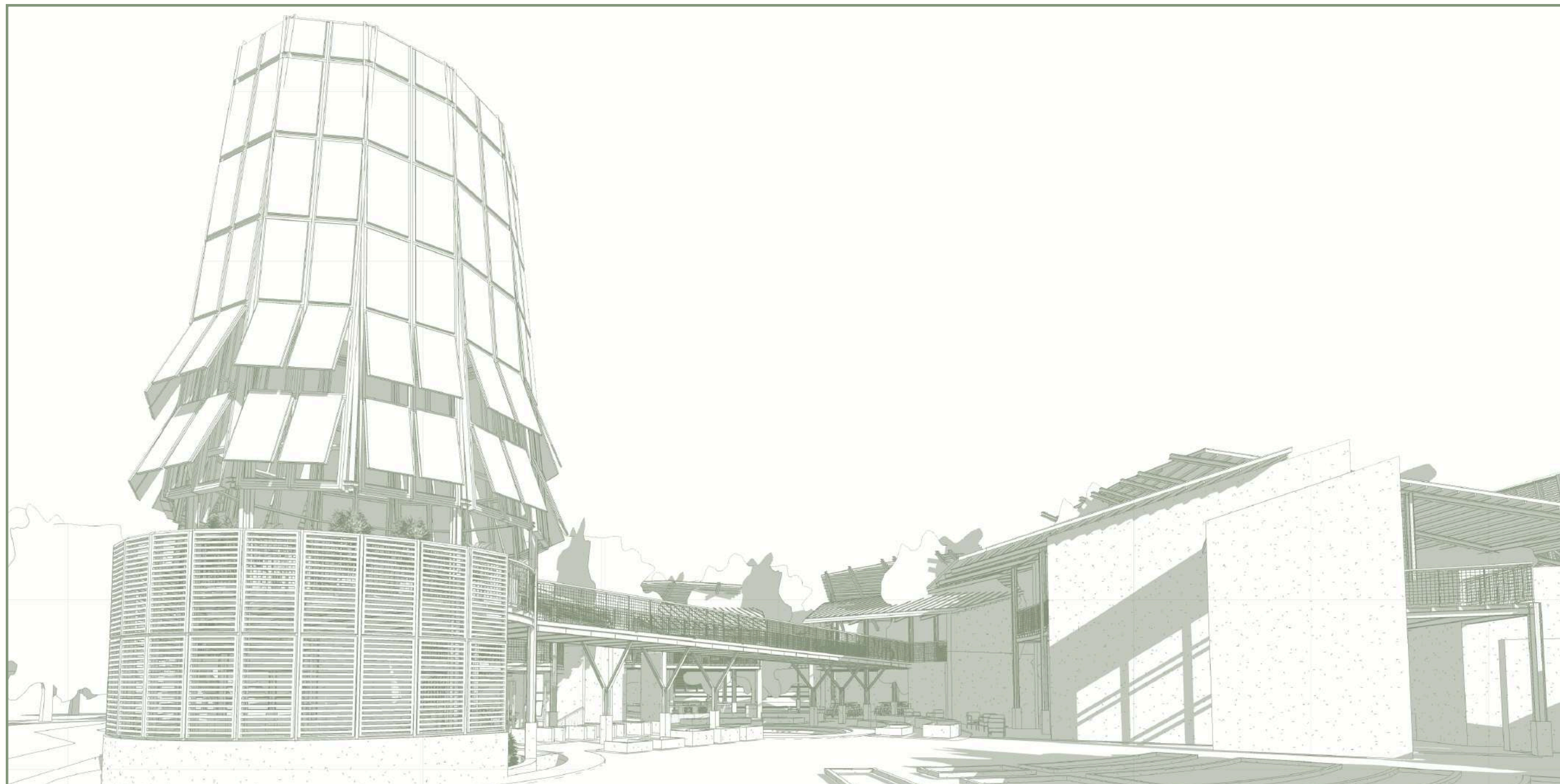




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GREEN STRATEGIES FOR BUILDING DESIGN: ASSIGNMENT 2

PASSIVE GREEN BUILDING STRATEGIES

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TABLE OF CONTENTS

1

INTRODUCTION

- SITE INTRODUCTION
- PROJECT INTRODUCTION

2

SITE PLANNING

- SITE CONSIDERATION
- SUN-PATH ANALYSIS
- WIND ANALYSIS
- LANDSCAPING
- STORMWATER MANAGEMENT

3

DAYLIGHTING

- URBAN DESIGN CONTEXT
- BUILDING & ROOM DESIGN
- SUN PATH ANALYSIS
- PASSIVE STRATEGIES
- FACADE DESIGN & VISUAL COMFORT
- INTERIOR & SHADING
- SYSTEM ENHANCING LIGHTING

4

NATURAL VENTILATION

- WIND ANALYSIS
- NATURAL CROSS VENTILATION
- OPEN PLAN
- WATER FEATURES
- DOUBLE SKIN FACADE

5

FACADE DESIGN

- FACADE DEVELOPMENT
- FACADE PLACEMENT
- DOUBLE SKIN FACADE
- ROOF DESIGN
- MATERIALITY

6

STRATEGIC LANDSCAPING

- SITE INTEGRATION
- SOFTSCAPE & HARDSCAPE FEATURES
- BIOSWALE & RAINGARDEN
- GREEN ROOFS
- RAINWATER MANAGEMENT
- GREYWATER TREATMENT

7

QUALITY & SPATIAL EXPERIENCES

8

REFERENCES

SITE INTRODUCTION



Persiaran Wawasan, Taman Wawasan, 47100 Puchong, Selangor

3°02'01.0"N 101°37'27.9"E

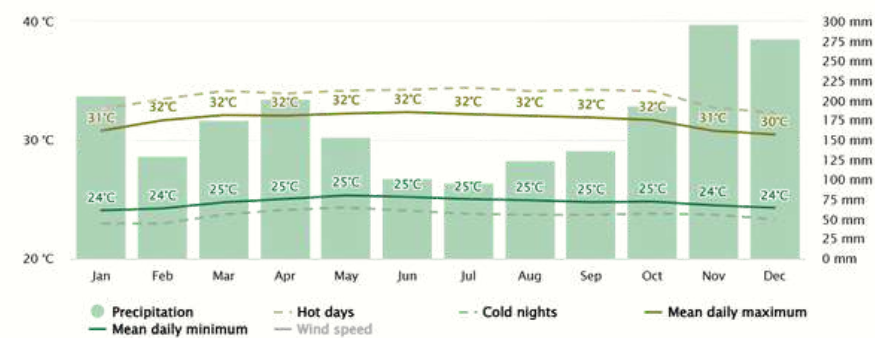
Taman Wawasan in Puchong is a freehold **mixed residential** and **commercial** township developed by **Setia Promenade Sdn Bhd** (S P Setia) located strategically between Bandar Puchong Jaya and Bandar Puteri Puchong.

It has **strong connectivity** through **major highways** like LDP, KESAS, ELITE, and the North-South Highway, and is within walking distance to the Pusat Bandar Puchong **LRT station** on the Sri Petaling Line.

The township sits at about 49 meters above sea level with **mostly flat terrain**, making it ideal for development and comfortable living.

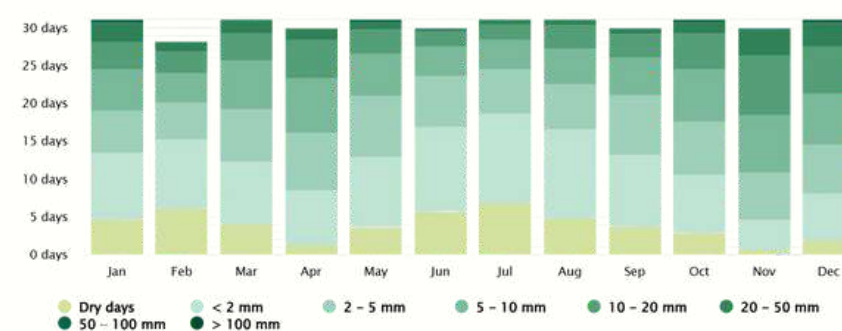
For selected study site, it is located at the **recreational centre** of Taman Wawasan which spans over **38,800 sqm**

Average Temperatures and Precipitation



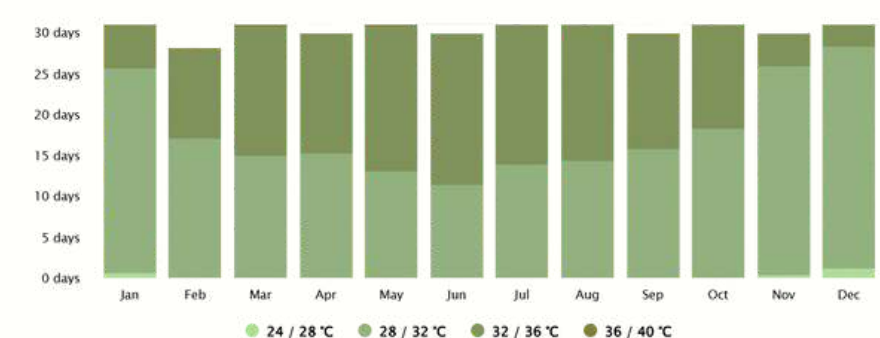
- Max temperature: Peaks in April–May, 33–34°C
- Min temperature: Dec–Jan, 23–26°C
- Rainfall: Highest July–Nov (peak in Sept ~275 mm); driest in Feb–March
- Hot days in April–May; and cold nights in Jan, Feb, Dec
- Wind speed is consistent with slight increase in June–July

Precipitation Amounts



- The early months of the year have a high number of dry days
- From May to November, there is an increase in rainy days with varying intensity
- The wet season (mid-year to late-year) experiences more days with significant rainfall (greater than 10 mm)

Maximum Temperature



- Most days fall within the 24–32°C range throughout the year
- Hotter days (above 32°C) are more frequent around April and May
- Cooler temperatures (around 20–24°C) are more frequent at the beginning and end of the year

MASTER PLAN

SITE STRENGTHS

DIVERSE RECREATIONAL FACILITIES

The park features various amenities such as jogging and cycling paths, sports courts, playgrounds, outdoor gym equipment, and a man-made lake, curating spaces that allow for interaction and community

SITE WEAKNESSES

LIMITED PARKING

The park has limited designated parking spaces, forcing visitors to park along the roadside, causing congestion and inconvenience; which could ruin the experience for visitors.

LIGHTING LIMITATIONS

Some areas of the park have limited nighttime lighting, making it less safe and less attractive at night.

SITE OPPORTUNITIES

COMMUNITY PROGRAMS

Organizing regular events, workshops, and fitness programs can further engage the community and encourage a healthy lifestyle.

SITE THREADS

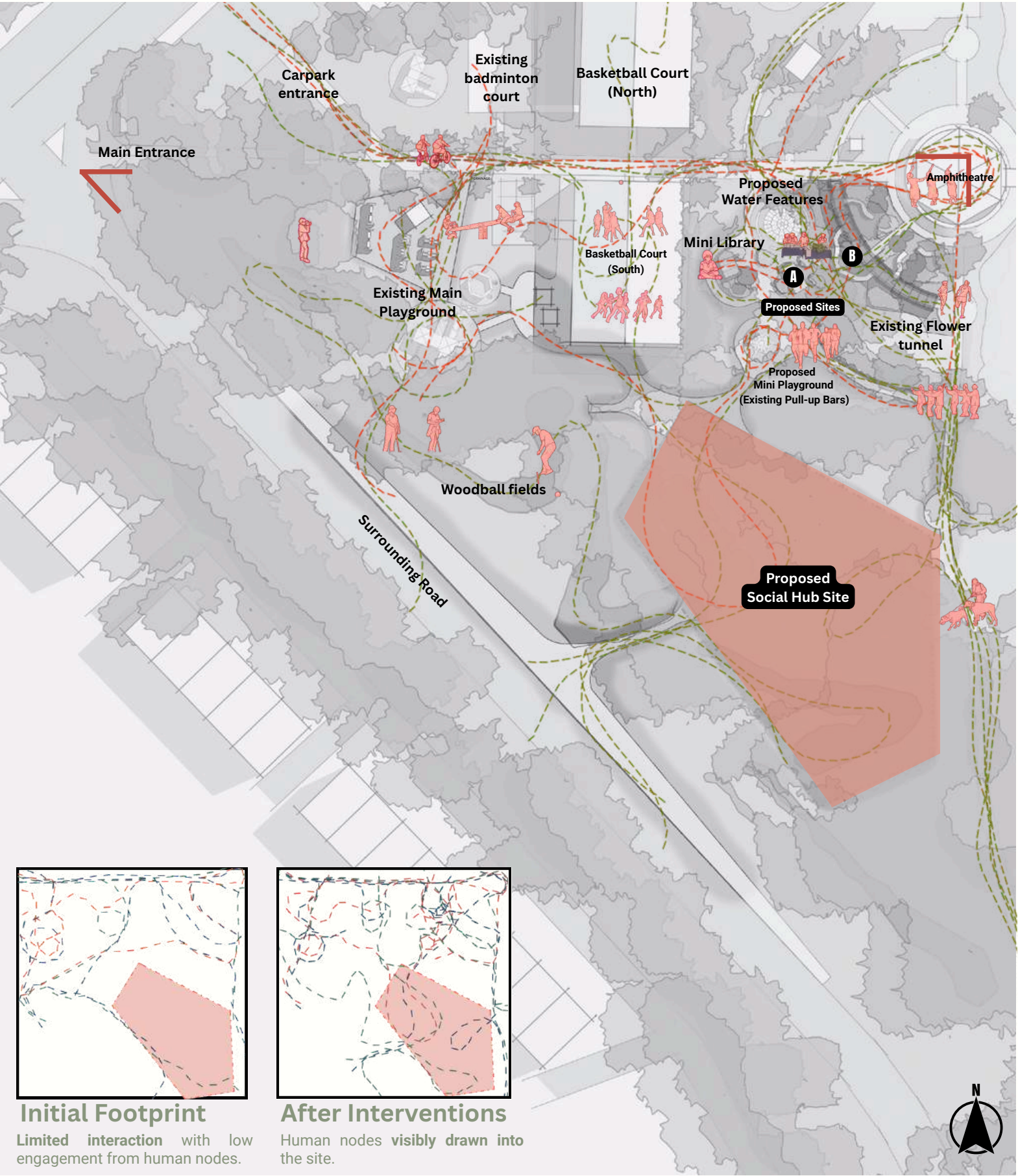
OVERCROWDING

The park is very popular, especially on weekends and holidays, which can lead to overcrowding and affect the quality of the visitor experience.

