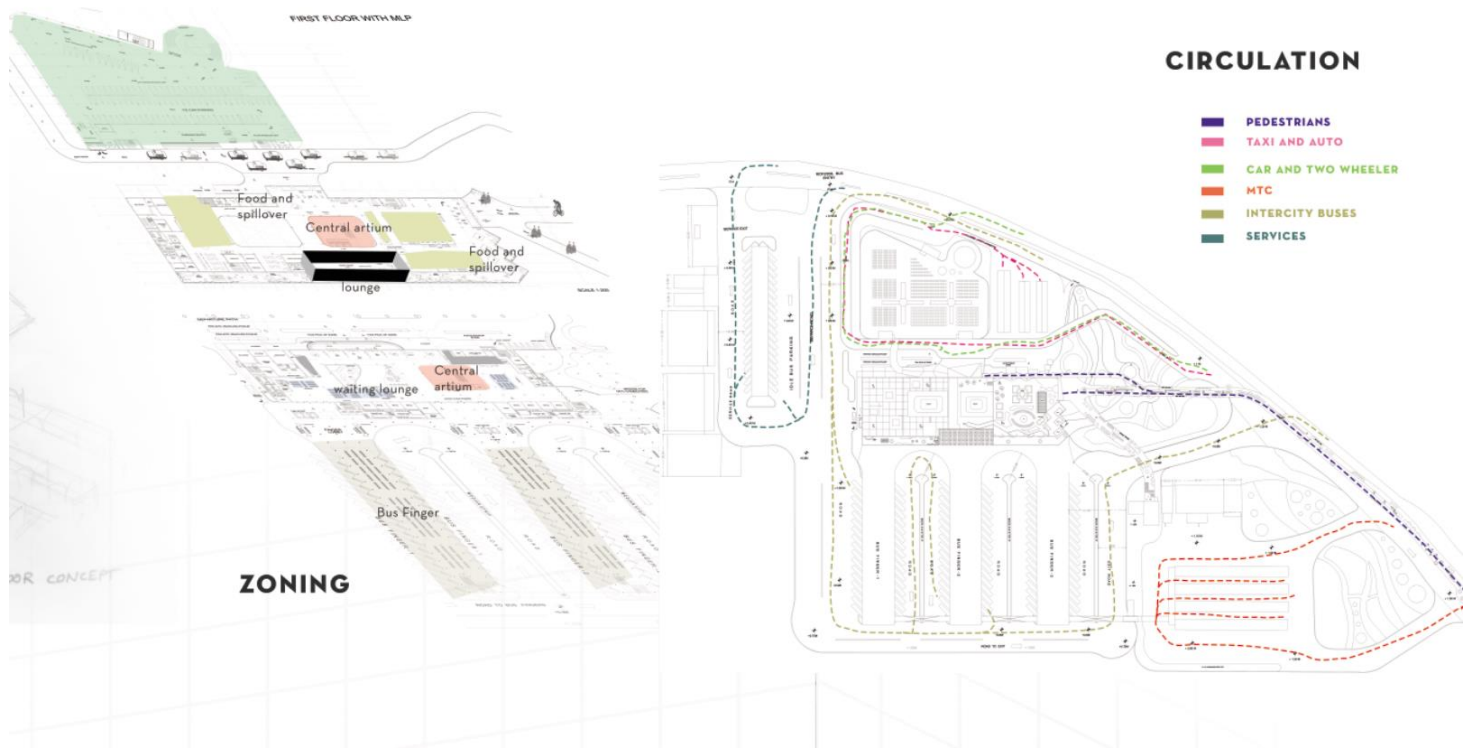


Figure 5.5 Zoning and Circulation

The Design Approach

- The design integrates amenities into the first floor, maximizing views of the wetlands and bus fingers from the balconies.
- Open, flexible spaces accommodate various activities and events, enhancing the terminus's functionality and creating an engaging experience for commuters and visitors.
- Clear visual pathways for passengers upon entering the terminus are crucial for improving their experience and facilitating decision-making.
- To design the waiting lounges, bus fingers, and retail stores on the ground floor of the terminus is essential for ensuring efficient passenger flow and providing convenient access to transportation services and amenities.

