

AGRICULTURE RESEARCH INSTITUTE

Submitted in partial fulfillment of the requirements for the
award of
Bachelor of Architecture degree

By

MATHUMITHA A.G. (Reg No. 3621046)



DEPARTMENT OF ARCHITECTURE

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

**(DEEMED TO BE UNIVERSITY) JEPPIAAR NAGAR,
RAJIV GANDHI SALAI, CHENNAI - 600 119**

Accredited with Grade "A" by NAAC

JUNE – 2021



SATHYABAMA

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DEPARTMENT OF ARCHITECTURE

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Mathumitha A.G. (Reg. No . 3621046) who carried out the project entitled “ Agriculture research institute” under our supervision from January 2021 to June 2021.

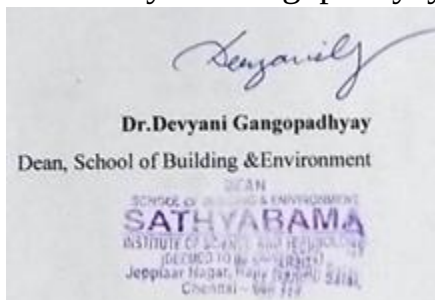
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Submitted for Viva voce Examination held on 03.06.2021

Internal Examiner

External Examiner

DECLARATION

I Mathumitha A.G hereby declare that the Project Report entitled “Agricuiltue Research Institute”done by me under the guidance of Mr.Arun and_____

(External) at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Architecture degree.

DATE:

PLACE: Chennai

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

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TABLE OF CONTENTS

TITLE	PAGE NO.
LIST OF FIGURES	6
LIST OF PLATES	8
1. INTRODUCTION	9
1.1. Aim	9
1.2. Objective	9
1.3. Methodology	10

2. LITERATURE STUDY	11
2.1. Spanish - Portuguese Agricultural Research center	11
2.2. Rucid college for Organic agriculture	17
2.3. Arizona Western College Community building and science + Agriculture Center	21
3. AREA STATEMENT	25
4. SITE STUDY	27
4.1. Site analysis	27
4.1.1. Climate	28
4.1.2. Chronology and Timeline	32
4.1.3. Landuse map	33
4.1.4. Figure and Ground	33
4.1.5. Micro climate	34
4.1.6. SWOT analysis	35
5. CONCEPT	36
6. MASTER PLAN	38
7. DETAILED PLANS	40
8. VIEWS	48

LIST OF FIGURES

TITLE	PAGE NO.
Fig 2.1 : Spanish - Portuguese Agriculture Research center	11
Fig. 2.2: Site view	12
Fig. 2.3: Floor plans	12
Fig.2.4: Section	13
Fig. 2.5 : Views	14
Fig. 2.6: Flexibility	15

Fig 2.7: Sustainability	16
Fig. 2.8: Circulation	16
Fig.2.9: RUCID college for Organic Agriculture	17
Fig. 2.10: Floor plans	18
Fig. 2.11: Elevation	18
Fig. 2.12: Section	19
Fig. 2.13: Materials	19
Fig.2.14: Earth design	20
Fig.2.15: Roof detail	20
Fig 2.16: Arizona western college	21
Fig.2.17: Site plan	21
Fig 2.18: Concept	22
Fig.2.19: Floor plans	22
Fig.2.20: Section	23
Fig.2.21: Interior views	23
Fig.2.22: Views	23
Fig.2.23: Sustainability	24
Fig.2.24: Night view	24
Fig. 4.1: Site Analysis	27
Fig. 4.2: Climate graph	28
Fig. 4.3: Average temperature graph	29
Fig. 4.4: Weather chat	29
Fig. 4.5: Wind speed	30
Fig. 4.6: Wind rose	30
Fig. 4.7: Water temperature table	31
Fig. 4.8: Chronology and Timeline	32

Fig.4.9: Land use map	33
Fig.4.10: Figure and ground	33
Fig. 4.11: Micro climate	34
Fig. 4.12: SWOT analysis	35

LIST OF PLATES

TITLE	PAGE NO.
Plate 3.1 Area Statement	26
Plate 5.1 : Concept	37
Plate 6.1 : Master plan	39
Plate 7.1: Academic block floor plans	41
Plate 7.2: Academic block Section, Elevation	42
Plate 7.3: Admin block	43
Plate 7.4: Community center	44
Plate 7.5: Research center	45
Plate 7.6: Hostel and Mess block	46
Plate 7.7: Auditorium and Cafeteria block	47
Plate 8.1: Views	49

CHAPTER 1

INTRODUCTION TO TOPIC :

Agriculture consists of growing plants and rearing animals in order to yield and produce in a way maintaining the biological equilibrium in nature. It is the most important enterprise in the world. Agriculture helps to meet the basic needs of human and its civilization by providing food, clothing, shelters, fuel, furniture, medicine and recreation. It also provides raw material for Industries. Agricultural development is multidirectional having galloping speed and rapid spread with respect to time and space.

The thought behind developing the Agriculture research institute is to improve the skill of students through practical applications and to develop employability, so that they may explore postsecondary opportunities and career in each area of Agriculture. This Student Handbook on Introductory Agriculture, as part of skill development is being introduced to the students of IX standard will give an insight into the basic principles of agriculture and explain the various components of agro-based industry of our country.

Vertical farming is the practice of growing crops in vertically stacked layers. It often incorporates controlled-environment agriculture, which aims to optimize plant growth, and soilless farming techniques such as hydroponics, aquaponics, and aeroponics. Some common choices of structures to house vertical farming systems include buildings, shipping containers, tunnels, and abandoned mine shafts.

1.1 AIM :

To Provide human resources, skills and technology required for sustainable development of agriculture

1.2 OBJECTIVE : ○ To reach the benefits from food systems both economically and environmentally in urban planning.

1.3 METHODOLOGY :

A. DATA COLLECTION

- References from library and secondary resources
- Users and activities
- Building standards
- General consideration
- Program and area requirements
- Analysis and inference

B. CASE STUDY

- Literature study
- Comparative analysis between literature studies
- Inference

C. SITE STUDY

- Micro level analysis
- Macro level analysis
- SWOT analysis

D. CONCEPT DEVELOPMENT

- Sketches, concept, model, 3Ds
- Zoning

E. DESIGN EVOLUTION

- Master plan
- General layout or arrangement
- Plans, elevation, section
- Structural details
- Model / perspective views

CHAPTER - 2

LITERATURE STUDY

2.1 SPANISH – PORTUGUESE AGRICULTURAL RESEARCH CENTER (CIALE)



Fig 2.1 : Spanish - Portuguese Agriculture Research center

This laboratory is meant for research and experimentation in farming and plant maintenance. It has the infrastructure required to conduct research related to agricultural activities in the field of physiology, biochemistry and molecular biology of plants, fungus and microorganisms.

The site is part of a bigger area of environmental interest close to the river Tormes. An intervention was proposed in which the architecture is not imposed but rather becomes part of the environment.

The building emerges in the landscape distancing itself from a housing environment without a clear order, with different shapes. The topographic redevelopment of the site leads to two levels: in the upper, with the entrance from the street, the building is hidden in the

landscape, while the lower level opens onto the river, separating from the ground by piles that isolate the construction of possible floods.

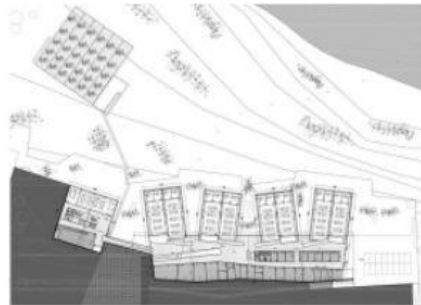


Fig. 2.2: Site view

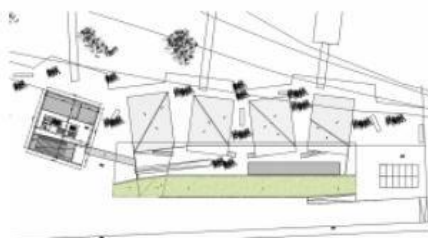
- Location: SPAIN - SALAMANCA
Architect: CANVAS ARQUITECTOS
Year: 2008
Area: 4800 m²



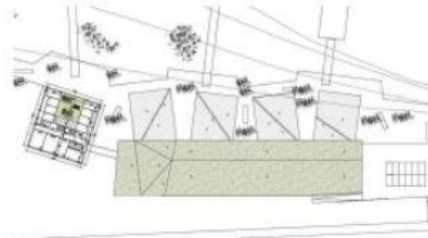
Basement floor



Ground floor



Second floor



First floor

Fig. 2.3: Floor plans

- **LEGABILITY:**

One of the aims of the proposal is to get permeability and transparency between building and landscape, in order to obtain this, a light multilayer facade system is used, resulting in a variable density filter that meets both the heat and sunlight needs as well as the necessary privacy. Guaranteed that the structure work with the path of the sun and allowed the light for passive solar gain.

- Decreasing brightness.
- Decrease warmness to the structure inner spaces and cooling during summer.
- Use of Shading structure.
- Pleasant daylight.
- Enhanced regular ventilation
- Cross ventilation.



Fig.2.4: Section

- **COMFORT:**

The building achieved visual comfort as its oriented towards the river and the landscape around the site which allows the user to feel the integration between the surrounding environment and the building



Fig. 2.5 : Views

- **FLEXIBILITY:**

The architecture is clear and easily understandable, seeks a flexible and versatile scheme, able to solve the appearance of new programs that will necessarily be incorporated into the research complex.

Movable partitions are used in order to reshape the plan according to its functions

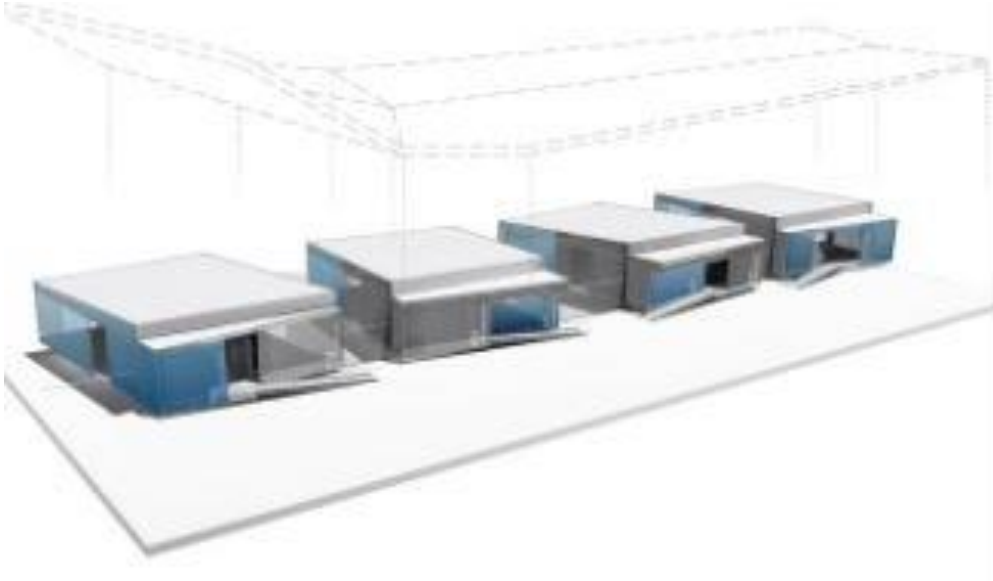


Fig. 2.6: Flexibility

- **SUSTAINABILITY:**

- * Use of green roof feature acting as a cooling strategy in summer.