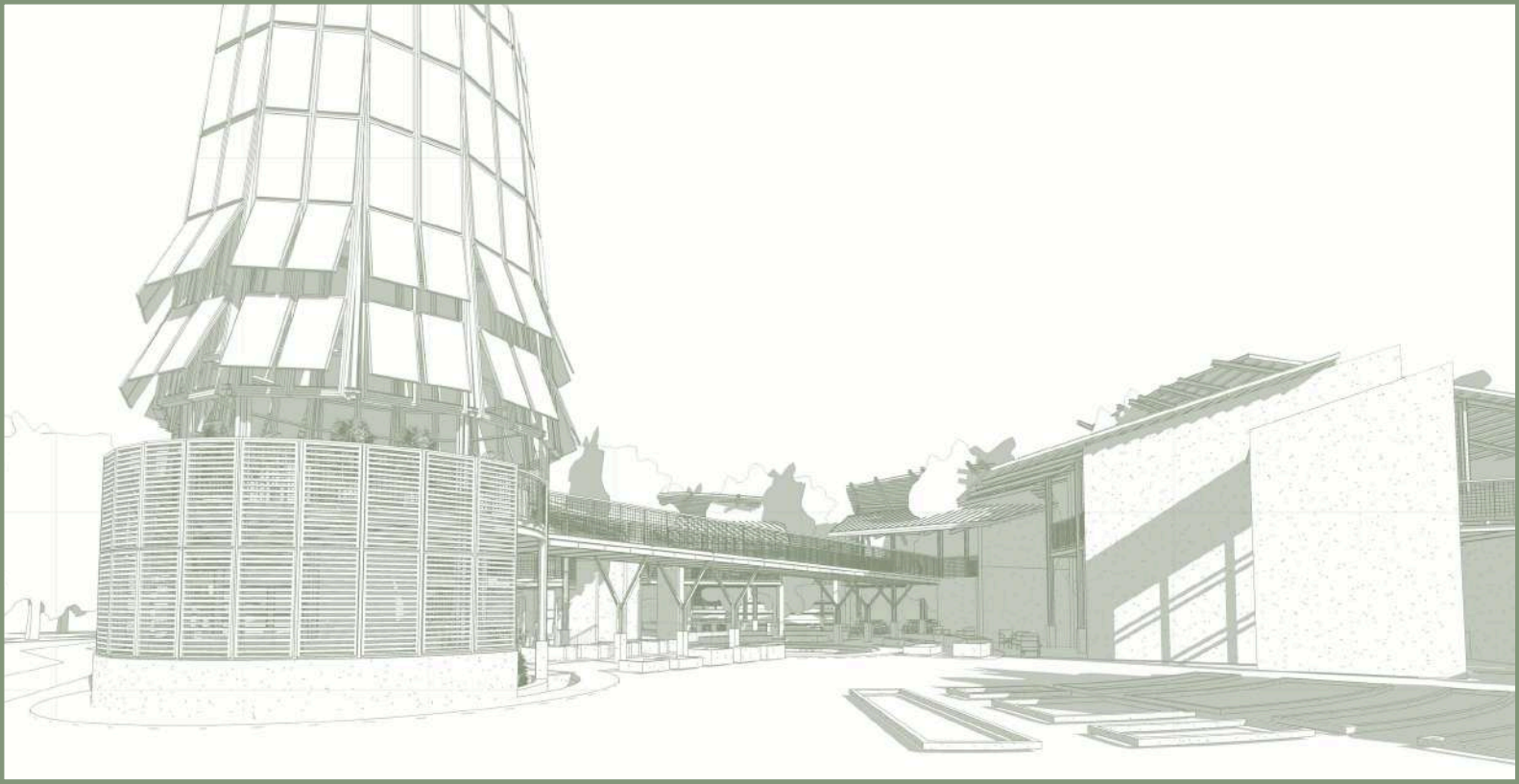
ENVIRONMENTAL DEGRADATION

Without proper maintenance and visitor cooperation, the park's natural beauty and cleanliness may deteriorate over time.

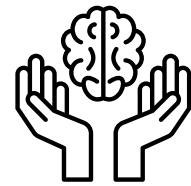
The footprints of the community form the **identity** and **culture** of Taman Wawasan Recreational Park. Through **daily routines**, people **continuously shape** the park's **spatial character** over time. By studying these human nodes and the patterns they create, we uncover how the space is truly experienced.



PROJECT INTRODUCTION



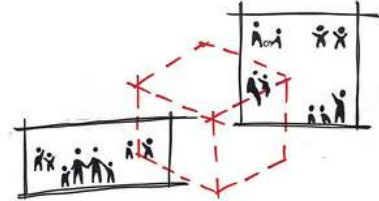
NARRATIVE



YOUR MEMORY ARE MEANT TO BE REMEMBERED

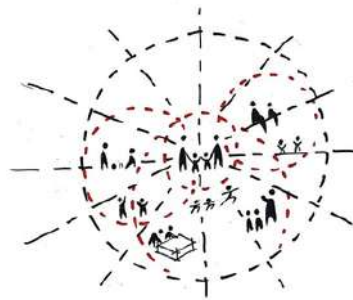
Set within the lush setting of Taman Wawasan Recreational Park, “The Memory Mechanism” is a family-focused creative and recreational hub inspired by the inner workings of a watch. Each cluster functions like a moving part that is designed to foster connection, interaction, and rhythm across generations. Through operable features and natural materials that age over time, the structure captures the passage of time and transforms everyday moments into lasting memories.

DESIGN CONCEPT



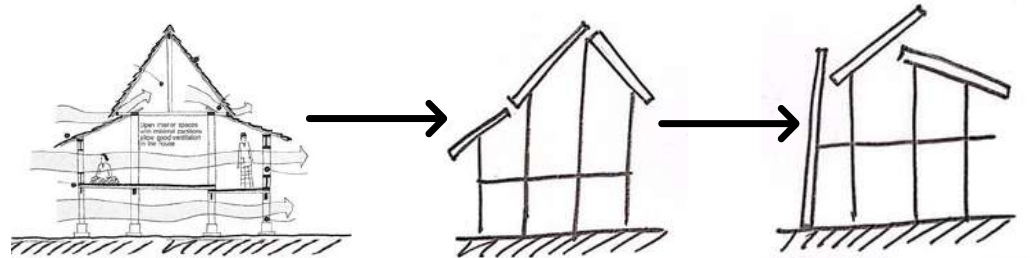
The project is imagined as a living timepiece — a community hub where each space functions like a gear in a watch, turning together to mark not hours, but shared memories. Through interactive, operable architecture and rhythmic spatial flow, the design invites families to create lasting moments across time.

DESIGN INTENTION



To create a responsive, memory-driven space where each architectural element functions like a watch component — encouraging interaction, connection, and the preservation of shared experiences over time.

FORM DEVELOPMENT



SITE ANALYSIS



SITE RESPONSE



ZONING

Active programmes (creative, community, and wellness) on the North and passive (leisure and gathering) on the South



CIRCULATION

Multiple access points from the park for the pedestrian and main entrances from the highway for vehicular access



VEGETATION

The structures and programmes are built around the existing vegetation



SUNPATH

Overhangs and second-skin facade are used on both the east and west with additional shading devices on the west sides



VENTILATION

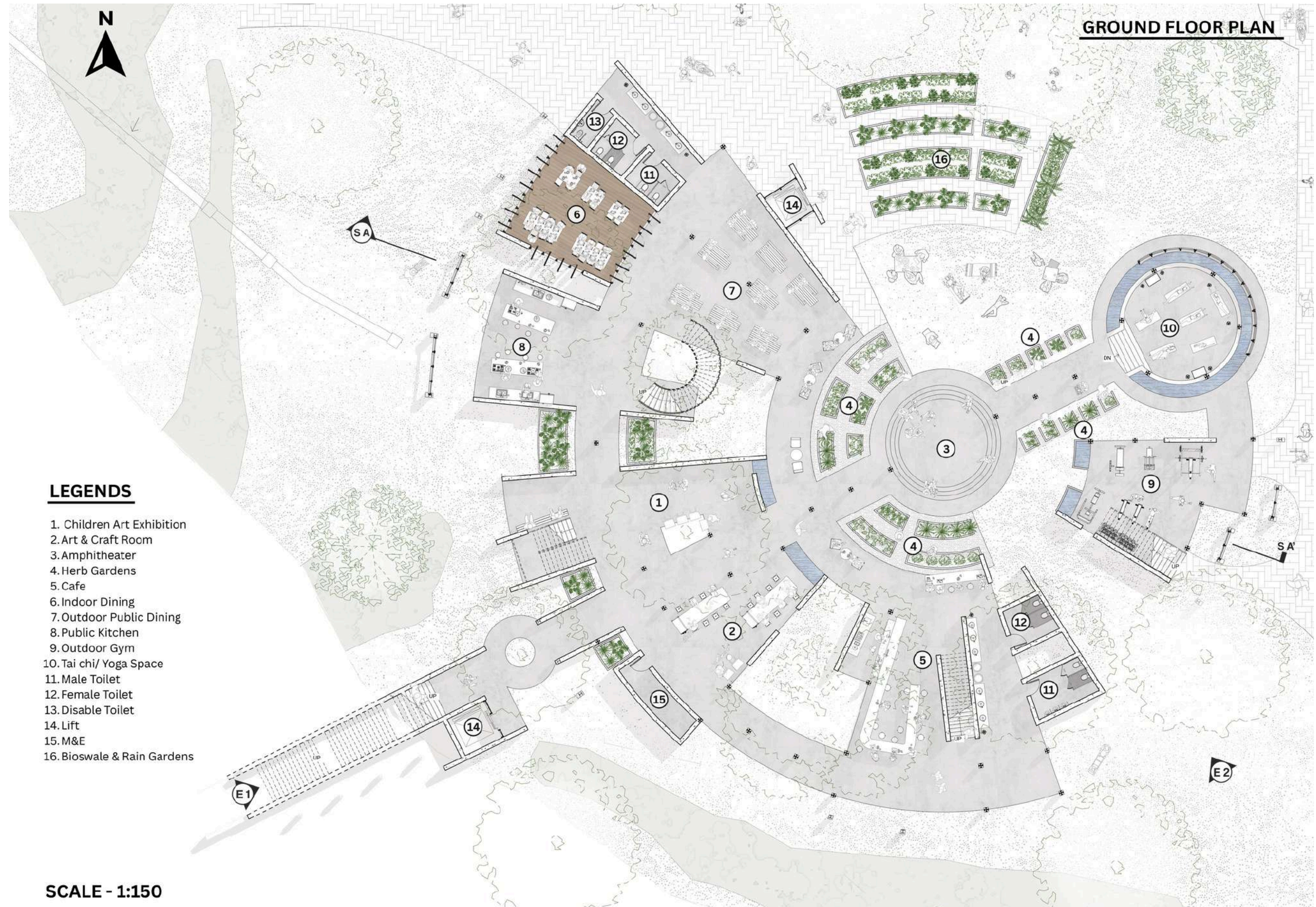
The structure has a cluster/porous layout and water features mainly on the east for maximizing cross-ventilation and cooling