Circulation

- The main idea is to connect all commuters, including those using MTC buses, taxis, cars, two-wheelers, pedestrians, and cyclists, to the first floor.
- The first floor serves as a hotspot in the design, providing a central hub for various activities and services.
- The ground floor functions as a transition space for commuting, featuring waiting lounges and facilitating the movement of passengers.



Plate 5.1 Site Plan



Plate 5.2 First Floor Plan

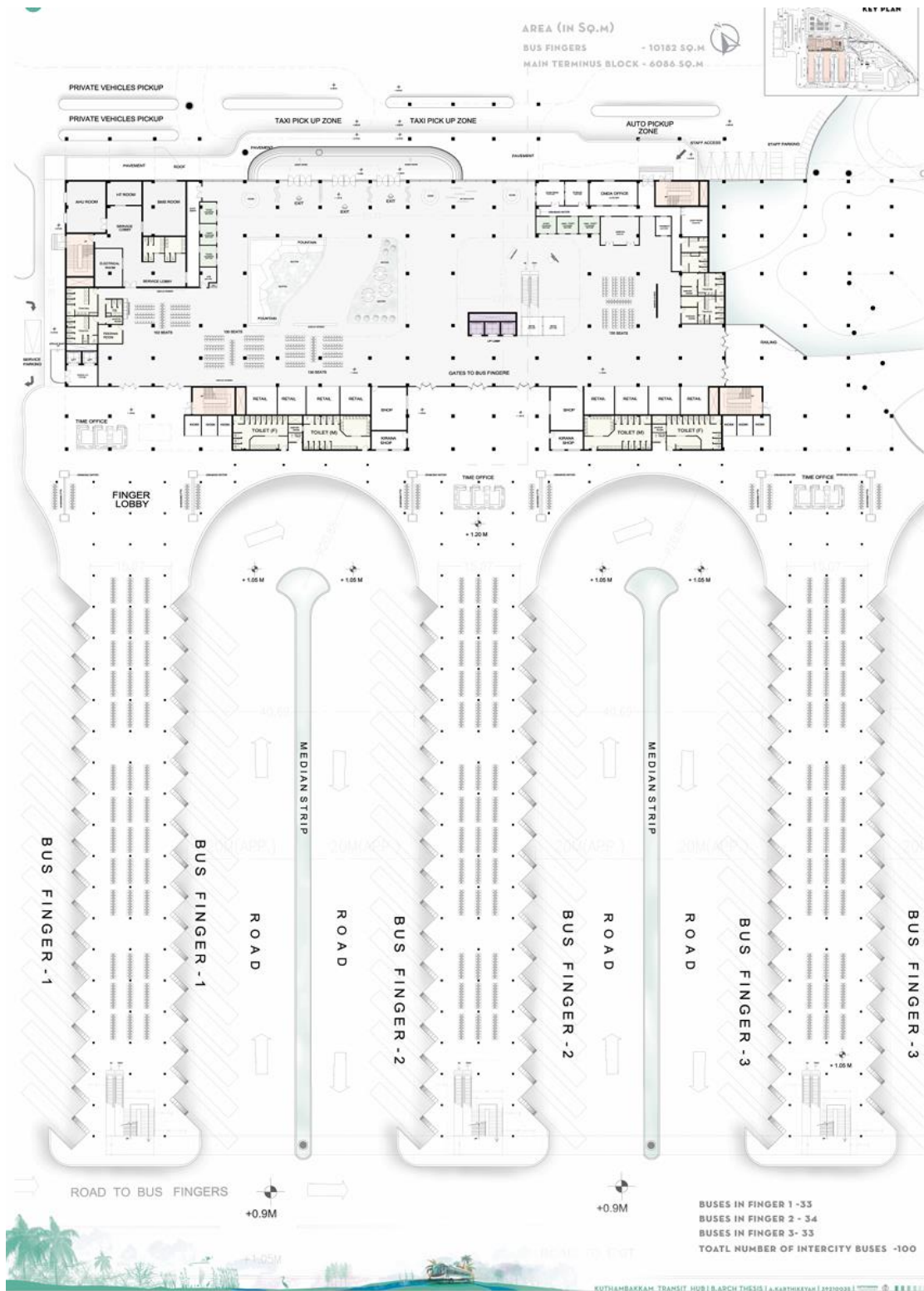


Plate 5.3 Ground Floor Plan

MEZZANINE FLOOR PLAN (SCALE 1:200)