- * Use of curtain walls in order to allow natural lighting

- * Usage of Shading devices Multilayer façade to control the heat gain & sunlight

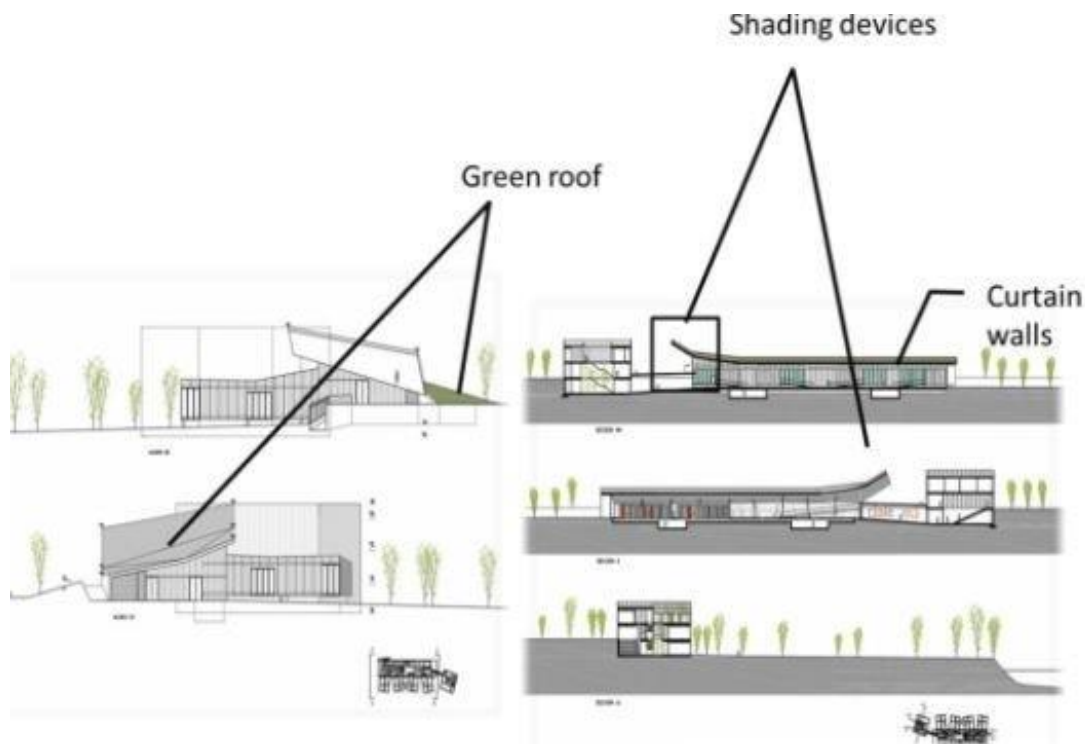


Fig 2.7: Sustainability

- **CIRCULATION:**

The plan was simplified (not complex). The building is separated from the ground and supported on piles, the materials of the structure is revealed throughout the entire building, A gallery of accessible facilities under the slabs runs the building all the way long. This infrastructure can solve the maintenance and further introduction of new services and technology. This solution avoids ceilings that would hide the structure and blur the proposal. Variety of vertical circulation throughout the plan .



Fig. 2.8: Circulation

2.2 RUCID College for Organic Agriculture



Fig.2.9: RUCID college for Organic Agriculture

RUCID (rural community in development) is a privately run college for organic agriculture, the institution's management has a keen interest in ecosolutions. consequently, studio FH designed all buildings with decentralized rainwater harvesting systems, while kitchens fitted fuel-efficient wood stoves. The project was built by local teams contracted on a labor basis and over seen by an in-house construction manager

Location: Mityana, Uganda

Area:2110m²

Year:2017

Architect: Studio FHarchitects and Lightearthdesigns

Landscape designer: Thelandscape studio studio

Structural engineer:Edsonagume

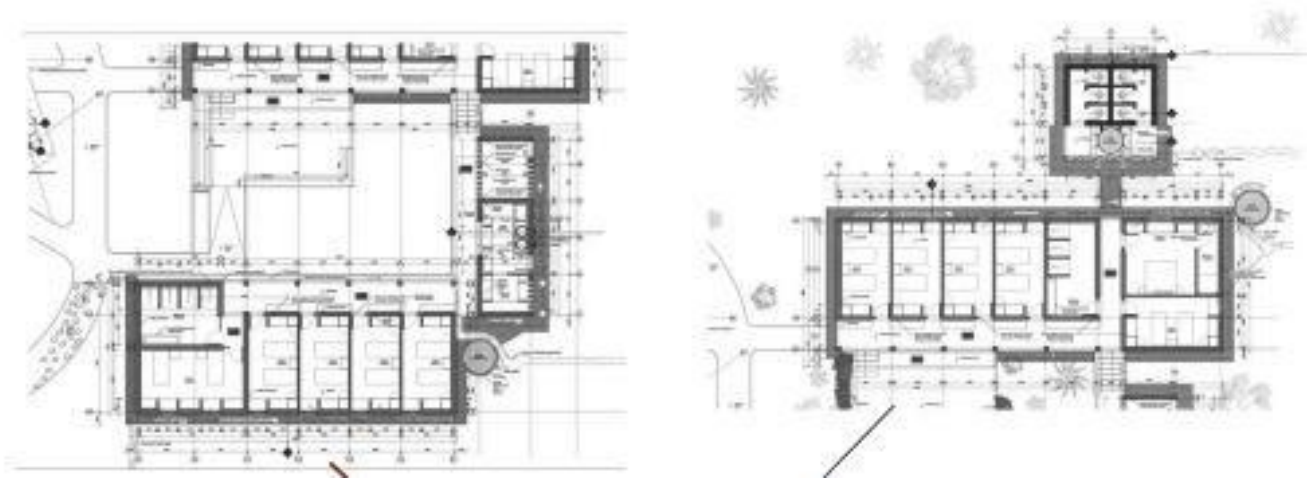


Fig. 2.10: Floor plans

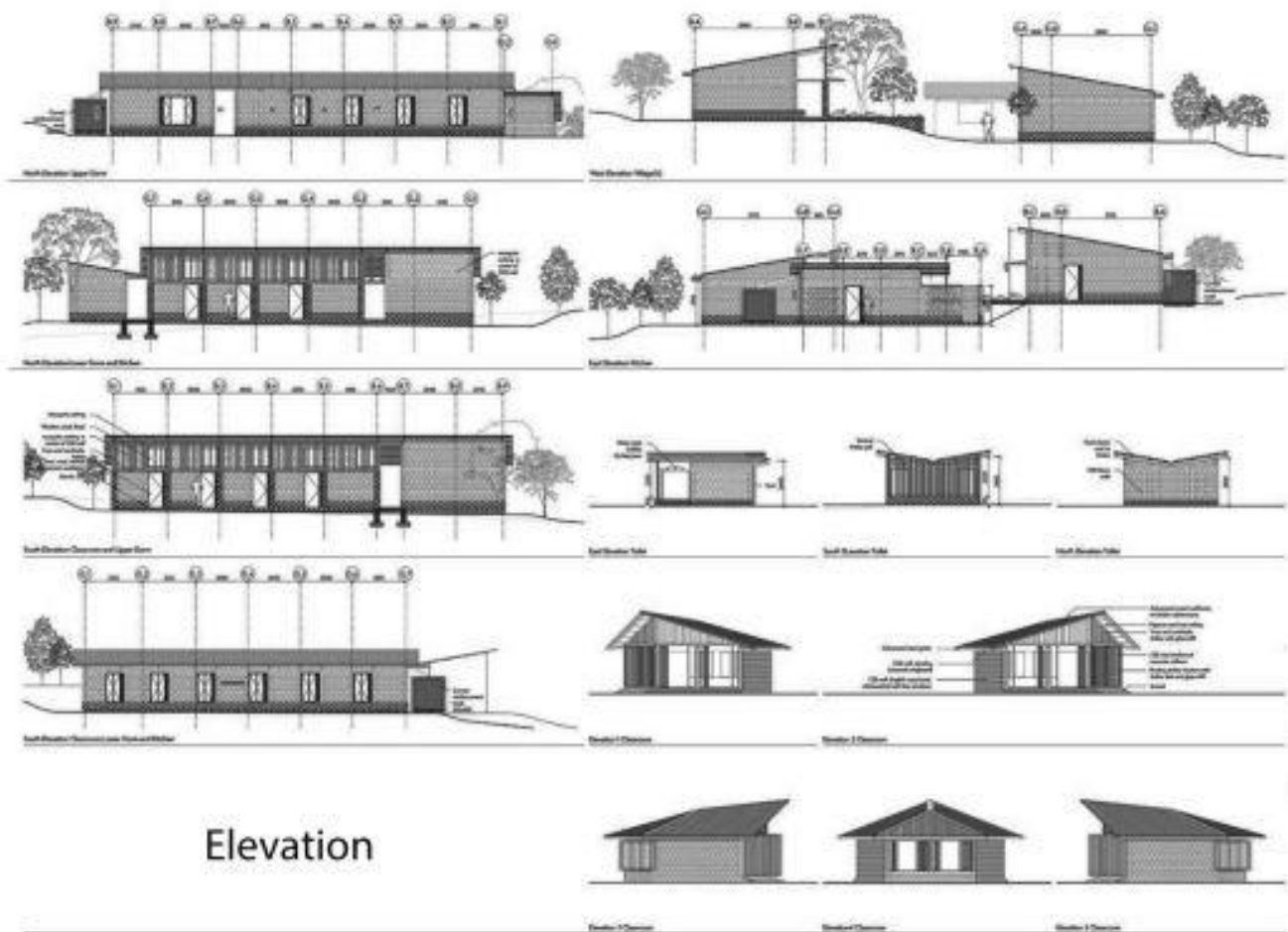
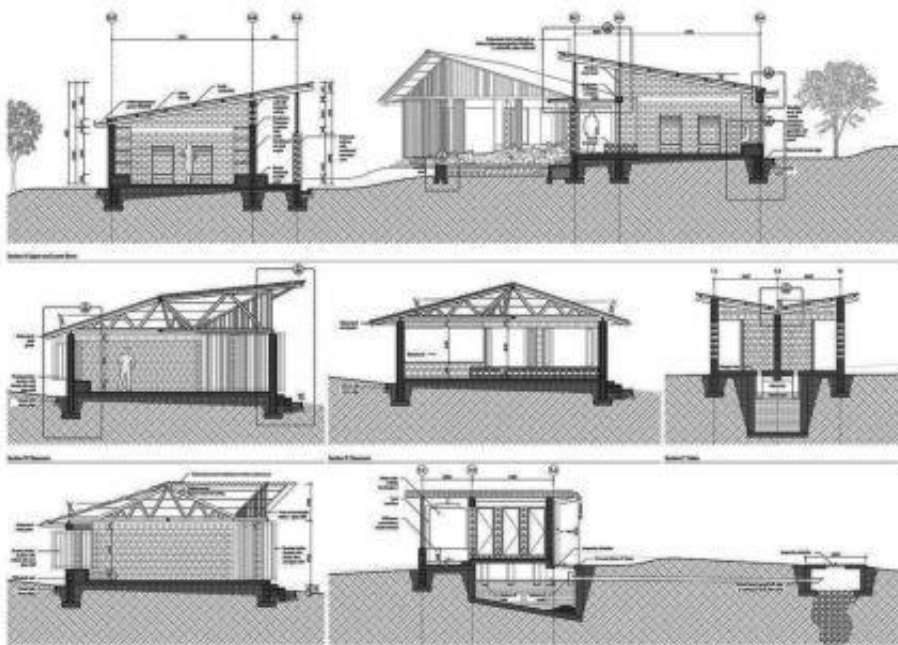