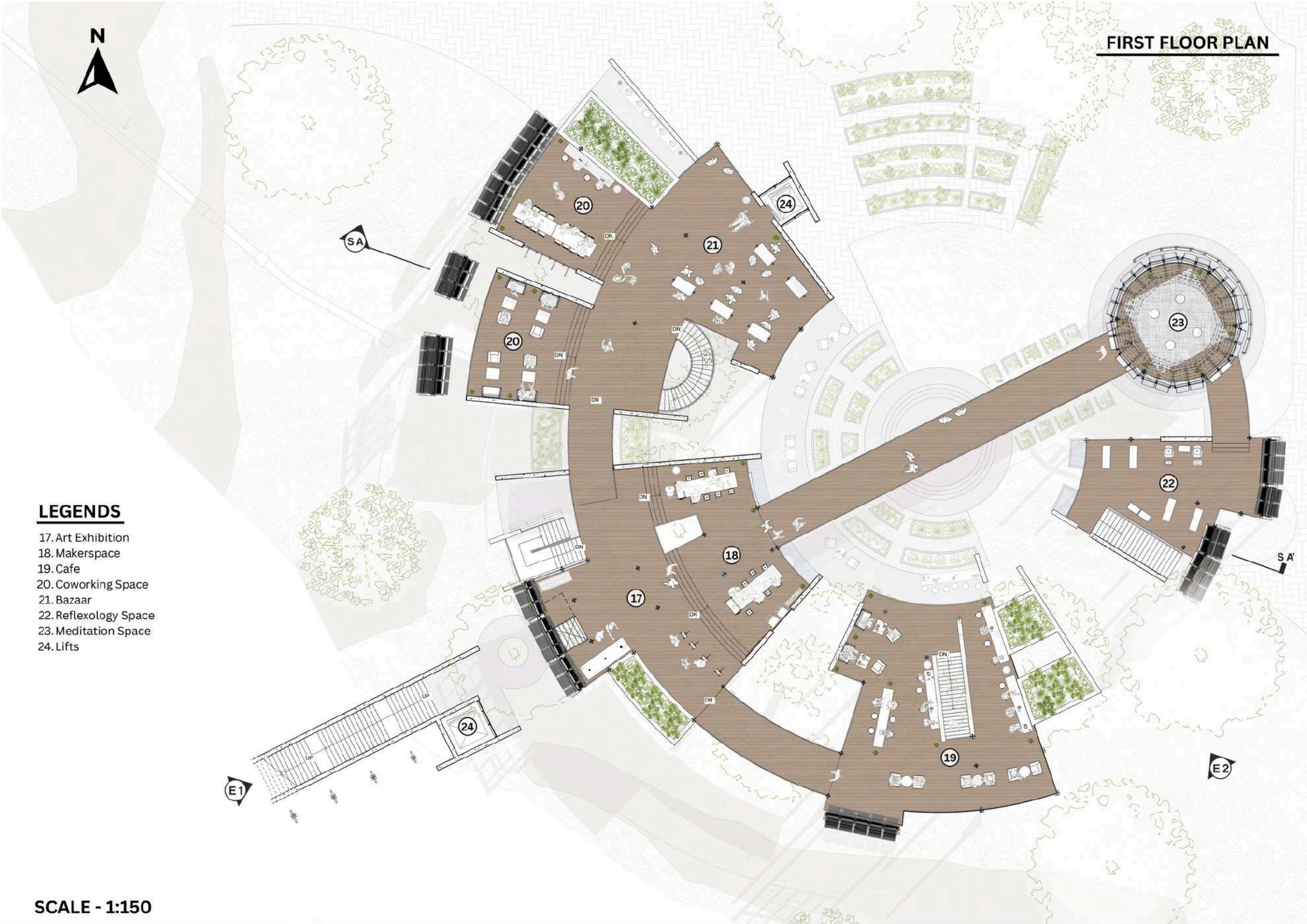
VIEWS

The second-skin facade also act as a buffer wall

ORTHOGRAPHS



ORTHOGRAPHS

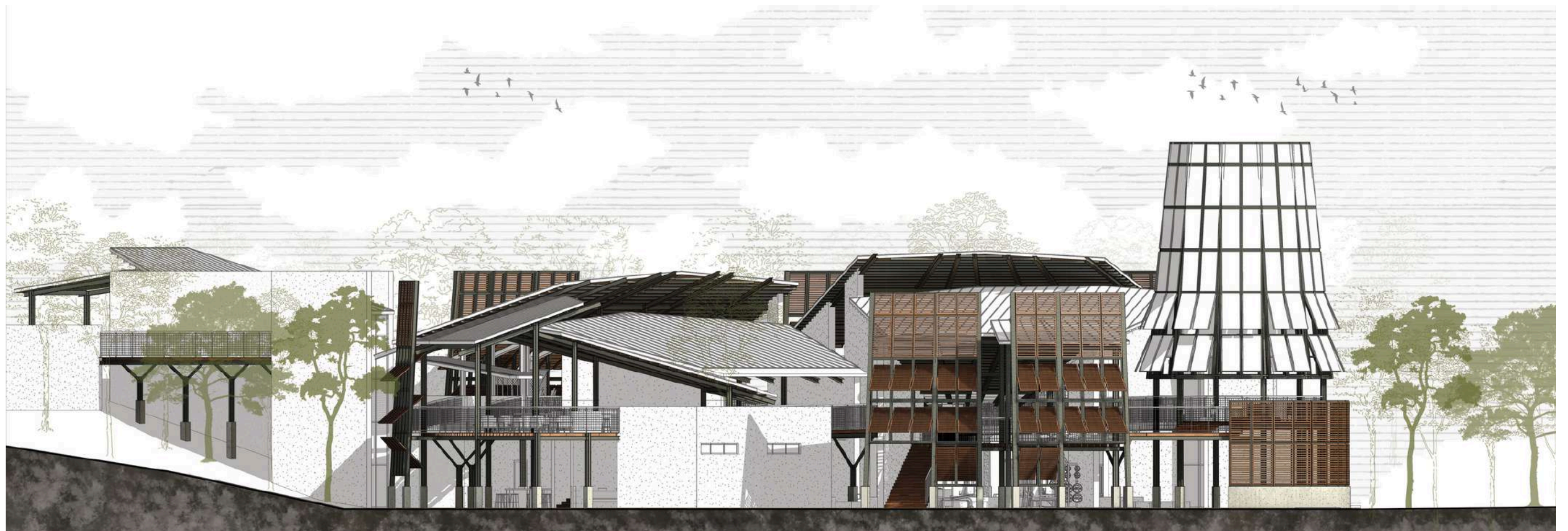


ORTHOGRAPHICS

ELEVATION 1



ELEVATION 2



ORTHOGRAPHICS

SECTION A-A'

① 1200mm(L) x 1200mm(W) x 500mm THICK REINFORCED CONCRETE PILE COLUMN FOOTING

② UC254x254 STEEL COLUMN WITH HORIZONTAL BEAM SUPPORT TO DOUBLE SKIN FACADE

③ 7000mm(H) x 300mm(W) x 300mm THICK CRUCIFORM STEEL COLUMN FINISH WITH BLACK OXIDE COATING

④ 1000mm(H) x 400mm(W) x 400mm THICK CONCRETE PEDESTAL WITH POLISHED FINISH

⑤ 500mm THICK REINFORCED CONCRETE RAFT FOUNDATION

⑥ 150mm(h) x 2000mm(w) x 10mm THICK STEEL RISER WITH 2000mm(l) x 3000mm(w) x 50mm THICK STEEL TREAD

⑦ 1000mm(h) x 50mm THICK STEEL STRINGER SUPPORTING STAIR TREAD AND RISER

⑧ 3000mm(h) x 300mm THICK STEEL 30-DEGREE Y COLUMN FINISH WITH BLACK OXIDE COATING

⑨ 100mm(h) x 100mm(w) x 5mm THICK Z-SHAPED STEEL PURLIN WITH 500MM C/C

⑩ 900mm(h) STAINLESS STEEL BALUSTERS AND HANDRAILS, WITH WIRE MESH INFILL AND CONTINUOUS HANDRAIL

⑪ K-STYLE GUTTER SYSTEM ATTACHED TO FASCIA BOARD USING STEEL BRACKET

⑫ 2000mm(h) x 1000mm(w) HORIZONTAL TIMBER LOUVERS SLANTED AT 30 DEGREE



ORTHOGRAPHICS

SECTIONAL PERSPECTIVE



ORTHOGRAPHS

EXPLODED AXONO

Meditation & Movement
Inspired by the vernacular architecture of ASEAN, especially in the east, this cone-shaped space supports yoga, tai chi, and meditation. The radial steel frame and timber louvers evoke stillness and balance while referencing traditional architecture.

Wellness Centre
This block features an outdoor gym below and a reflexology room above. Steel columns and timber decks create an open, breathable environment, encouraging wellness through connection with nature.

Cafe Block

A layered café and dining space, this block invites casual gathering across levels. Surrounded by timber seating platforms and held up by a steel skeleton, it blends industrial clarity with warmth and flexibility.

Art & Craft Hub

With children's art spaces on the ground and a makerspace + art exhibition above, this block celebrates creativity. The playful, split-level steel and timber structure echoes the dynamic, assembled nature of vintage toys.

Community Cluster

Serving as the project's social heart, this block houses a public kitchen and dining area below and a bazaar with coworking spaces above. The layered steel framing and shaded timber surfaces provide comfort, openness, and a sense of shared belonging.



SITE PLANNING

SITE CONSIDERATION

Climate:

- The tropical climate provides consistent sunlight and natural airflow

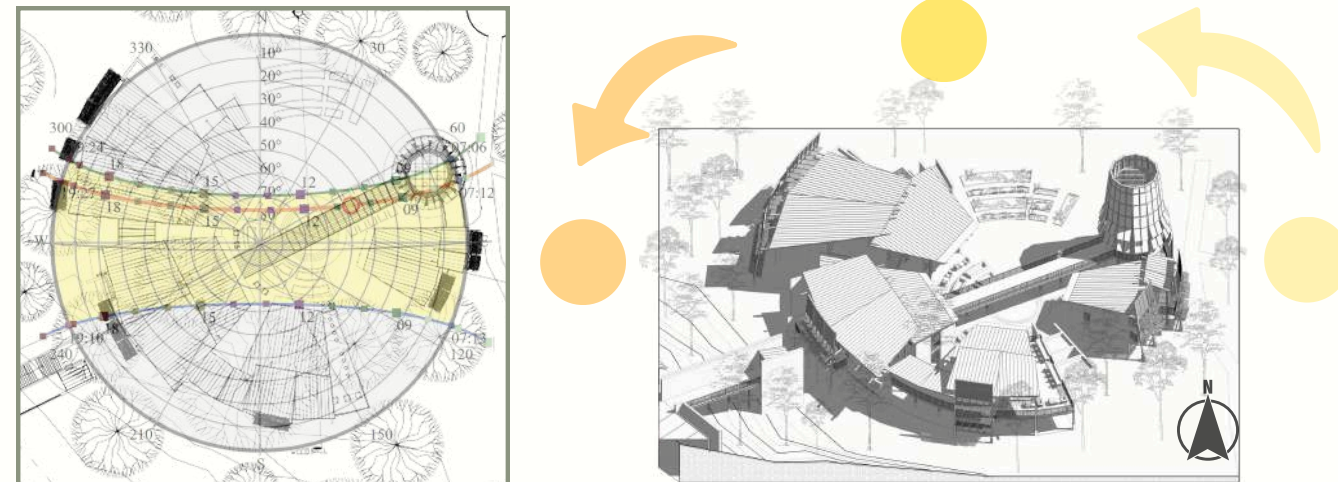
Accessibility:

- easily reachable by footpaths within the park

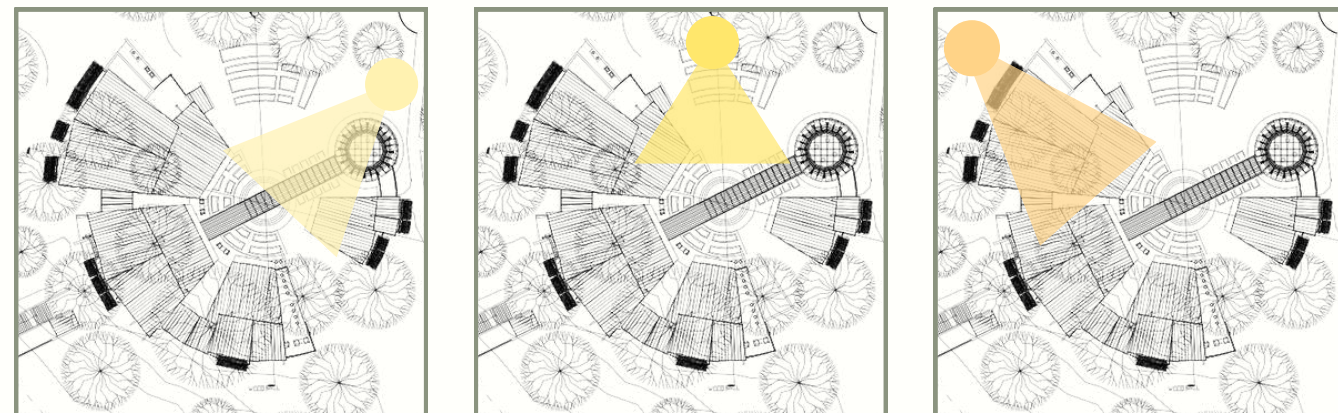
Minimal Land Disturbance:

- Located on a flat, sparsely vegetated area, the site requires minimal clearing or grading

SUN-PATH



- Majority of the facade oriented North-South to optimized daylight, by minimizing exposure to harsh east and west sun and thus also minimized heat gain
- The second skin facade, which is made out of louvers, is a shading device placed mostly on East and West sides filtering the harsh sunlight and reduce glare



Morning

- In the morning, the wellness cluster on the northeast receive the most sunlight filtered by the louvers