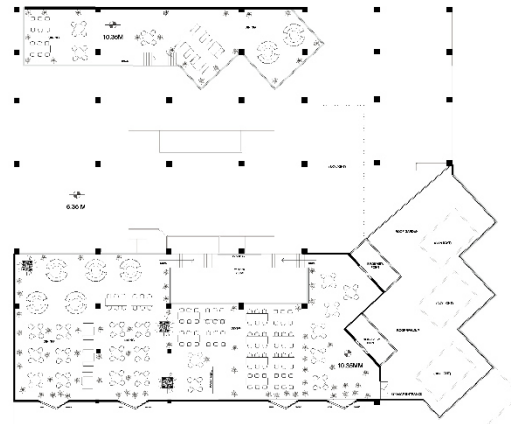
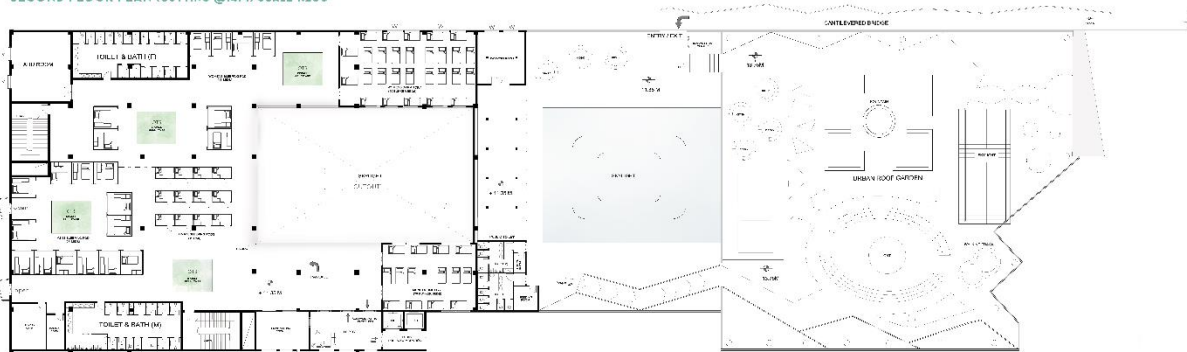


Figure 5.6 Mezzanine Floor Plan

6 SECOND FLOOR PLAN AND TERRACE PLAN

SECOND FLOOR PLAN (CUTTING @14M) SCALE 1:200



TERRACE FLOOR PLAN SCALE 1:200



Plate 5.4 Second and Terrace Floor Plan

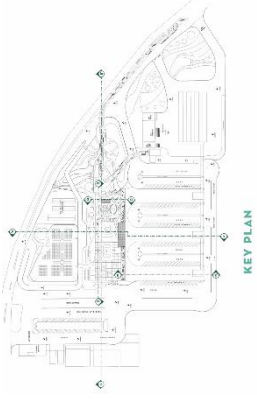


Figure 5.7 Section cut Key plan



Figure 5.8 Section AA'



Figure 5.8 Section BB'



Figure 5.10 Figure showing section CC'', section DD' & section EE'