Fig. 2.11: Elevation



Section

Fig. 2.12: Section

Materials:

Local material sand construction techniques were used throughout the design, including manually compressed stabilized soil blocks, largely made from earth sourced on site, and eucalyptus wood for the building buildings' roof sand shading screens



Fig. 2.13: Materials

Given the school management's keen interest in eco solutions the most local of construction technology was used: manually compressed stabilized soil blocks, largely

made from earth sourced onsite, and roofs and shading screens made of eucalyptus wood found in nearby plantations

The buildings were designed in collaboration with Light Earth Designs who prepared the Masterplan as well as the schematic designs of the dormitory courtyards.

All buildings have a decentralised rainwater harvesting system and kitchens with fitted fuel-efficient wood stoves.



Fig.2.14: Earth design

Studio FH added the pentagon-shaped classrooms, detailed all buildings and oversaw the construction on site.



Fig.2.15: Roof detail

2.3 Arizona Western College Community Building And Science + Agriculture Center



Fig 2.16: Arizona western college

Located in the growing agriculture area of Yuma, Arizona, the AWC project is a comprehensive development of multiple buildings designed to:

- Increase interaction amongst user groups inside and outside at all scales: between faculty and students, differing departments, and the campus and community.

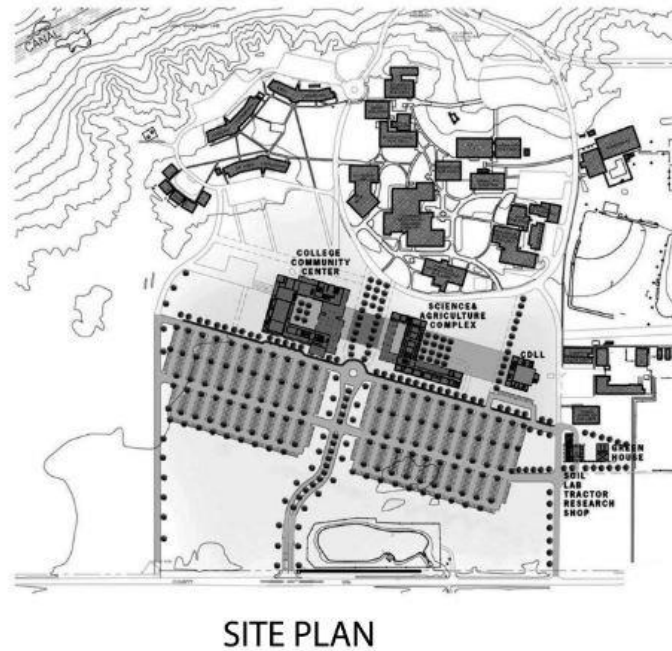


Fig.2.17: Site plan

- Create a new campus identity and front door redirecting the main campus entry to the south toward the community of Yuma.

Location: Yuma, United States

Area: 175000.0 ft²

Year: 2008

Architects: Gould Evans

Landscape Architect: GBTwo

Owner: Arizona Western College

The design team saw an opportunity to maximize programmatic overlaps as a way to create collaborative zones for spontaneous interaction between diverse users

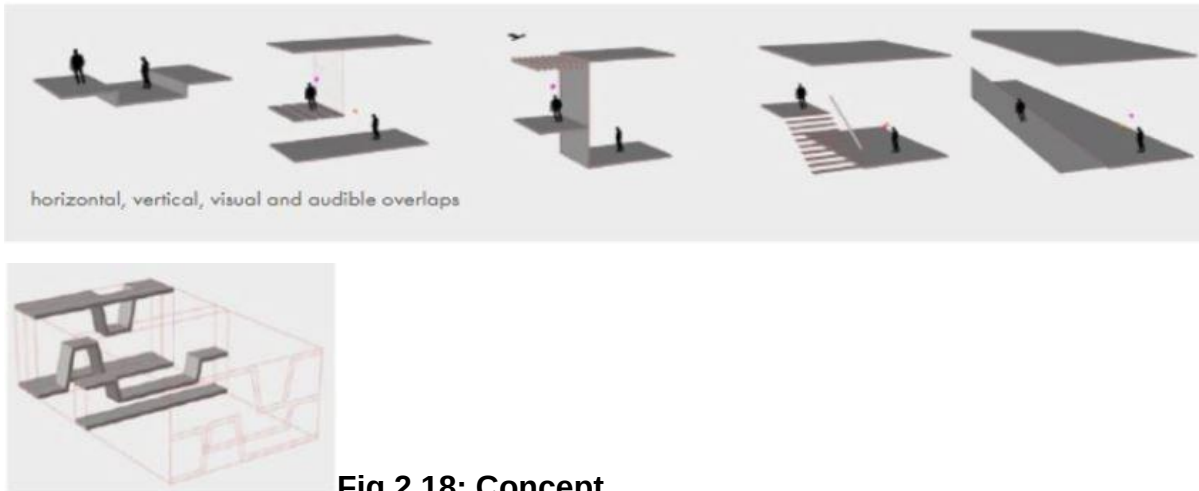


Fig 2.18: Concept



Fig.2.19: Floor plans



Fig.2.20: Section

Connection of Space and Program Student

Life and Support Services.

Informal student spaces throughout both buildings allow students to study and gather between classes and spur collaborative research discussions.



Fig.2.21: Interior views

Connection of Resource

The 'one-stop shop' concept was designed to bring multiple programs from dispersed locations on campus into a central location, streamlining the student service process.



Fig.2.22: Views

Sustainability:

The self-shading skin pattern also creates a ventilated wall cavity, reducing heat gain. Initially designed as copper, the skin was changed to aluminum due to material cost escalation. The building concept easily supported this change without compromising the integrity of the design. The color of the aluminum skin changes as the sun moves throughout the day.



Fig.2.23: Sustainability

Exterior:

Exterior cladding skin sections were designed as repeating modular elements, providing a simplified production process, reduced waste and cost-effective, high visual impact solution.



Fig.2.24: Night view

CHAPTER - 3

AREA STATEMENT

Plate 3.1 explains the Area Statement for the design.

Plate 3.1 Area Statement

DESIGN PROGRAM

S.No	Program	No. of units	Area sq.m
	VERTICAL FARM		
1	reception	1	50
2	storage	3	400
3	growing area	3	1200
4	gathering space	1	370
5	breakout space	1	120
6	staff area	1	30
7	director's office	1	36
8	meeting room	1	40
9	mud room	1	20
10	processing/ loading	1	280
11	shipping	1	30
12	freezer	1	20
13	coolers	4	180
14	cafeteria	1	150
15	office area	1	80
16	Restroom		40
			3046

30	conference room		50
31	UG lecture hall	8	1200
33	PG lecture hall	4	600
34	Phd lecture hall	3	300
35	faculty room		120
36	washrooms		70
37	seminar hall		300
38	plant breeding & genetics lab		180
39	plant pathology lab		200
40	department of agronomy lab		100
41	soil science lab		150
			3420

	HORTICULTURE DEPARTMENT	No. of units	Area (SQ.M)
42	lobby		100
43	dean room		20
44	office room		30
45	conference room		50
46	UG lecture hall	8	1200
47	PG lecture hall	4	600
48	Phd lecture hall	3	300
49	faculty room		120
50	washrooms		70
51	seminar hall		300
52	computer lab		100
53	soil science lab		150
54	crop physiology lab		150
55	tissue culture lab		150
			3340

	AGRICULTURE RESEARCH INSTITUTE	No. of units	Area (SQ.M)
	ADMIN DEPARTMENT		
17	reception and lobby		200
18	waiting area	30	60
19	vice chancellor's office		60
20	department director's office		75
21	administration office		60
22	cashier room		25
23	accountant room		35
24	conference room	30	30
25	maintenance room		15
26	staff toilets		100
			660

66	medical room		50
67	mess		300
			4502

	BOYS HOSTEL	No. of units	Area (SQ.M)
68	entrance lobby & waiting		50
69	office room		20
70	security room		12
71	warden room		40
72	UG hostel	8	1500
73	PG hostel	4	800
74	laundry	3	50
75	staff quarters		1500
76	washrooms		
77	shops, canteen		30
78	multipurpose hall		150
79	medical room		50
80	mess		300
			4502

	STUDENTS AMENITIES CENTER	No. of units	Area (SQ.M)
81	xerox center		12
82	pharmacy		25
83	canteen		300
84	shops	2	25
85	library		300
86	Indoor sports		600
			1382