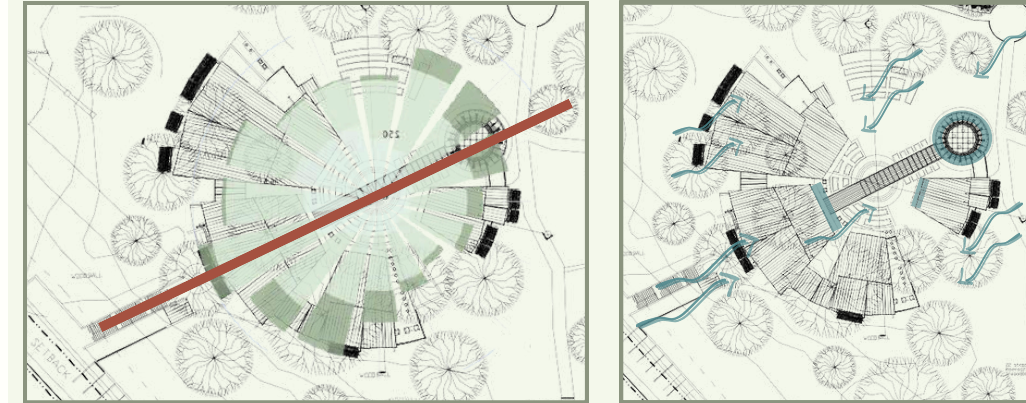
Afternoon

- During noon, majority of the structure is well covered by the deep overhang roof, reducing heat gain

Evening

- At the evening, the lower sun are blocked by the steep hill and vegetation around the site

WIND ANALYSIS



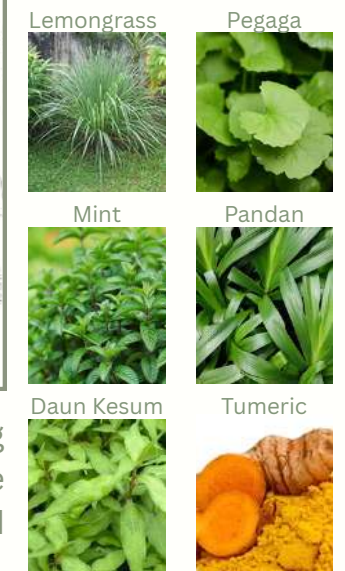
The structure is align with the wind direction and has open plan with porous design to maximize cross-ventilation.

LANDSCAPING

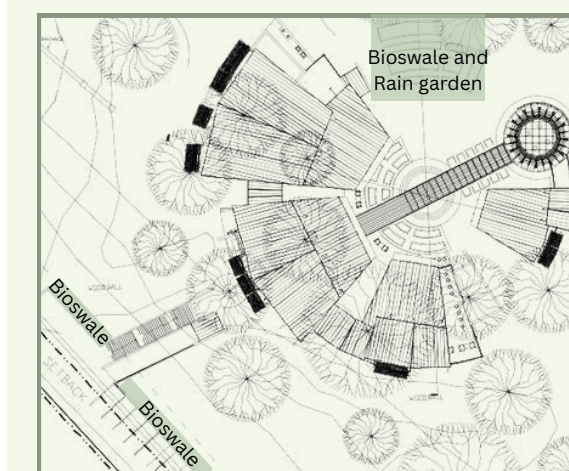


Incorporating permeable pathway, preserving existing vegetation where possible, and adding natives vegetation in the Herb-Garden help reduces the environmental impact and improves microclimate comfort.

NATIVES HERBS:



STORMWATER MANAGEMENT



- The additional rain garden and bioswale around the building perimeter, especially some part that is prone to flooding, and parking slows down and filter runoff using native and adaptive plants
- The deep overhang roofs helps drain heavy tropical rains and also provide shade to internal spaces
- The open courtyard and gardens around it help to absorb rainwater, preventing flooding

DAYLIGHTING

URBAN DESIGN CONTEXT



Low Building Density

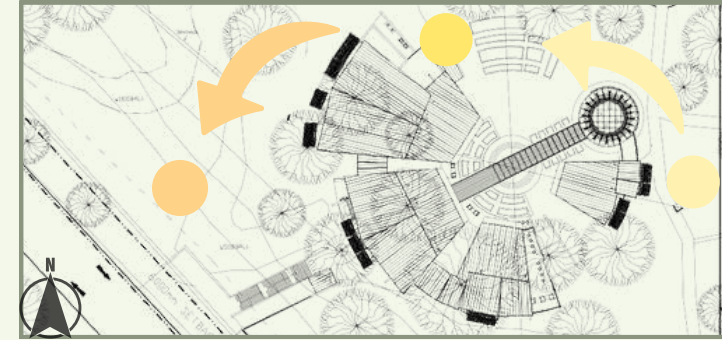
- Located on the south side of Taman Wawasan Recreational Park in Puchong, Malaysia, with relatively low surrounding building height
- Minimum shadow cast from the neighboring building. Majority of the shadow cast from the existing vegetation around the park



Landscape

- Surrounding landscape is open with medium to high-profile trees, allowing the sunlight to be filtered through the trees and into the building

BUILDING & ROOM DESIGN

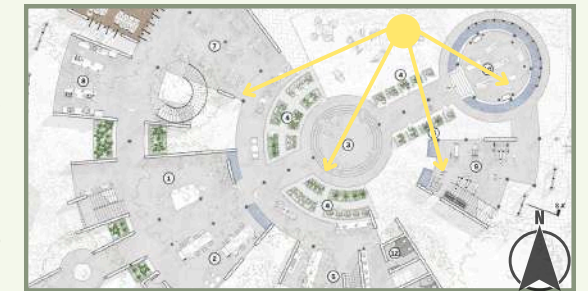


Orientation

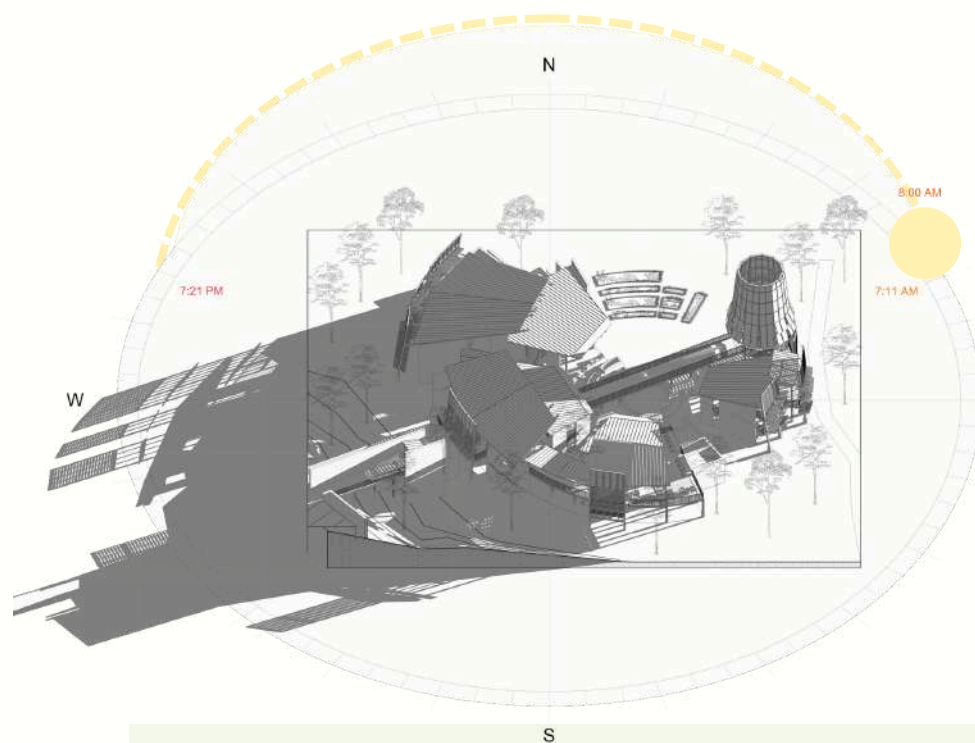
- Majority of the facade oriented North-South to optimized daylight, by minimizing exposure to harsh east and west sun and thus also minimized heat gain

Layout

- Open plan with high ceiling allowing sunlight to penetrate deep into the building
- Open interior zone promotes light diffusion and reduce need for artificial lighting during day

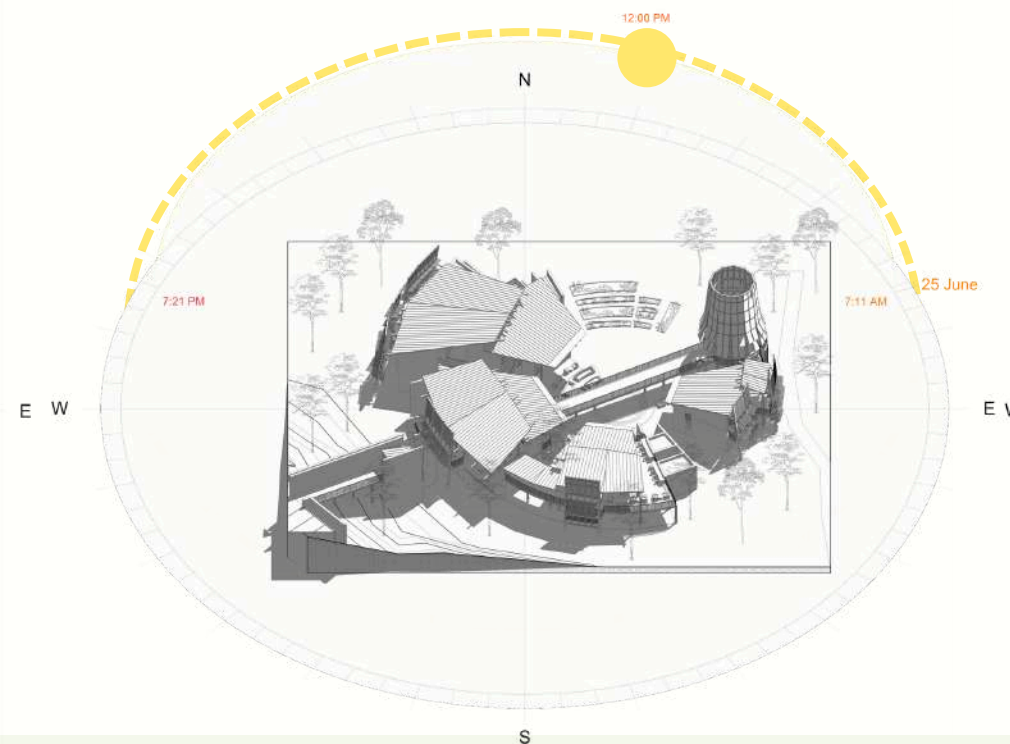


SUNPATH ANALYSIS



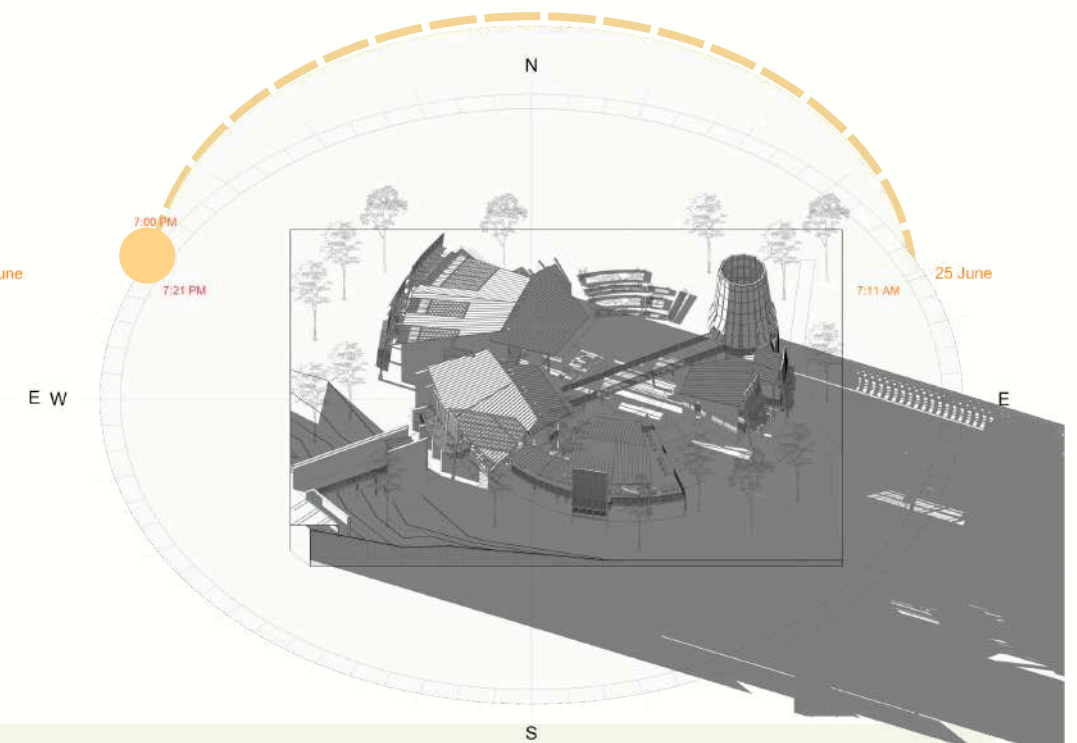
MORNING - 8.00 AM

During Sunrise, majority of the structures in the southwest are shaded leaving the rest receive the morning sun filtered through the louvers on the second skin facade



AFTERNOON - 12.00 PM

At noon, the structures are shaded by deep overhang roofs with skylight in-between two overlapping roofs. This helps the sunlight to penetrate deep into the structure while reducing heat gain.