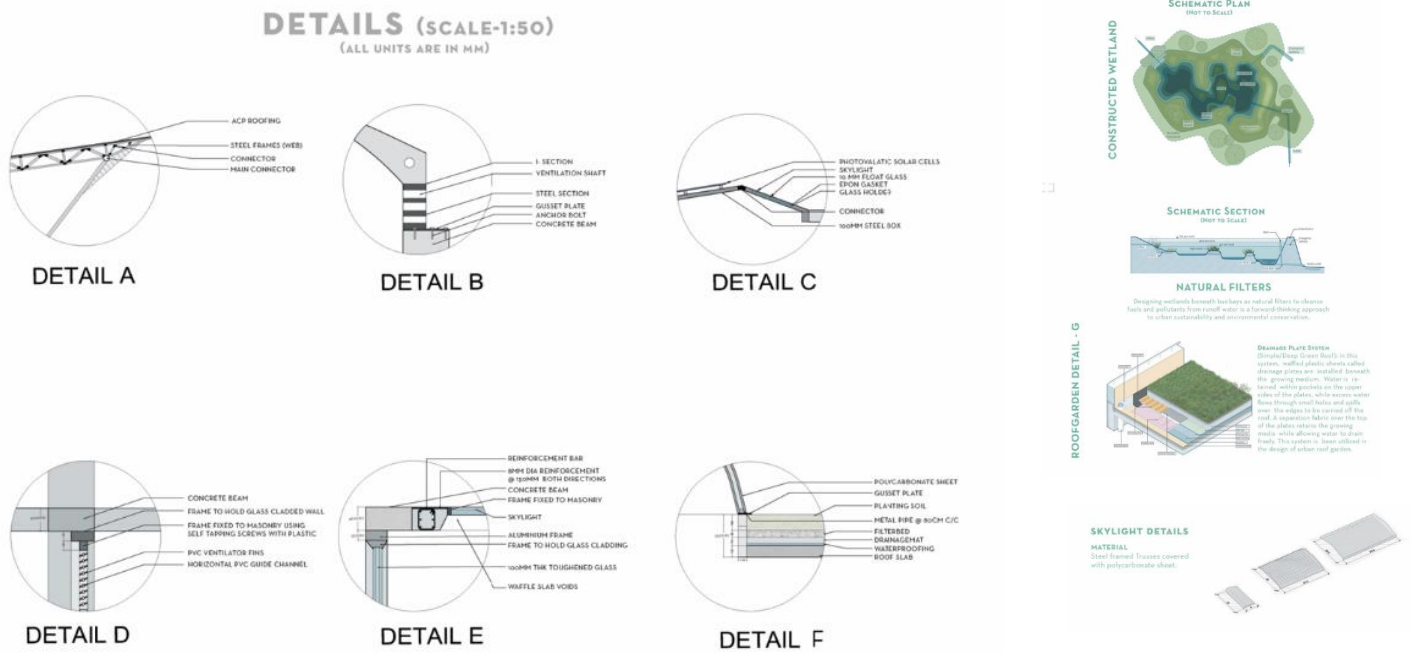


Figure 5.11 Details

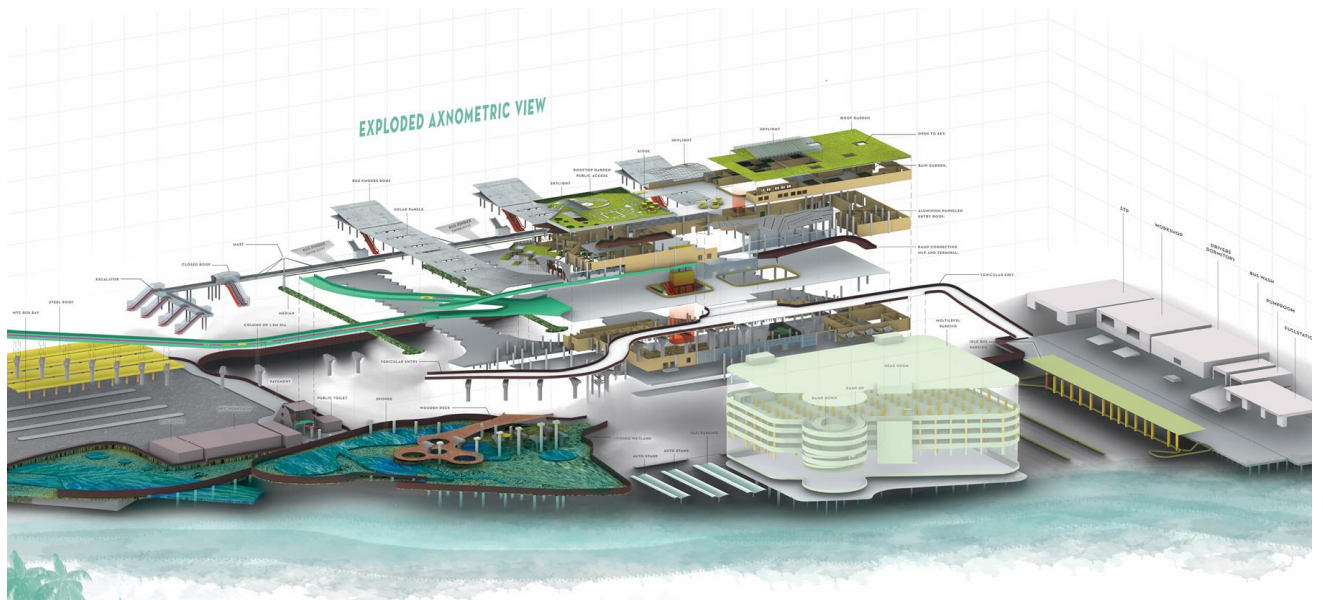


Figure 5.12 Second and Terrace Floor Plan