Name : Mathumitha A.G

Reg No: 3621046

Batch : 2016 - 2021

S21PROJ2 - THESIS

Department of Architecture

CHAPTER - 4

SITE STUDY

4.1 Site Analysis

Location: Nagercoil, Kanyakumari

Latitude: 8° 11'29"N

Longitude: 77° 26'37"E

CLIMATE: TROPICAL WET & DRY

Soil type: Aluvial soil

Max. Temperature : 29.1°C

Min. Temperature : 25.3°C

Average Rainfall: about 826 to 1456 mm

WIND DIRECTION: NORTH EAST

AREA : 22 ACRE

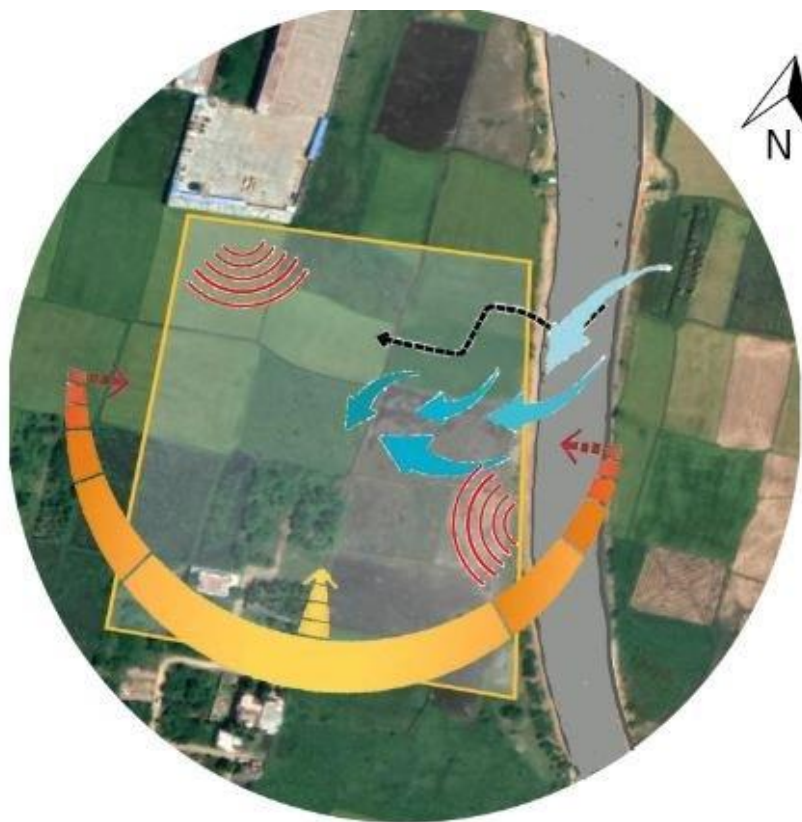


Fig. 4.1: Site Analysis

Kanniyakumari district is the smallest district in Tamil Nadu. Even though it is the smallest in terms of area (1672/Sq.Km), the density of population is the highest 1119/Sq.Km in Tamil Nadu next to Chennai. In literacy it stands first.

SITE JUSTIFICATION:

1. Agricultural related institutes not exists in Kanyakumari district.
2. Site is located near most popular agricultural market in Kanyakumari
3. Site is surrounded by agricultural fields and river
4. Site is located in the main area and where NH66 and NH47 meets at this place

4.1.1 Climate

Nagercoil is 29m above sea level. Nagercoil's climate is classified as tropical. In winter, there is much less rainfall in Nagercoil than in summer.

This climate is considered to be Aw (TROPICAL WET AND DRY CLIMATE) according to the Köppen-Geiger climate classification. The temperature here averages 26.6 °C | 79.8 °F. In a year, the rainfall is 985 mm | 38.8 inch.

Precipitation is the lowest in February, with an average of 17 mm | 0.7 inch.

With an average of 208 mm | 8.2 inch, the most precipitation falls in November.

NAGERCOIL CLIMATE GRAPH

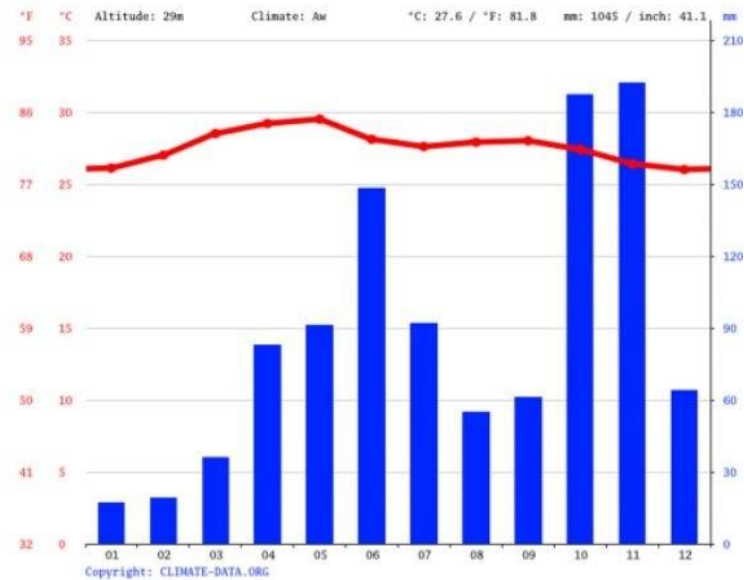


Fig. 4.2: Climate graph

At an average temperature of 28.1 °C | 82.6 °F, April is the hottest month of the year. November has the lowest average temperature of the year. It is 25.6 °C | 78.1 °F.

NAGERCOIL AVERAGE TEMPERATURE

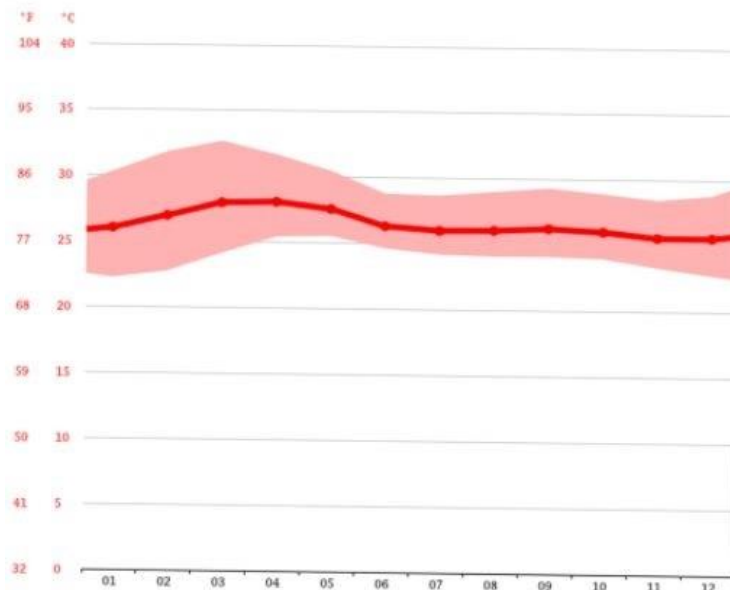


Fig. 4.3: Average temperature graph

Average temperature:

Between the driest and wettest months, the difference in precipitation is 191 mm | 8 inch. During the year, the average temperatures vary by 2.5 °C | 36.5 °F.

NAGERCOIL WEATHER BY MONTH / WEATHER AVERAGES

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	26 °C (78.9) °F	27 °C (80.6) °F	28 °C (82.4) °F	28.1 °C (82.6) °F	27.6 °C (81.7) °F	26.3 °C (79.4) °F	26 °C (78.9) °F	26.1 °C (79) °F	26.3 °C (79.3) °F	26 °C (78.9) °F	25.6 °C (78.1) °F	25.6 °C (78.1) °F
Min. Temperature °C (°F)	22.2 °C (72) °F	22.8 °C (73) °F	24.2 °C (75.5) °F	25.4 °C (77.8) °F	25.5 °C (78) °F	24.6 °C (76.4) °F	24.2 °C (75.6) °F	24.1 °C (75.4) °F	24.1 °C (75.4) °F	24 °C (75.2) °F	23.4 °C (74.1) °F	22.8 °C (73) °F
Max. Temperature °C (°F)	30.3 °C (86.6) °F	31.9 °C (89.3) °F	32.7 °C (90.8) °F	31.7 °C (89) °F	30.5 °C (86.9) °F	28.8 °C (83.9) °F	28.7 °C (83.7) °F	29 °C (84.3) °F	29.4 °C (84.8) °F	29 °C (84.1) °F	28.5 °C (83.3) °F	28.9 °C (84) °F
Precipitation / Rainfall mm (in)	18 (0.7)	17 (0.7)	41 (1.6)	84 (3.3)	91 (3.6)	88 (3.5)	58 (2.3)	56 (2.2)	63 (2.5)	187 (7.4)	208 (8.2)	74 (2.9)
Humidity(%)	64%	63%	67%	76%	79%	82%	81%	80%	79%	82%	81%	72%
Rainy days (d)	2	3	6	13	11	12	9	8	9	14	14	6

Fig. 4.4: Weather chat

Wind speed:

The diagram for Nagercoil shows the days per month, during which the wind reaches a certain speed.

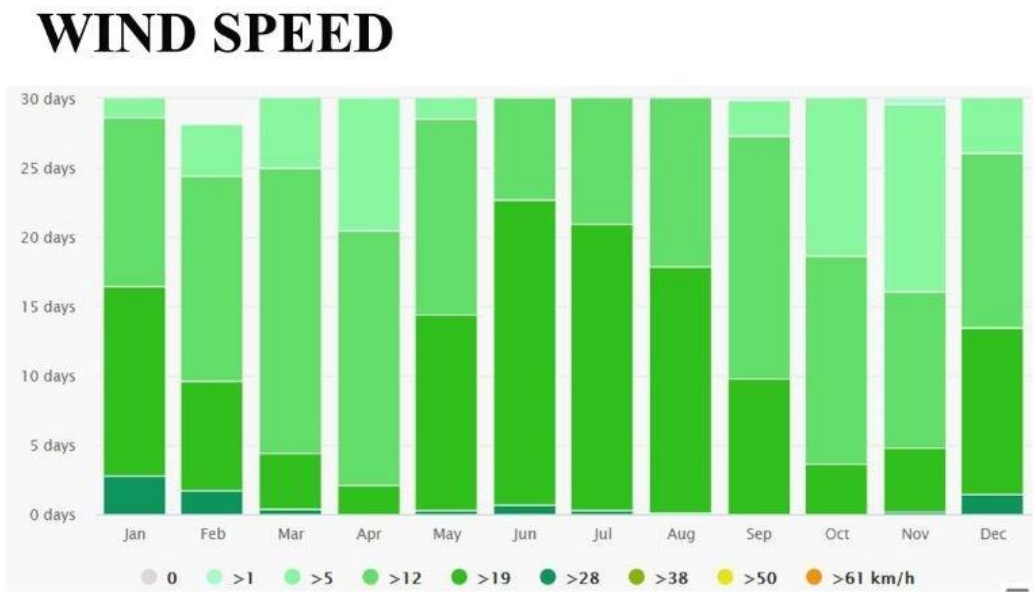


Fig. 4.5: Wind speed

The wind rose for Nagercoil shows how many hours per year the wind blows from the indicated direction

WIND ROSE



Fig. 4.6: Wind rose

Water temperature:

The annual water temperature for Nagercoil (Gulf of Mannar) is on average 27.80°C | 82.04°F. The month with the highest water temperature is April with 29.70°C | 85.46°F. The lowest water temperature of 25.60°C | 78.08°F will be reached in July. The highest average water temperature for this location is 29.70°C | 85.46°F and is reached on average around April 22. By contrast, the lowest average water temperature 25.60°C | 78.08°F around July 28

WATER TEMPERATURE NAGERCOIL

	January	February	March	April	May	June	July	August	September	October	November	December
Min. Water Temperature	27.5	27.7	28.4	29.3	27.8	26.5	25.6	25.8	26.2	27.1	28.3	27.7
°C (°F)	81.5	81.9	83.1	84.7	82	79.7	78.1	78.4	79.2	80.8	82.9	81.9
Avg. Water Temperature	27.7	28.1	29	29.6	28.7	27.1	26	26.1	26.7	27.6	28.4	28
°C (°F)	81.9	82.6	84.2	85.3	83.7	80.8	78.8	79	80.1	81.7	83.1	82.4
Max. Water temperature	27.9	28.4	29.3	29.7	29.4	27.8	26.5	26.4	27.3	28.3	28.6	28.4
°C (°F)	82.2	83.1	84.7	85.5	84.9	82	79.7	79.5	81.1	82.9	83.5	83.1