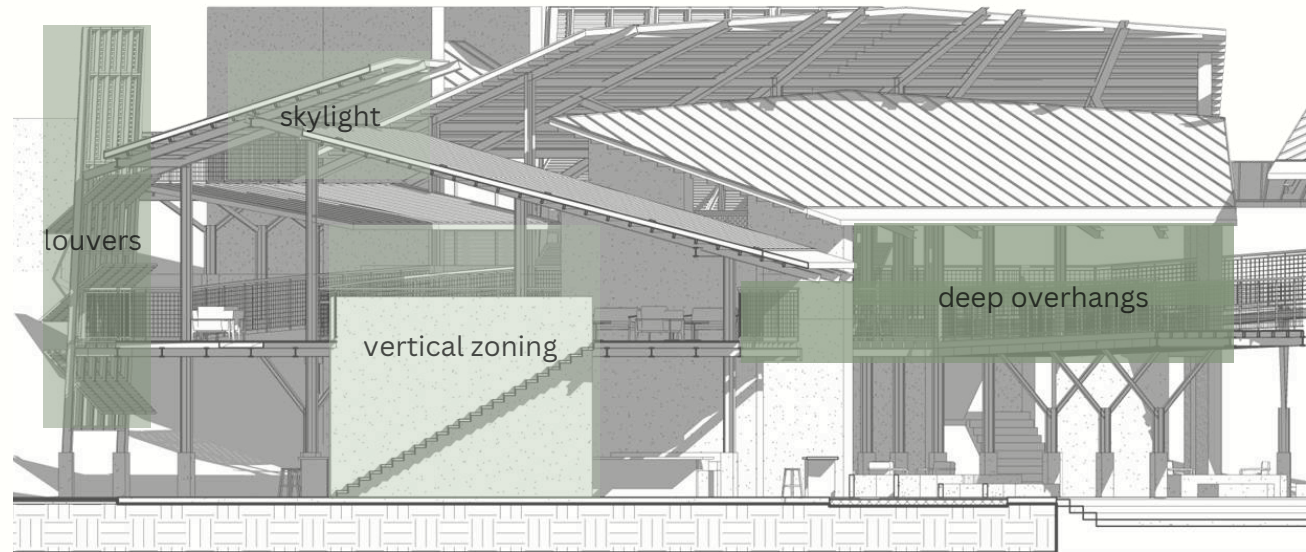


EVENING - 7.00 PM

In the evening, majority of the structure are shaded except the northwest where the harsh evening sunlight are diffuse and filtered through the louvers on the second skin facade

DAYLIGHTING

PASSIVE STRATEGIES



- Vertical zoning of daylight by using internal voids in my design to promote daylight penetration.
- Shading devices, such as louvers and overhangs, will be integrated into my facade strategy to help reduce glare, solar heat gain, and dependency on artificial lighting.

INTERIOR AND SHADING

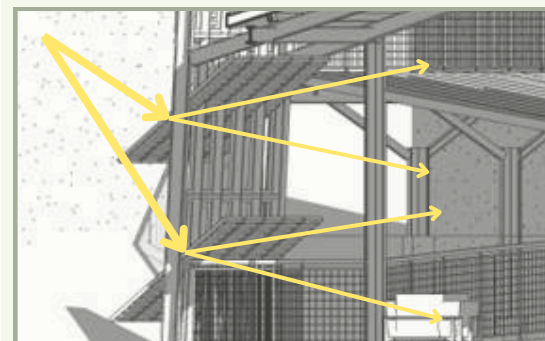


- The second skin louver facade helps to diffuse and filter out the harsh sunlight, providing shade while still letting some light pass through. It also create a unique pattern of shadows
- The greenery along the perimeter provides a soft, responsive shade that adapts seasonally

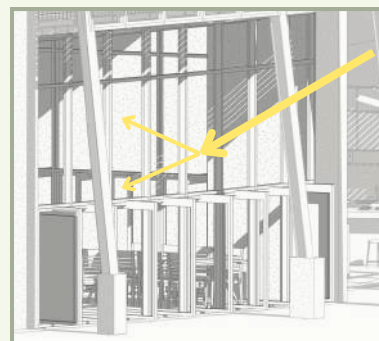


- Open spaces, light colored, and reflective/ glossy material in the interior help reflect lights further into the building

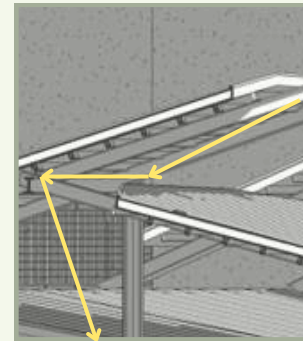
FACADE DESIGN AND VISUAL COMFORT



The Second Skin Facade are made of operable timber louvers that can be open and closed by the users in the first few levels. They were placed mostly on the east-west side in order to diffuse and filter out the harsh morning and evening sunlight

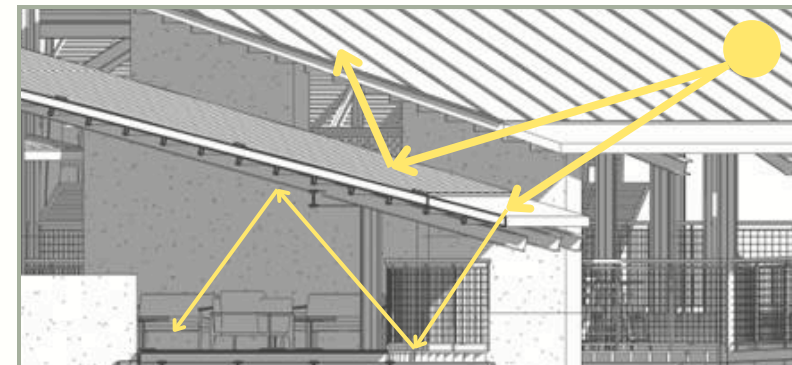


The indoor dining area have pivot doors and windows that uses clear glazing allowing daylight to penetrate while minimizing heat gain



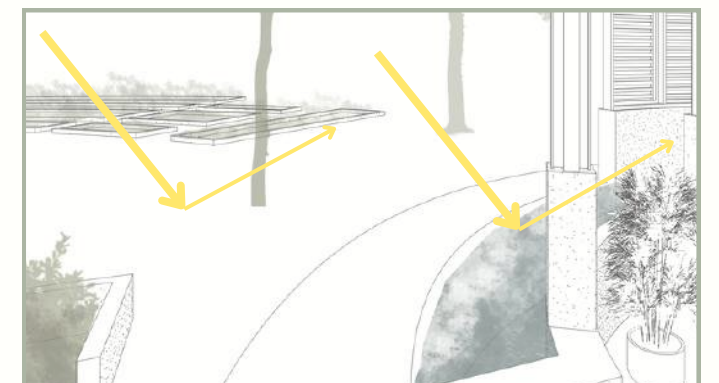
In-between the two overlapping roofs, there's an opening/ skylight bringing additional lights into the building

SYSTEM ENHANCING NATURAL LIGHT



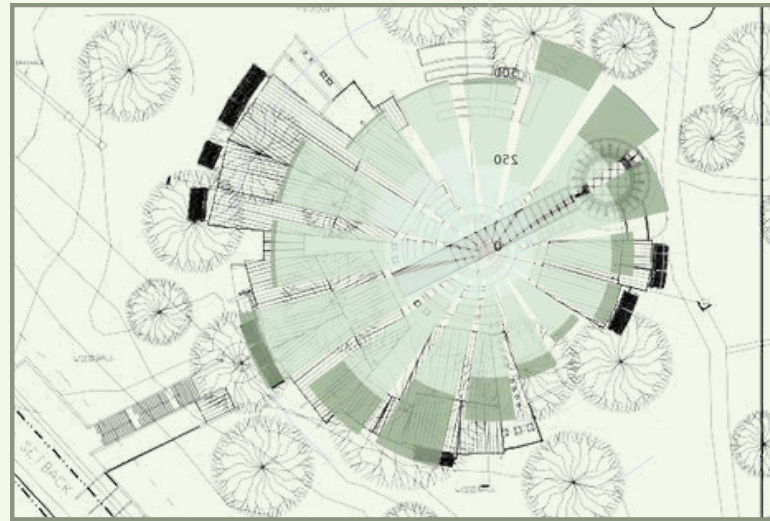
The deep overhang roof features a polycarbonate part on the end it, allowing additional light to come in the building while still providing shade from the rain

The vegetation and water features on the exterior create reflective surfaces that gently bounce daylight into shaded areas.

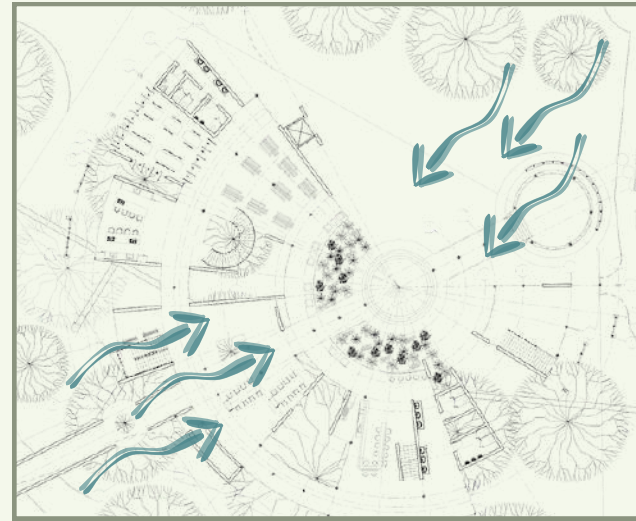


NATURAL VENTILATION

WIND ANALYSIS

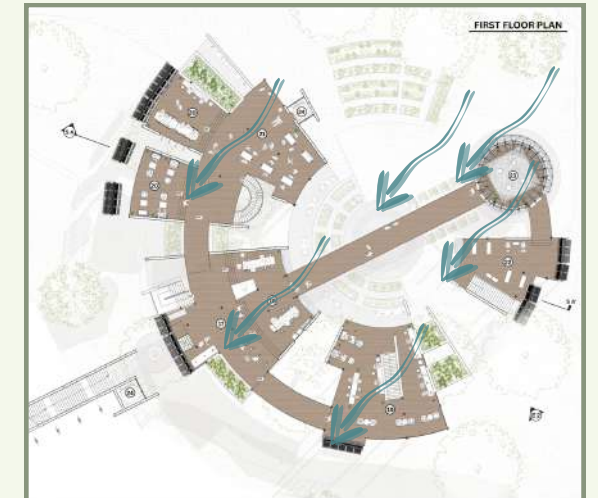
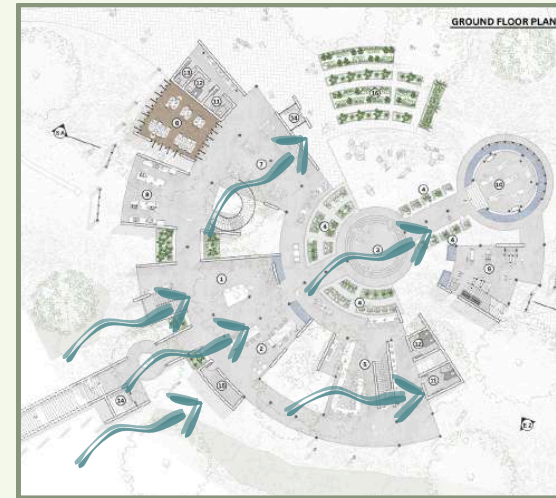


- Majority of the wind come from the Northeast and Southwest with the speed ranging from 2 - 20 km/h
- Moderate winds of 5 - 10 km/h occur regularly



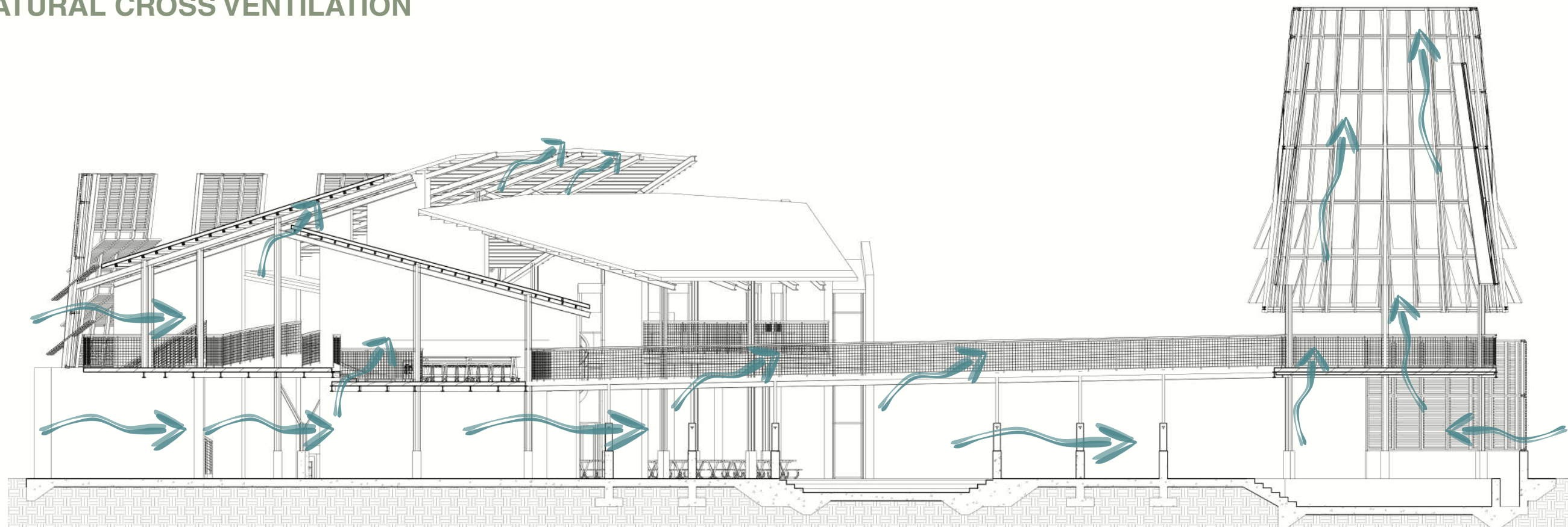
- The building is oriented to align with the axis of the wind direction and thus maximizing air flow and ventilation