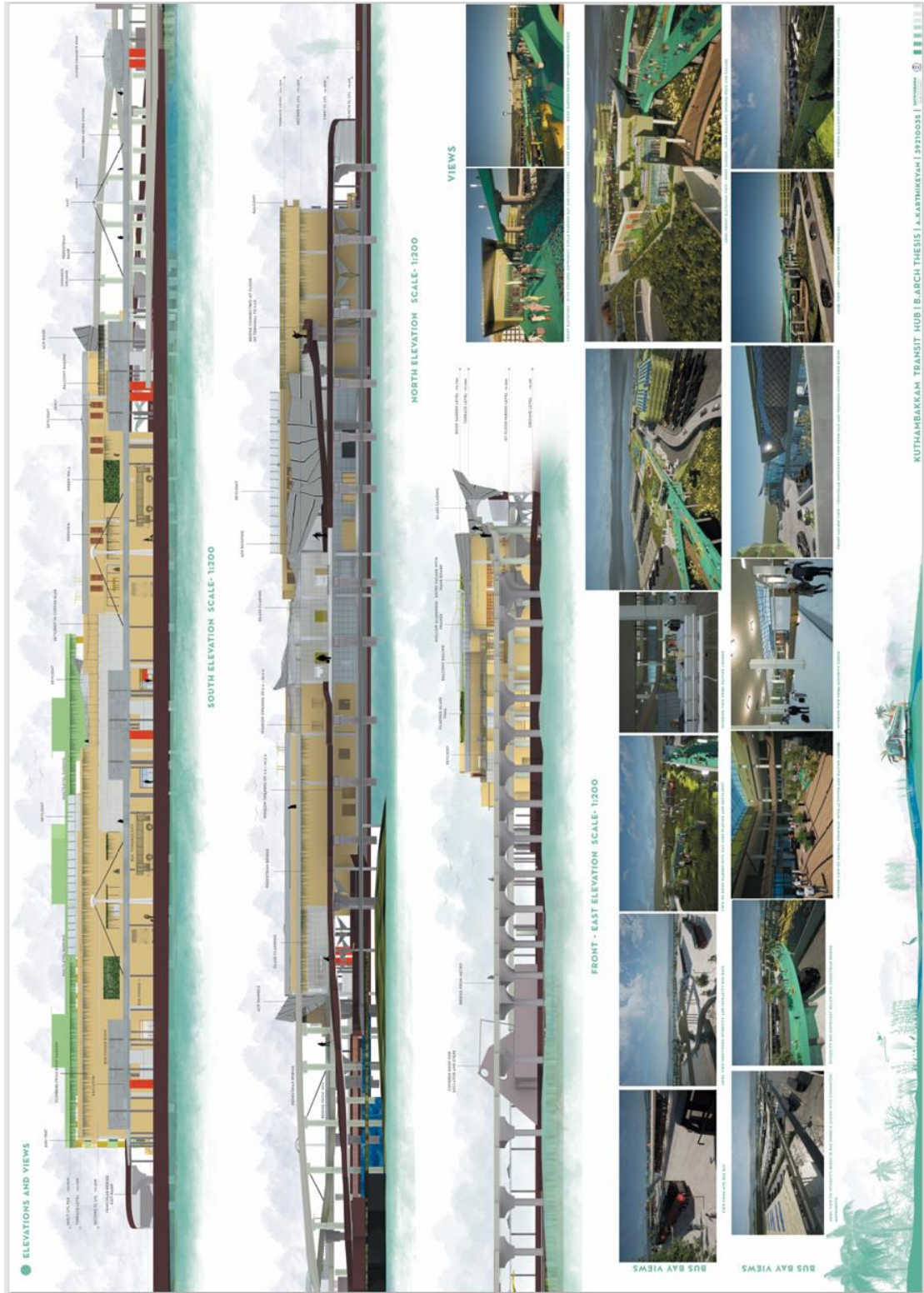


Plate 5.6 Elevation and Renders

CHAPTER 6

REFERENCES

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