Fig. 4.7: Water temperature table

4.1.3 Chronology and Timeline

CHRONOLOGY & TIMELINE OF THE SITE:

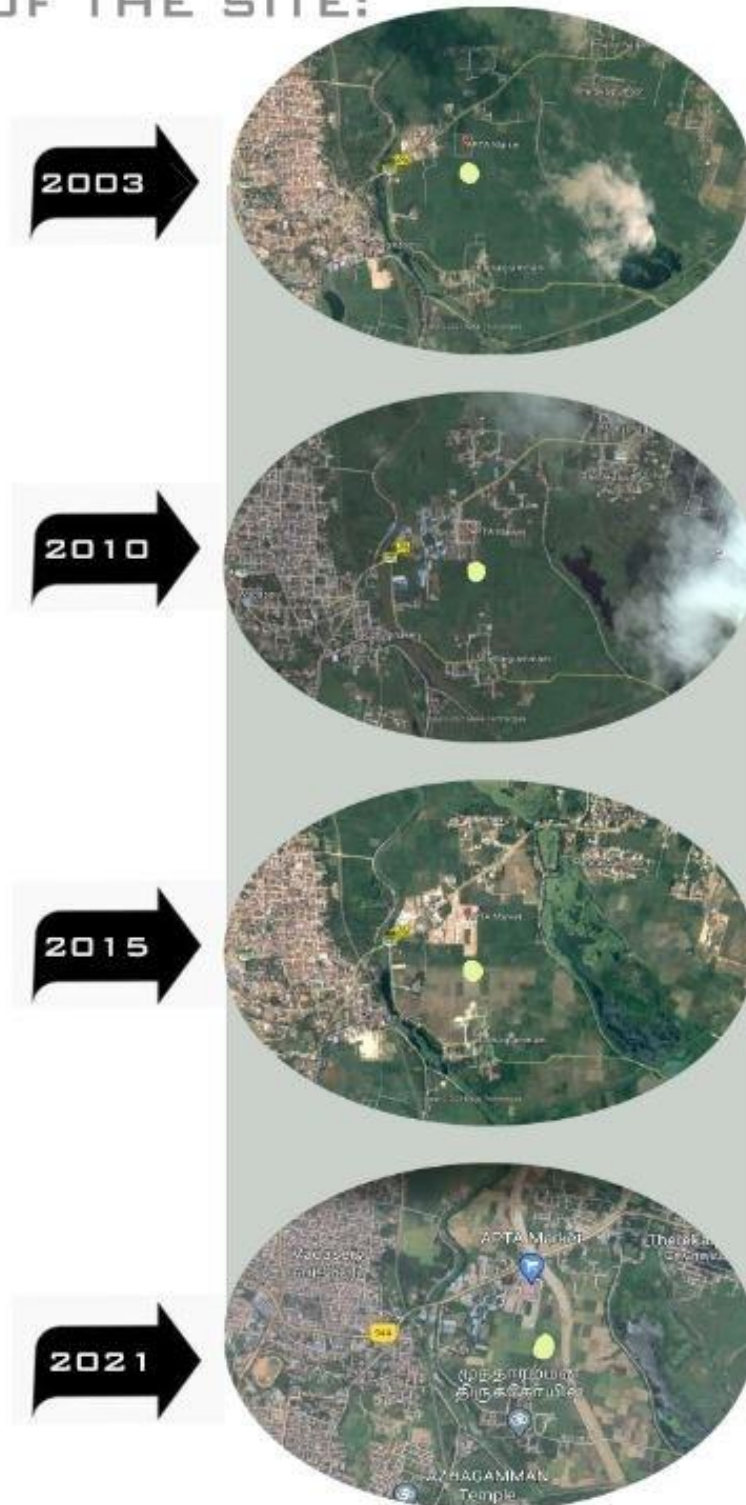


Fig. 4.8: Chronology and Timeline

4.1.4 Land use Map



Fig.4.9: Land use map

4.1.5 Figure and Ground



Fig.4.10: Figure and ground

4.1.6 Micro climate:

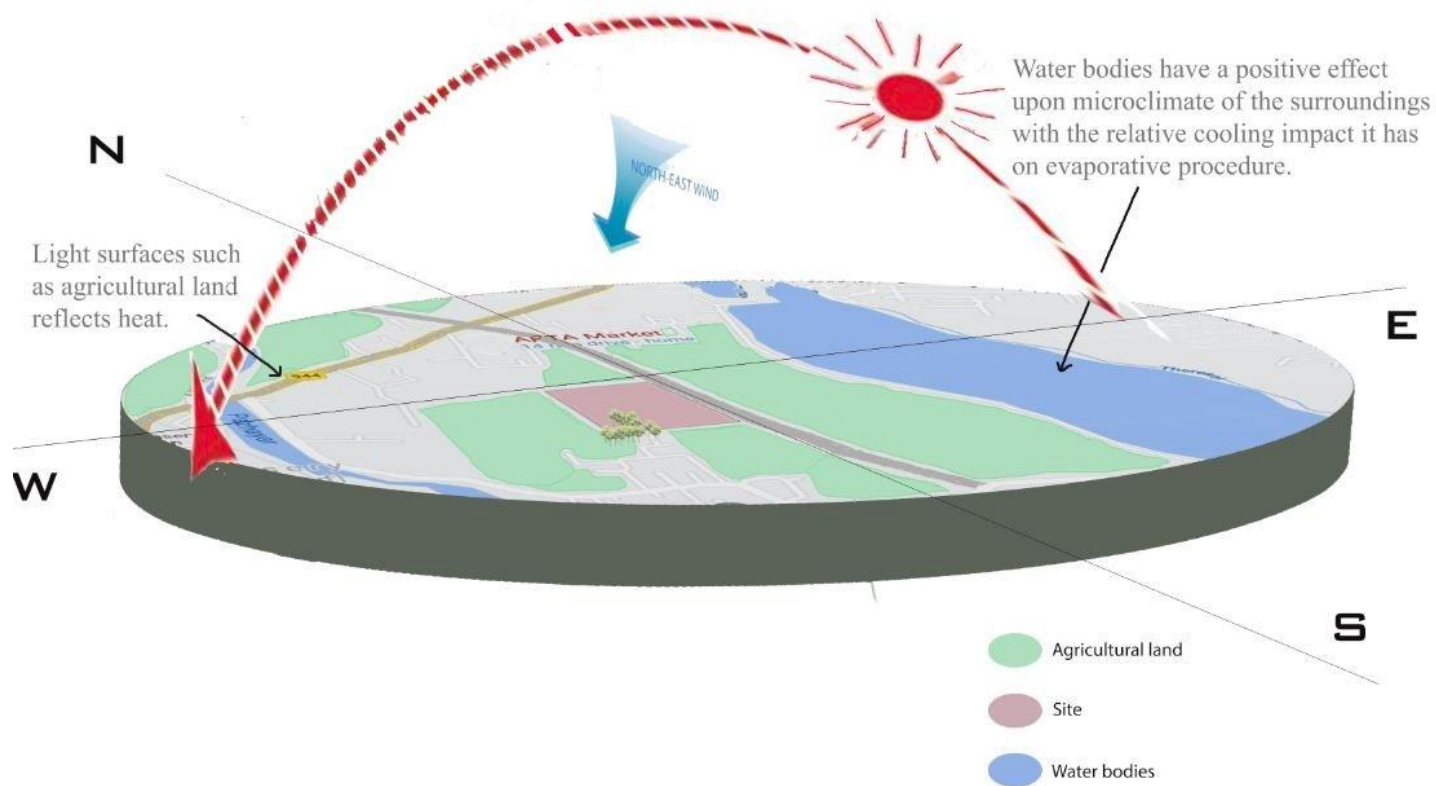
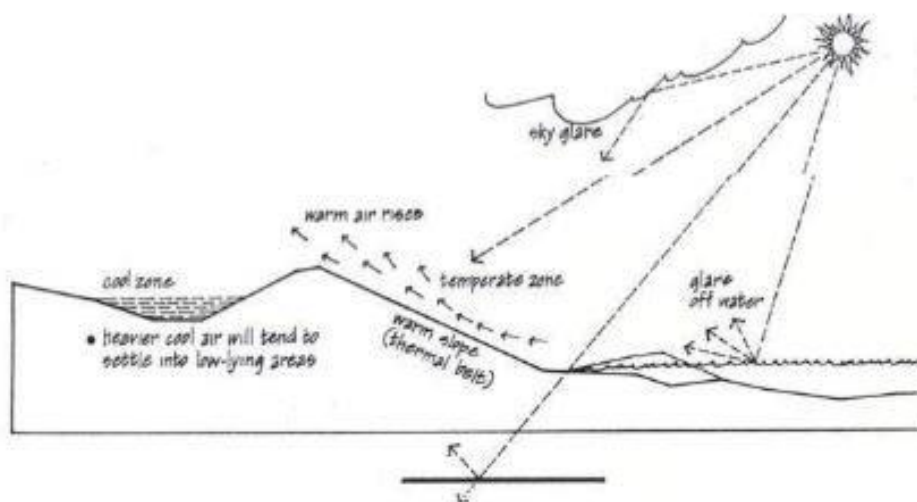


Fig. 4.11: Micro climate



4.1.7 SWOT Analysis:



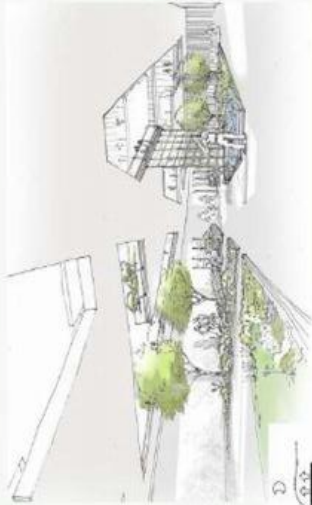
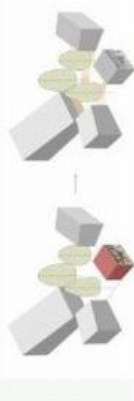
Fig. 4.12: SWOT analysis CHAPTER - 5

CONCEPT

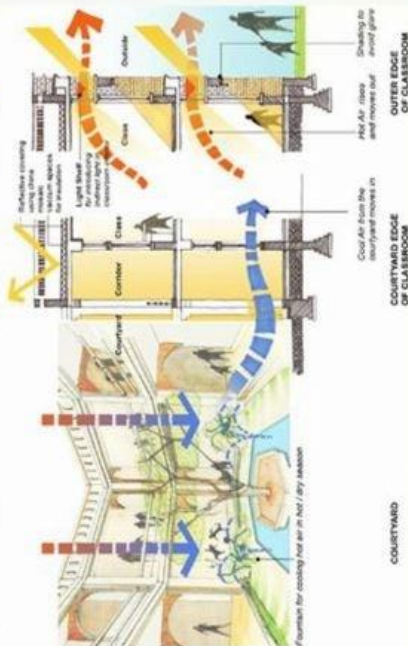
Plate 5.1 explains the concept study for the design

*The dual role for social interaction and environmental enhancement – mutually reinforcing one another, features an open space in **healthy campus life.***

"evidence base design" factors significantly improved physical and psychological/spiritual health improvement was confirmed. The method to let the youngest generation of terrestrials grow up in built environments with the lowest carbon and largest architectural values possible leads to a natural positive bioclimatic conditioning, which enables them to intuitively operate on an environmentally progressive basis.