OPEN-PLAN



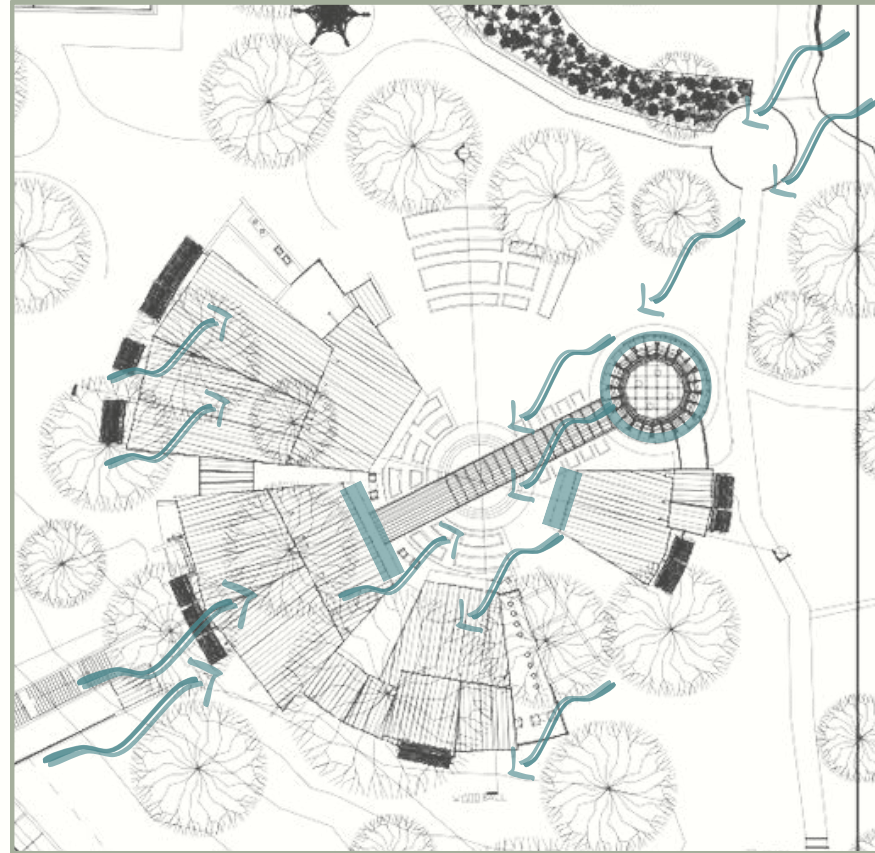
- The structure has a cluster typology allow the air flow through the building and accentuate the wind movement
- It also has an open and porous layout which helps directing the wind into the building and maximizing cross ventilation

NATURAL CROSS VENTILATION

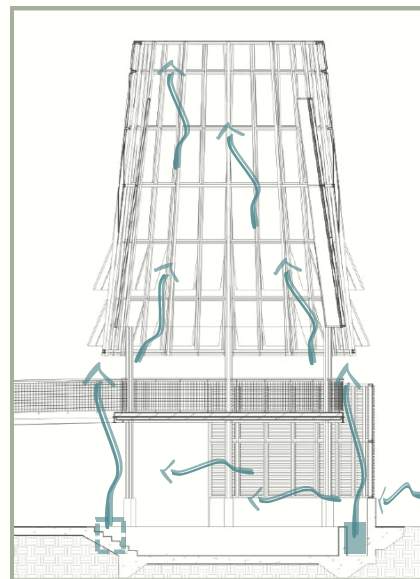
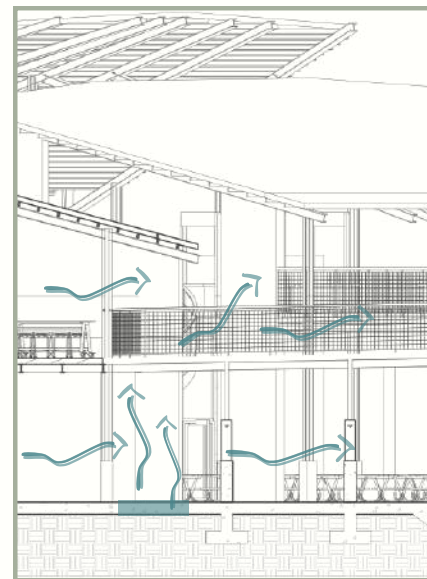


NATURAL VENTILATION

WATER FEATURES

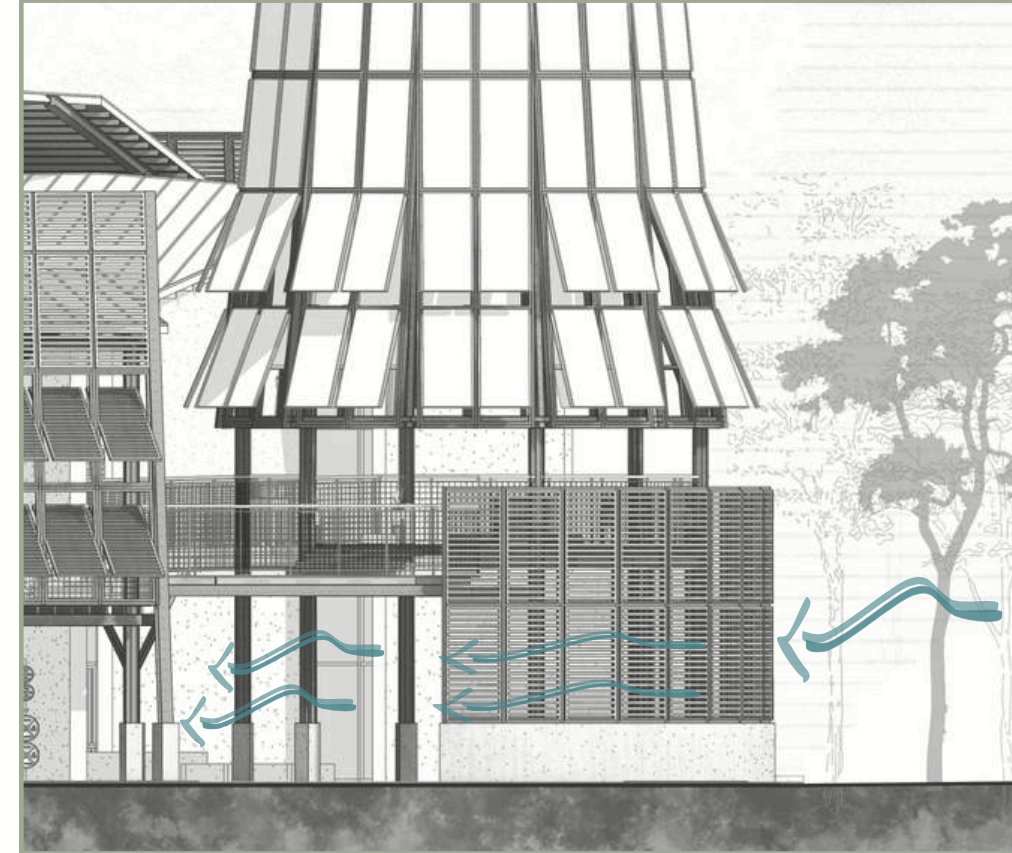


- The lake on the northeast from the site help cool down the structure by evaporative cooling effect, which cools down the warm air and drawn cooler air to the structure
- The structure has multiple strategically placed water feature. They were placed along the natural wind paths which was from northeast and southwest. This helps to channel prevailing winds into and through the structure
- The mediation structure also act as a thermal chimney promoting stack effect
- The water feature absorb heat during the day and release it at night, which stabilize microclimates around the building and prevents overheating
- it also create a buffer zone where temperature and humidity are moderated before the air enters interior spaces.

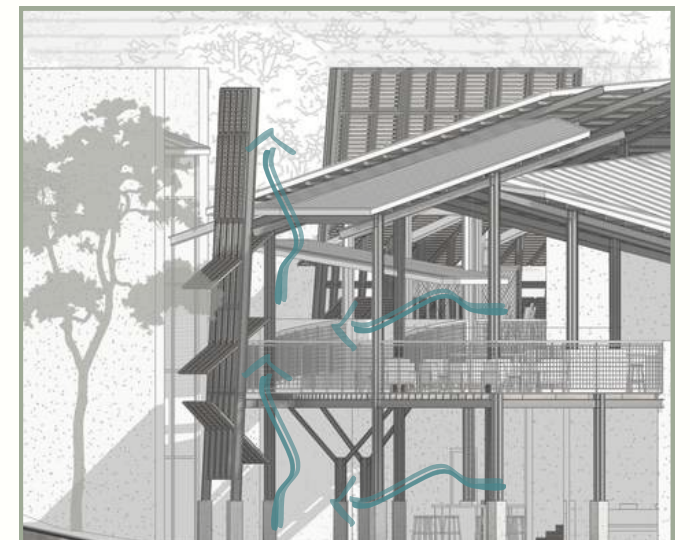
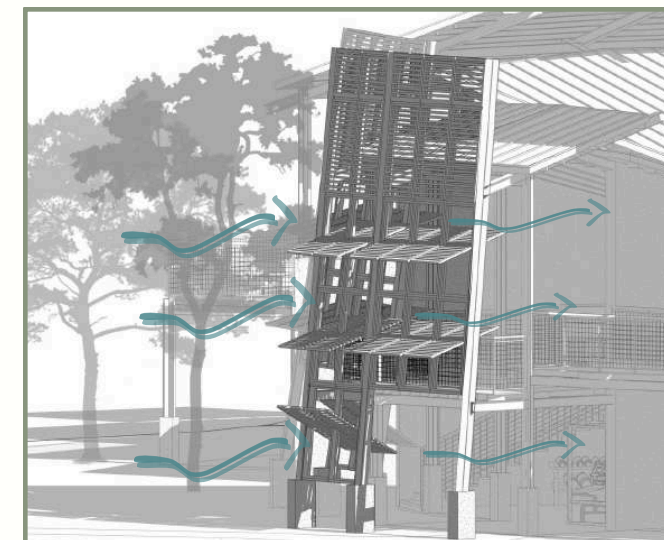


The temperature difference created by cooler air near water bodies and warmer air within the building can generate stack effect, encouraging air movement naturally from cool zones to warmer ones.

DOUBLE-SKIN FACADE



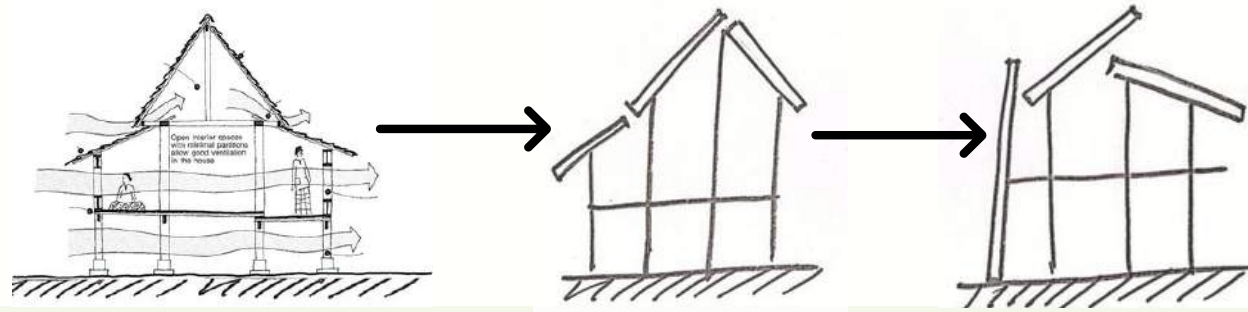
- The double skin facade features screen of louvers which helps increase the wind speed and spreading the wind deeper into the structure
- It also help block direct sunlight while allowing airflow, preventing internal overheating and reduce reliance on mechanical cooling



- The cavity between the inner and outer skins acts as a thermal chimney. As hot air rises within this gap, cooler air is pulled into the building from lower openings, enhancing stack effect ventilation.
- The louvers can be opened for ventilation during cooler periods and closed during hot or rainy weather, making the system climate-responsive and adaptable throughout the day or year.

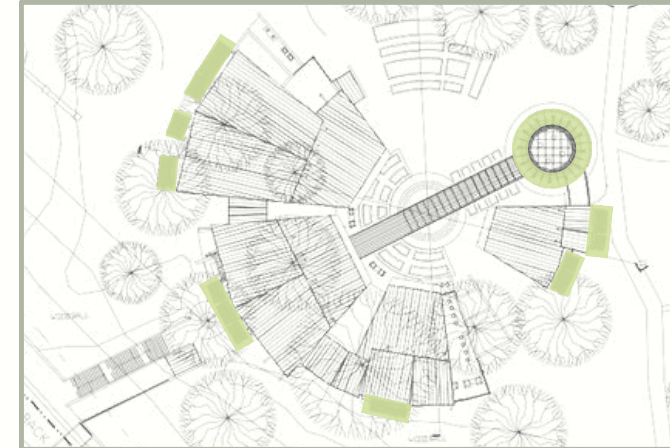
FACADE DESIGN

FACADE DEVELOPMENT



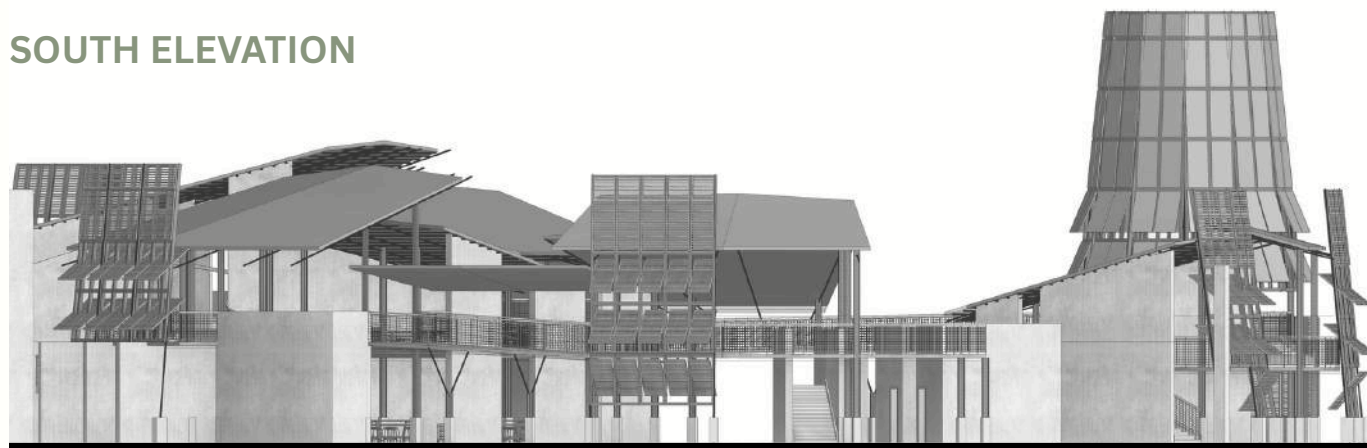
The facade is inspired by traditional Malaysian vernacular architecture, which responds to its tropical climates. The resulting form is the two overlapping pitched roofs with a skylight in between and a double-skin facade system, which echoes the sloping rooflines of traditional Malay houses.

FACADE PLACEMENT



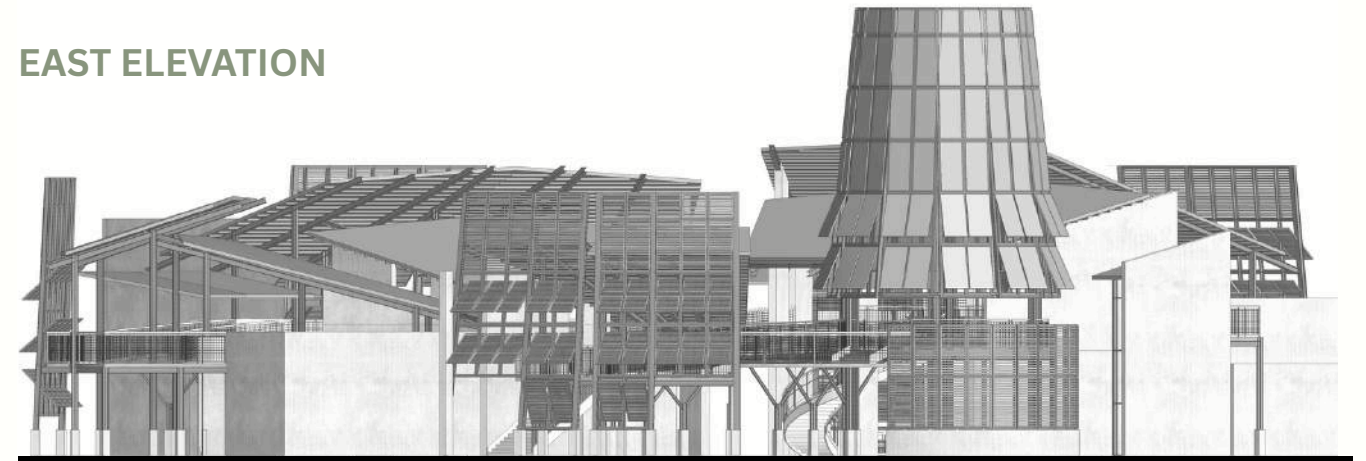
The second-skin facade, made from operable louvers, is primarily placed on the east and west orientations of the building, which supports solar control by filtering harsh low-angle sunlight, reducing internal heat buildup while still allowing natural daylight and airflow.

SOUTH ELEVATION



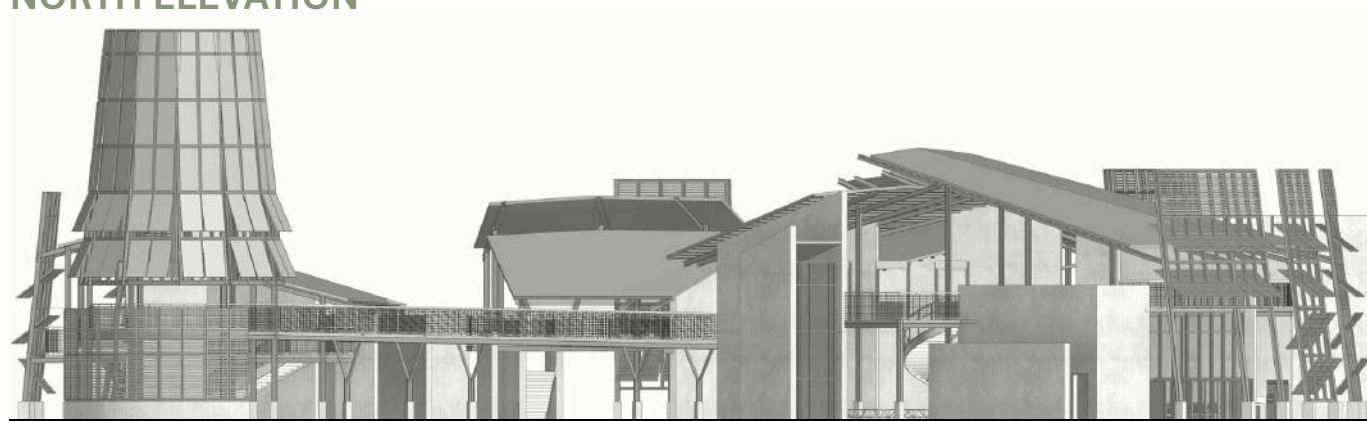
The overlapping roofs and operable louvers filter direct midday sun and promote vertical airflow, supporting passive cooling and shaded daylight entry. This orientation benefits from high sun angles, and the deep eaves provide effective solar control.

EAST ELEVATION



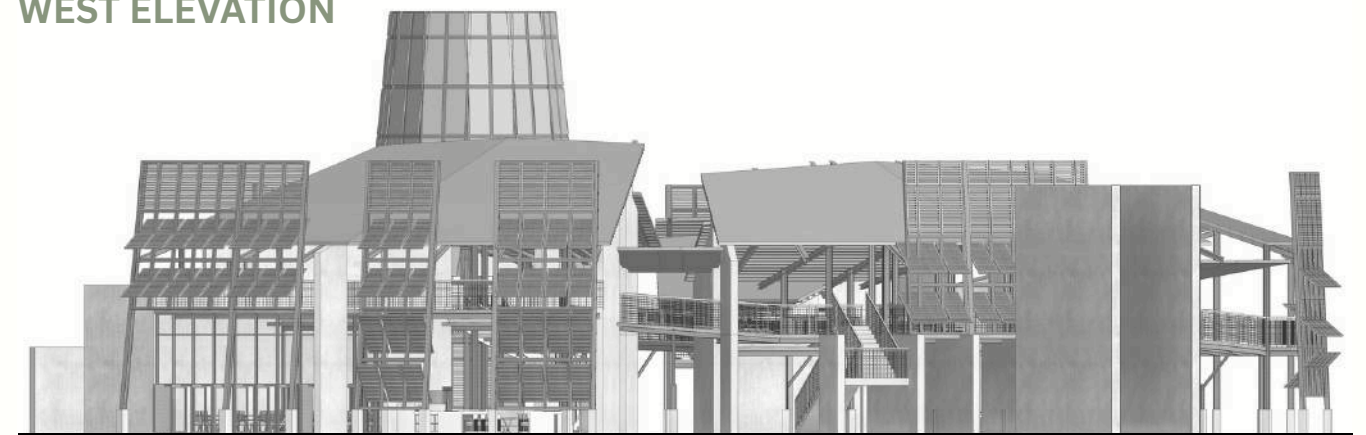
The timber louvers reduce glare and heat from morning sun, while allowing cool breezes to enter. The facade balances early daylight access with solar protection, improving indoor comfort during morning hours.

NORTH ELEVATION



This elevation maximizes indirect daylight, using more open surfaces to promote natural ventilation and minimize artificial lighting needs. With minimal solar heat gain, it serves as an ideal orientation for open circulation and communal areas.

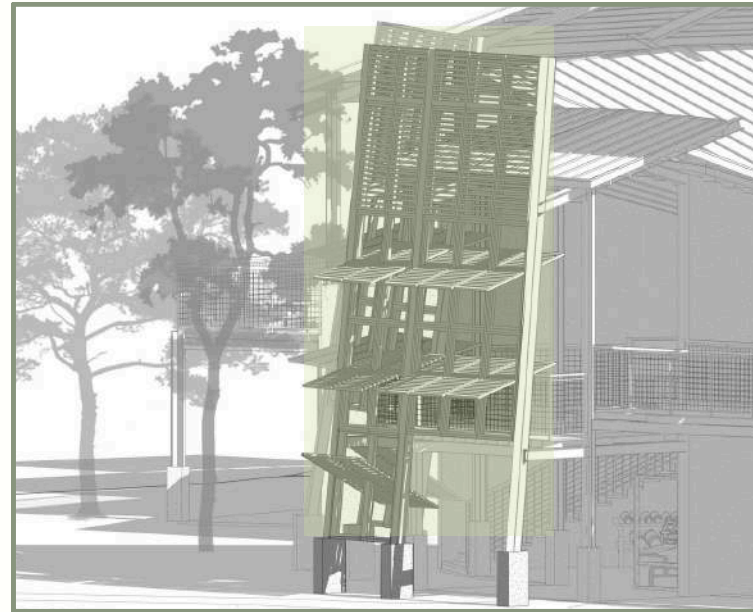
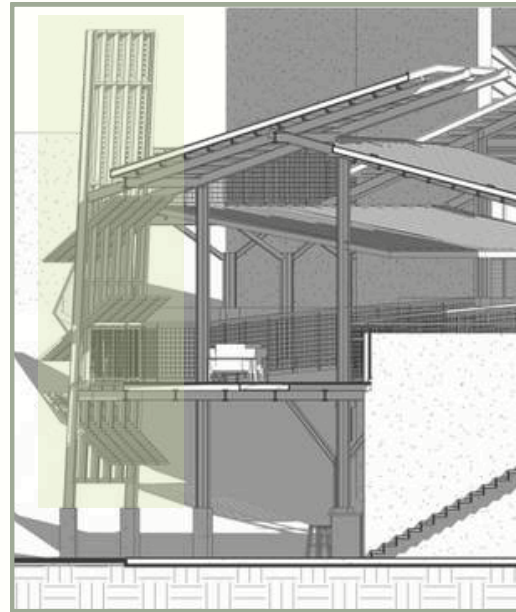
WEST ELEVATION



Designed to combat harsh low-angle afternoon sun, the west facade integrates dense vertical louvers and high-level vents to block heat while allowing hot air to escape. This creates a protective barrier while maintaining ventilation efficiency.

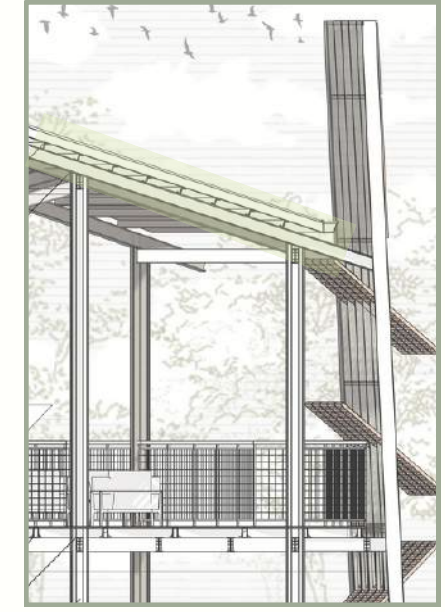
FACADE DESIGN

DOUBLE-SKIN FACADE



- The second skin facade act as shading device where it block direct sunlight, especially on the east and west side, which helps reduce internal heat gain
- The spacing between the louvers and operability allows cross-ventilation while maintaining privacy and shading, which promotes stack effect and also act as thermal buffer stabilizing indoor temperature
- Timber materiality used in the second skin facade introduces a natural tactile quality that connects occupants with nature, enhancing psychological comfort.