- Green & Open areas
- Landscape along walkway
- Sitting space along walkway
- Green roof
- Courtyard effect



ACADEMIC BLOCK
ADMIN BLOCK
COMMUNITY BLOCK
RESEARCH CENTER
CAFETERIA
AUDITORIUM
ACCOMMODATION
AGRICULTURE FIELD
PARKING
PLAY GROUNDS
FARM HOUSE
CIRCULATION

NG
ZONING

GNINON

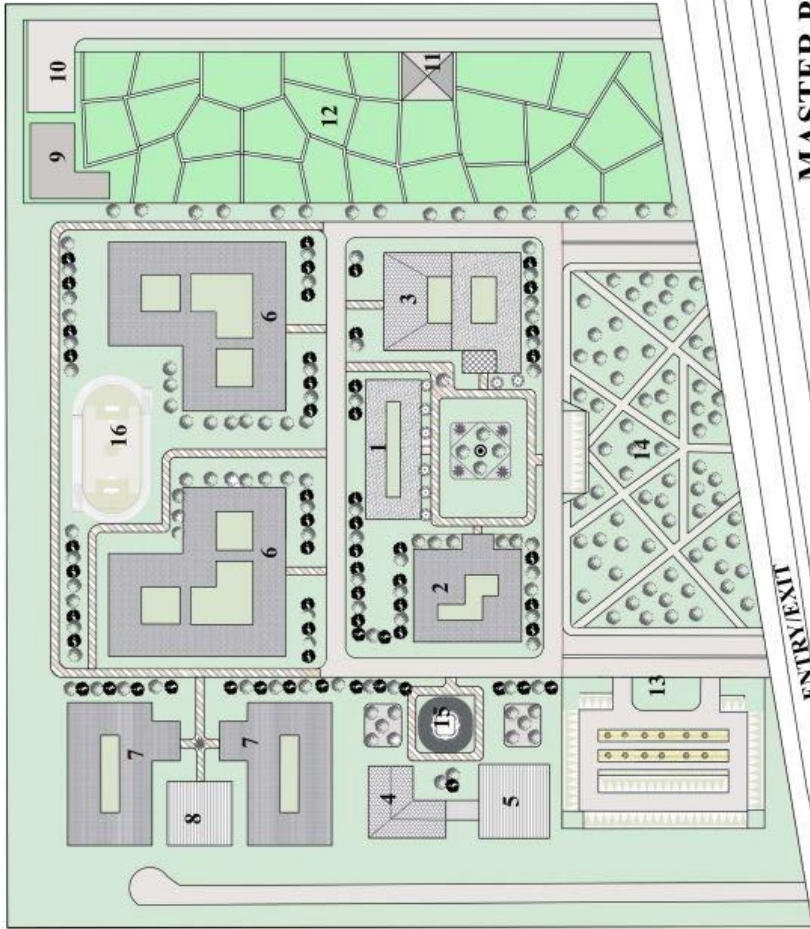


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37

MASTER PLAN

Plate 6.1 explains the Master plan of the design



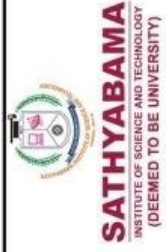
- 1 - ADMIN
- 2 - COMMUNITY CENTER
- 3 - RESEARCH CENTER
- 4 - CAFETERIA
- 5 - AUDITORIUM
- 6 - ACADEMIC BLOCK
- 7 - HOSTEL BLOCK
- 8 - MESS BLOCK
- 9 - FARM HOUSE
- 10 - TRACTOR SHED
- 11 - GREEN HOUSE
- 12 - AGRICULTURE FIELD
- 13 - PARKING
- 14 - OSR
- 15 - OAT
- 16 - PLAYGROUND

MASTER PLAN



SITE SECTION

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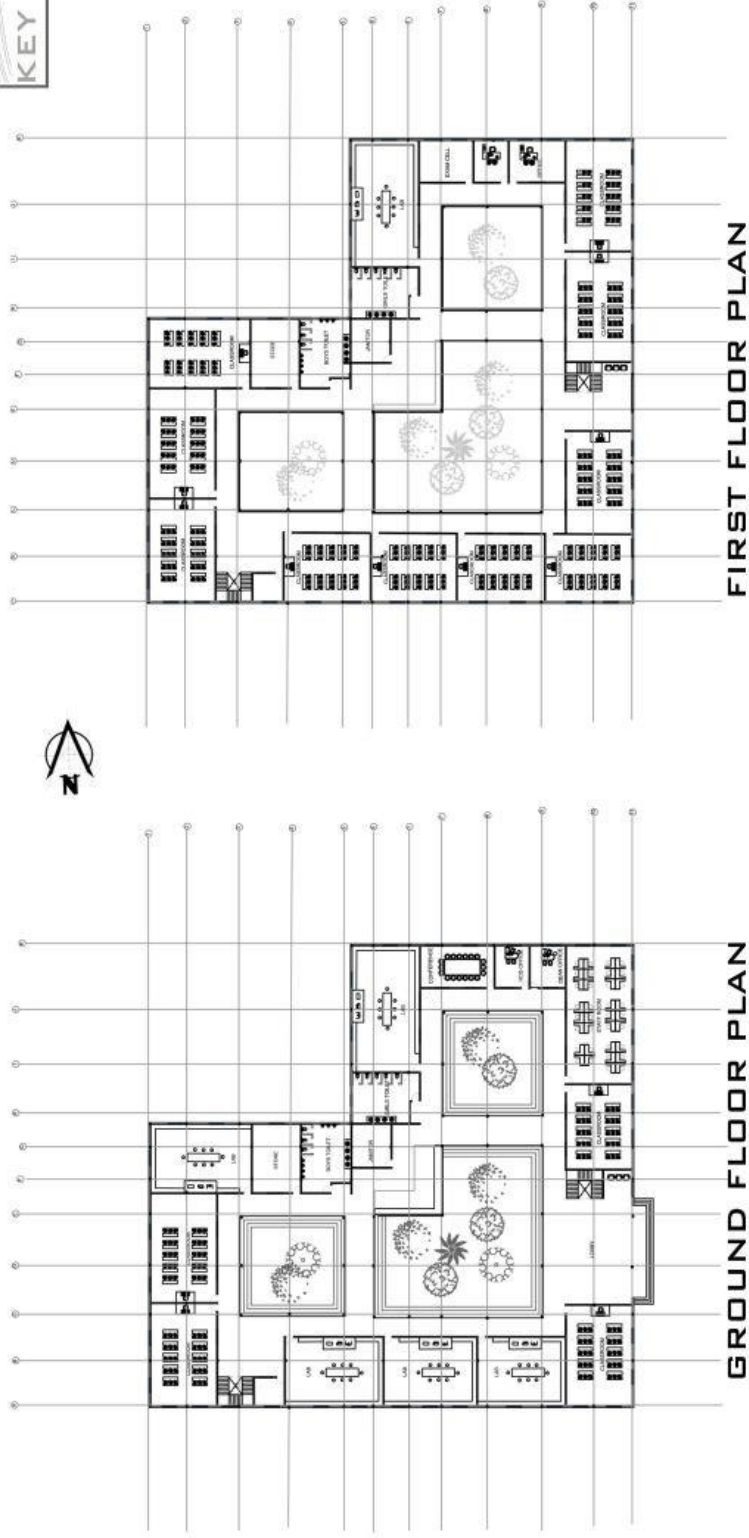
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Plate 6.1 : Master plan CHAPTER - 7

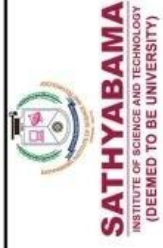
DETAILED DESIGN DRAWINGS

- Detailed drawing of Academic block floor plans in Plate 7.1
- Detailed drawing of Academic block section, elevation in Plate 7.2
- Detailed drawing of Admin block in Plate 7.3
- Detailed drawing of Community center in Plate 7.4
- Detailed drawing of Research center in Plate 7.5
- Detailed drawing of Hostel block in Plate 7.6
- Detailed drawing of Auditorium and cafeteria in Plate 7.7

ACADEMIC BLOCK



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Plate 7.1: Academic block floor plans

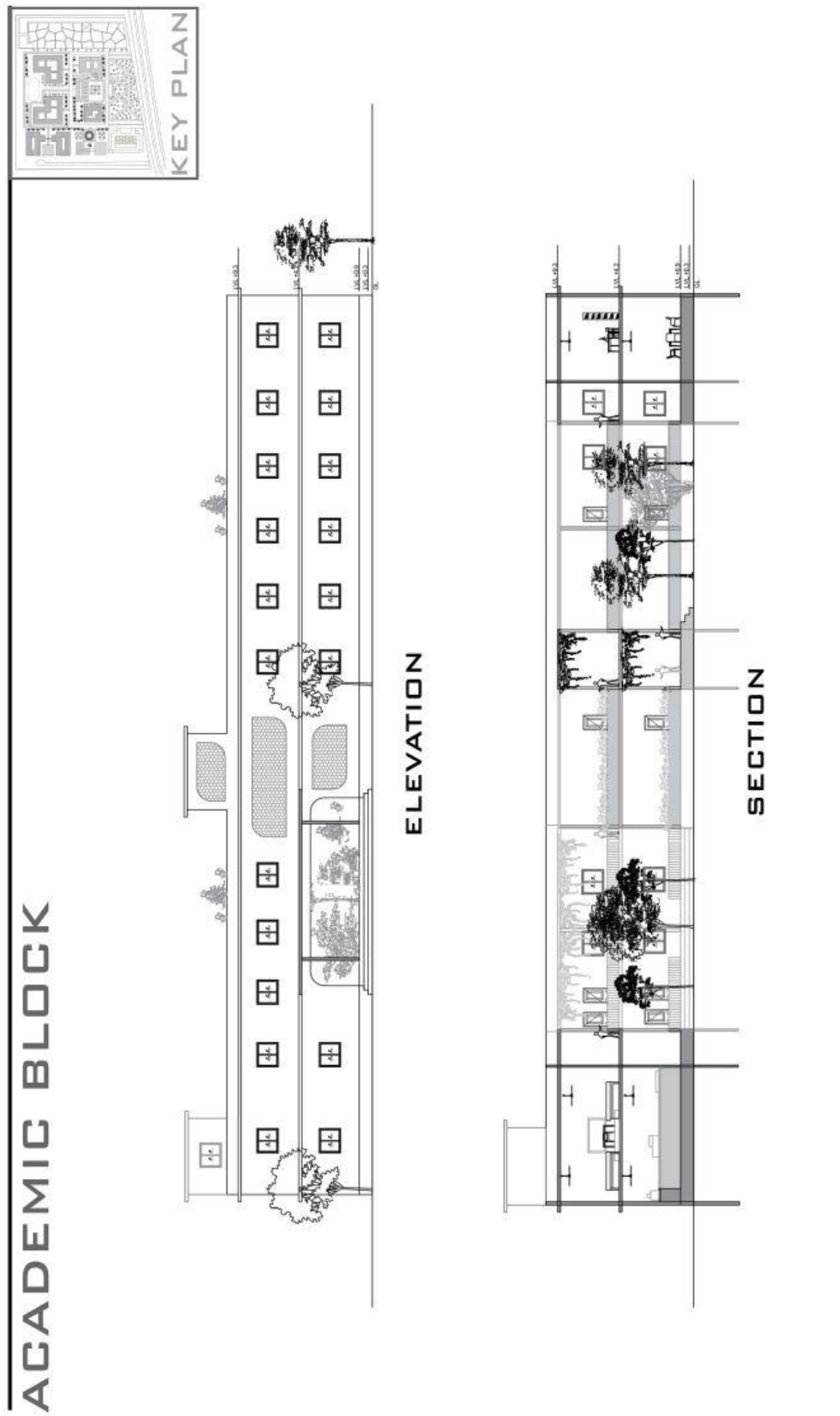
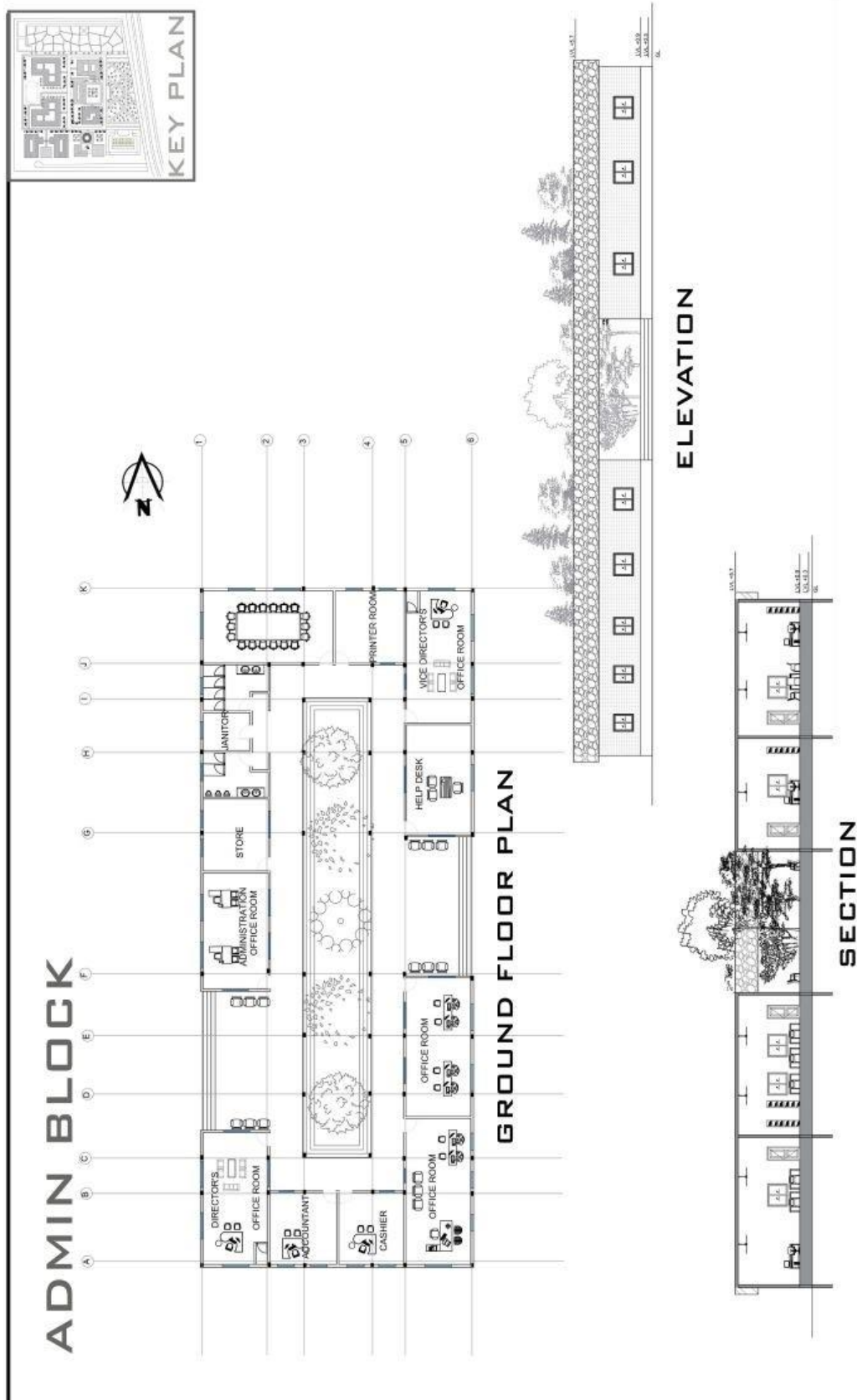
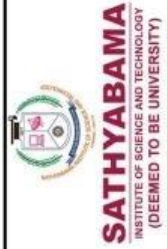


Plate 7.2: Academic block Section, Elevation

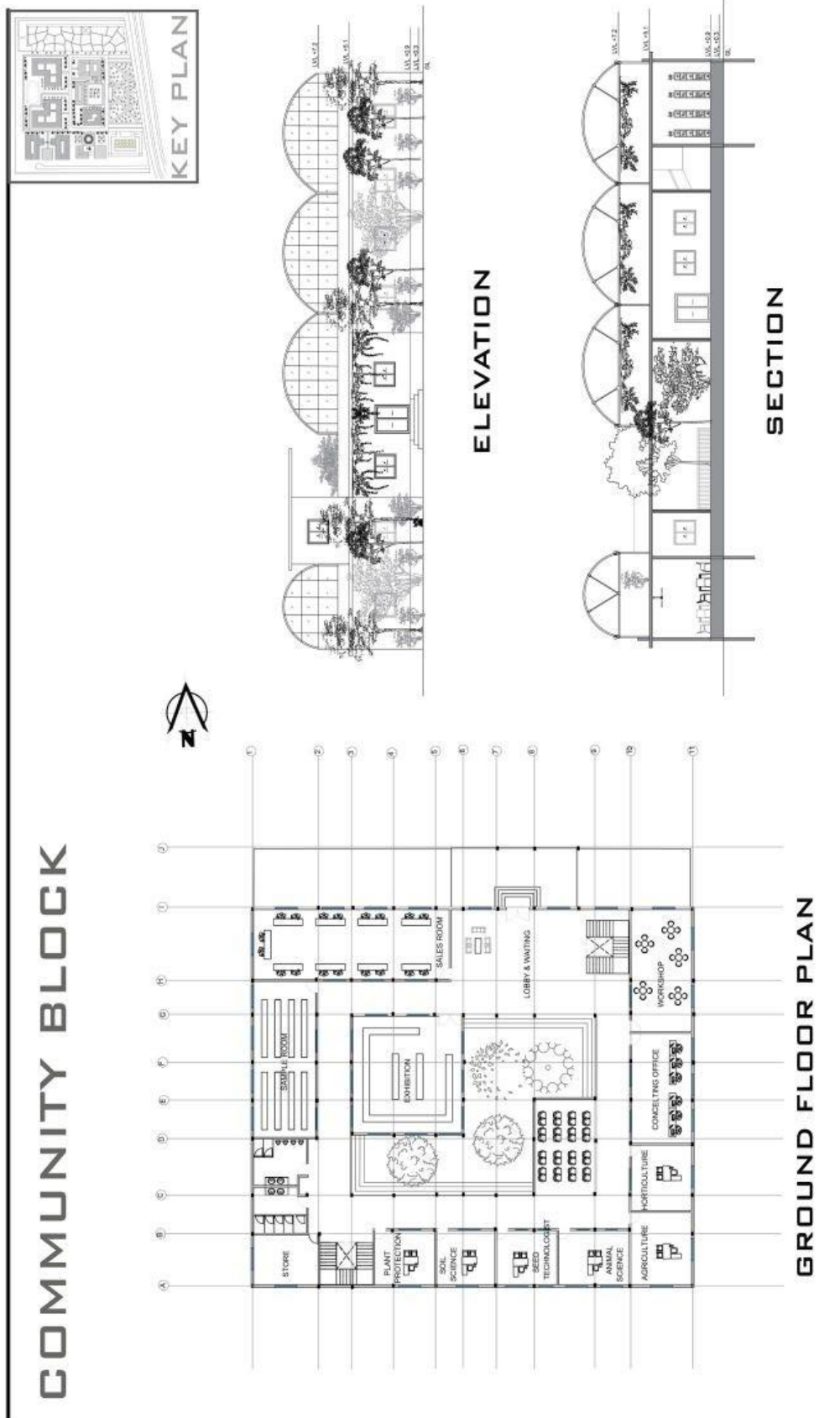


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Plate 7.3: Admin block



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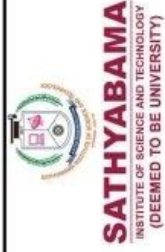
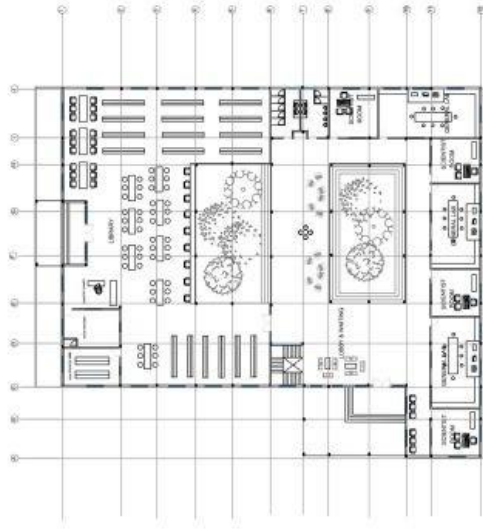
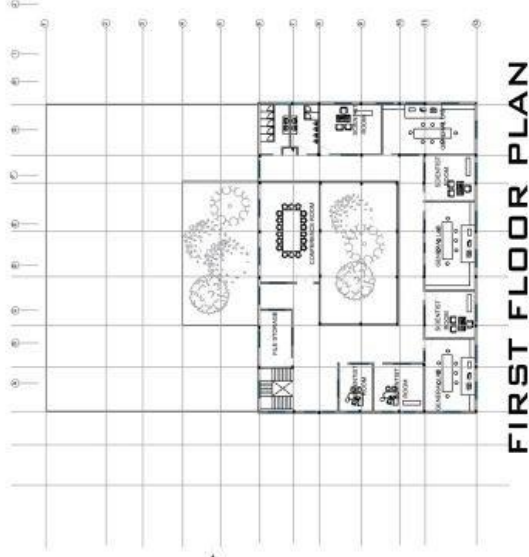


Plate 7.4: Community center

RESEARCH CENTER



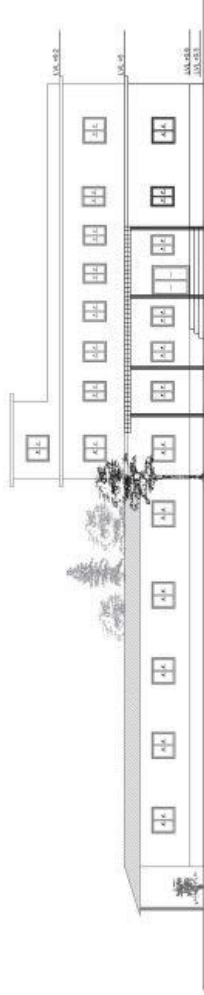
GROUND FLOOR PLAN



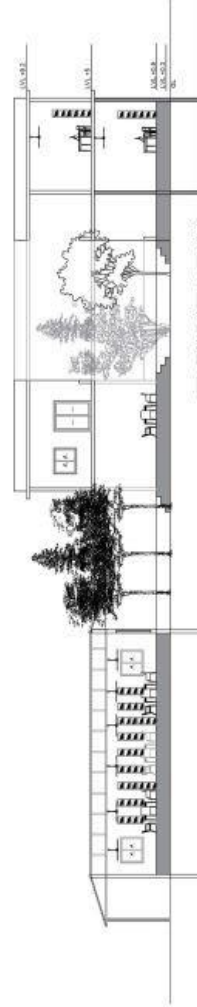
FIRST FLOOR PLAN



KEY PLAN



ELEVATION



SECTION

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Plate 7.5: Research center

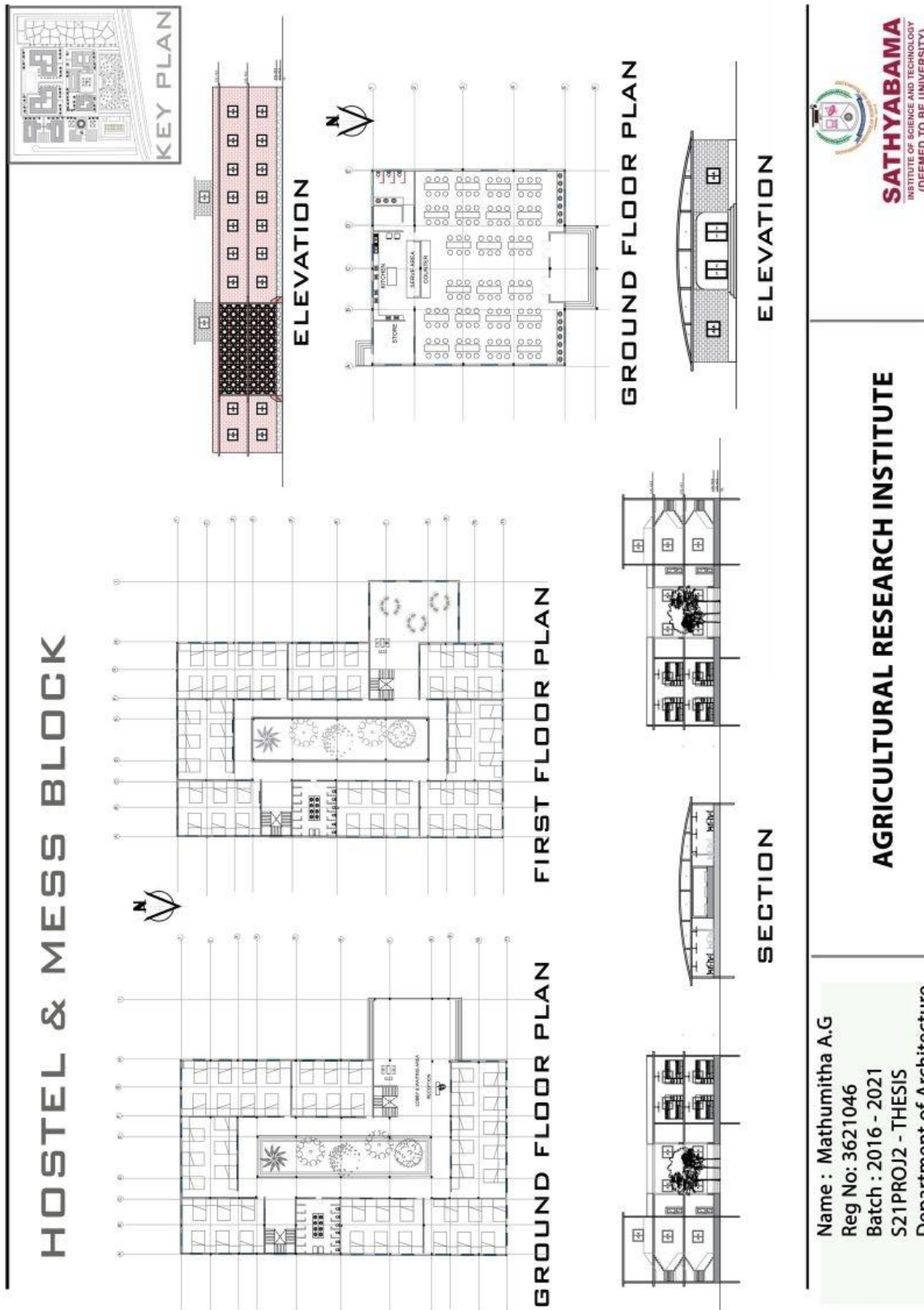


Plate 7.6: Hostel and Mess block

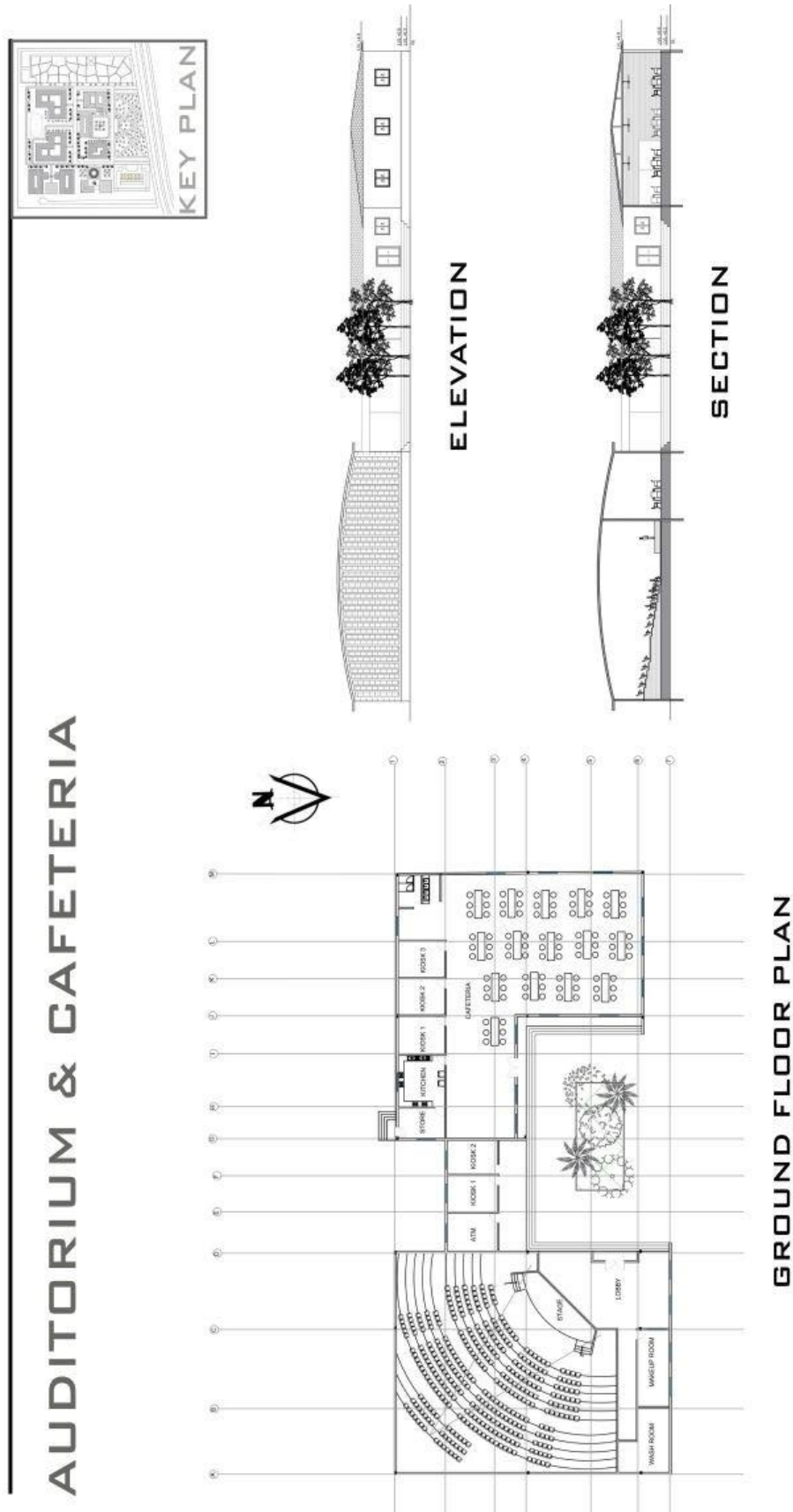


Plate 7.7: Auditorium and Cafeteria block CHAPTER - 8

VIEWS

Views for the design in shown in Plate 8.1

VIEWS



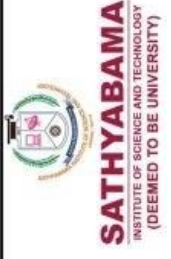
CAFETERIA



COMMUNITY CENTER

RESEARCH CENTER

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Plate 8.1: Views REFERENCE:

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<https://www.archdaily.com/577240/arizona-western-college-community-buildingand-science-agriculture-center-gould-evans/548a722ae58ece0c90000092-section>

<https://www.archdaily.com/226090/ciale-vicente-nunez-arquitectos/5017db0128ba0d49f5000ba8-ciale-vicente-nunez-arquitectos-section>

<https://en.climate-data.org/asia/india/tamil-nadu/nagercoil-23976/#:~:text=Nagercoil%20climate%20summary&text=Nagercoil's%20climate%20is%20classified%20as%20tropical.&text=This%20climate%20is%20considered%20to,is%20985%20mm%20%7C%2038.8%20inch.>