ROOF DESIGN



- The overlapping roofs create a ventilated cavity where hot air can escape, inspired by the vernacular tropical architecture, which promotes stack ventilation
- Also inspired by vernacular form, the angled overhangs shade the interior spaces from the midday sun, supporting passive solar control
- The polycarbonate part in the end of the roofs allows diffused daylight into interior spaces, reducing dependency on artificial lighting
- Reflective steel roofing paired with proper insulation minimizes solar heat gain
- The roof's profile encourages rainwater harvesting

MATERIALITY

Low-E Glazing:

- lets in natural light while keeping interiors cool or warm, depending on season

Concrete:

- foundation and ground floor slab provide thermal mass, helping stabilize indoor temperature
- concrete walls act as thermal buffers, helps acoustic control



Steel:

- Steel structure such as the cruciform column, universal steel column, and universal steel beam provide long spans and efficiency
- Reflective metal sheets on the roof which deflects sunlight and so minimizing heat gain

Timber:

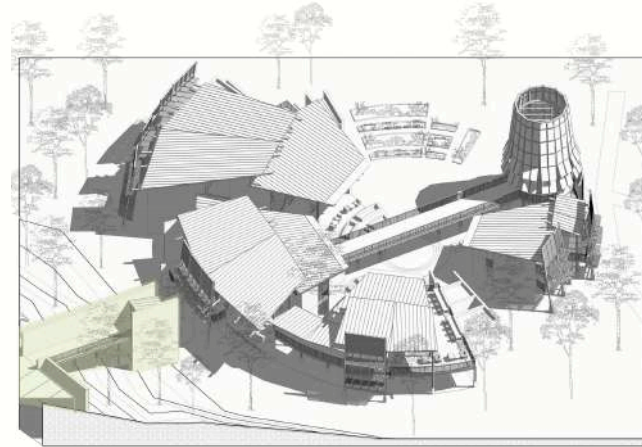
- used for the first flooring and louvers, which adds warmth and biophilic value
- Locally accessible materials with insulating or thermal mass qualities

STRATEGIC LANDSCAPING

SITE INTEGRATION

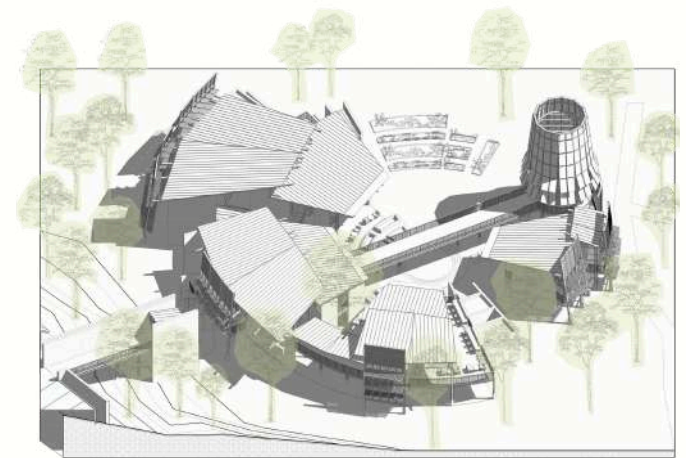


The structure is strategically placed on a flat, underutilized portion of the park, allowing for minimal grading and disturbance to existing vegetation, which supports low-impact development and environmental preservation. By occupying a transitional area between active and quiet park zones, the building enhances connectivity, promotes community use, and integrates harmoniously with its surroundings, transforming the site without overpowering it.



MINIMAL GRADING

Grading is done at the steep hill for access, preserving the site's natural terrain, reducing erosion, and supporting passive water and cooling strategies.



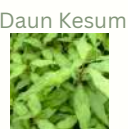
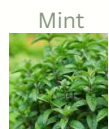
Preserving Existing Vegetation

Existing vegetation is largely retained to maintain biodiversity, enhance natural ventilation, and improve thermal comfort through shaded microclimates.

SOFTSCAPE & HARDSCAPE FEATURES

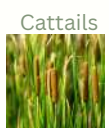
Herb Garden

- improve microclimate
- native herbs:



Bioswale

- provides drainage
- native plants:



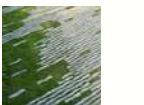
Green Roof

- Thermal Insulation and Microclimate Cooling



Permeable Pathway

- manage stormwater



Sengkurat Tree

- provide shades and filtered light



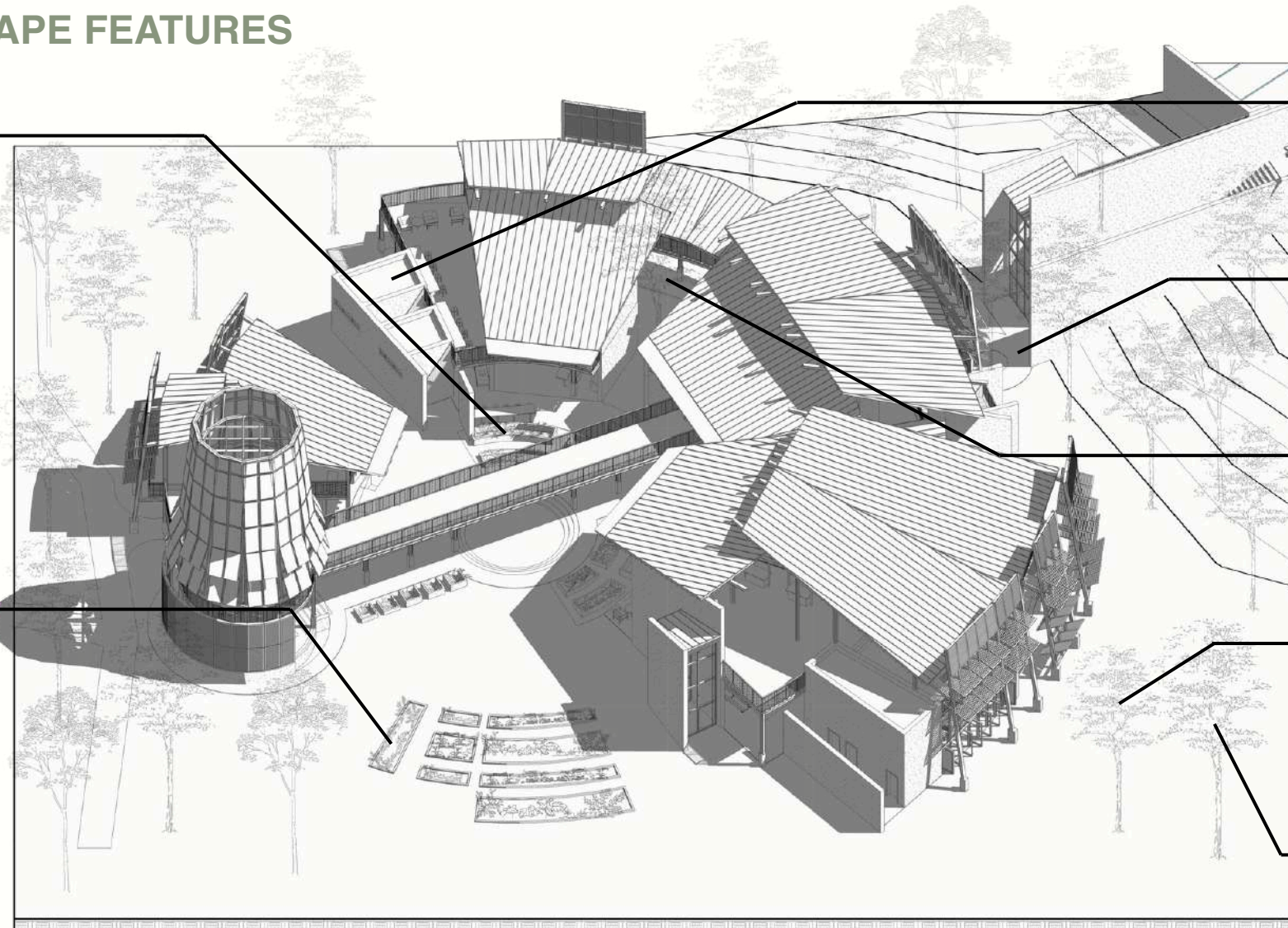
Madagascar Almond Tree

- provide shades



Oil Palm Tree

- filtered light



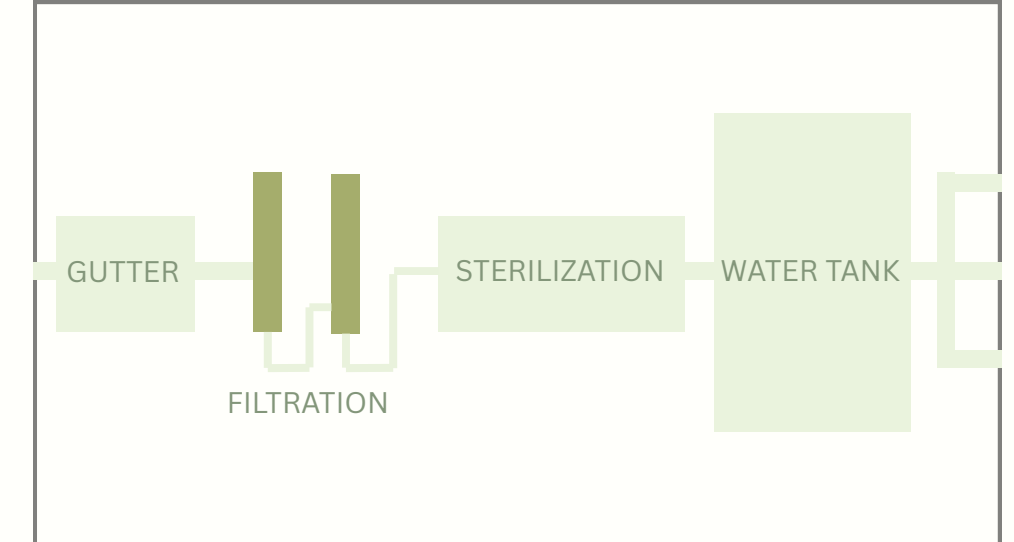
STRATEGIC LANDSCAPING

BIOSWALE AND RAIN GARDEN



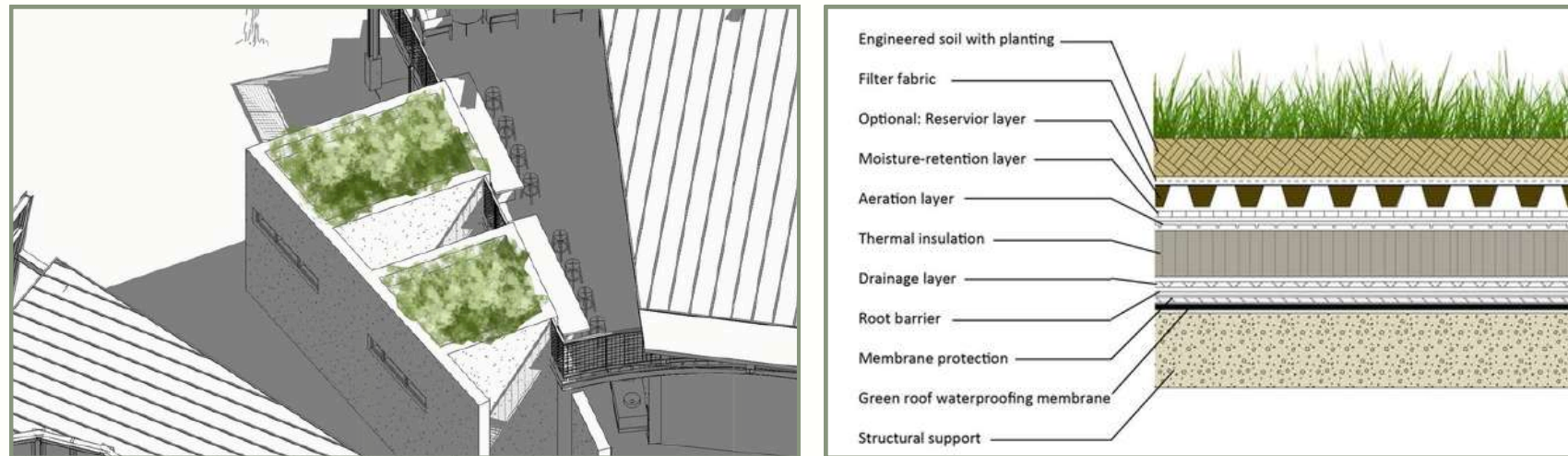
- Bioswales act as vegetated drainage channels, guiding water while allowing it to infiltrate gradually into the ground. While rain gardens hold and treat rainwater through layers of soil and native plants
- They are placed on the area where it's prone to flooding especially on the area where the site has a water pooling effect in between two trees (as shown on the diagram above)
- They both help stormwater management, improve water quality through natural filtration, help urban cooling, and enhance biodiversity

RAINWATER HARVESTING SYSTEM



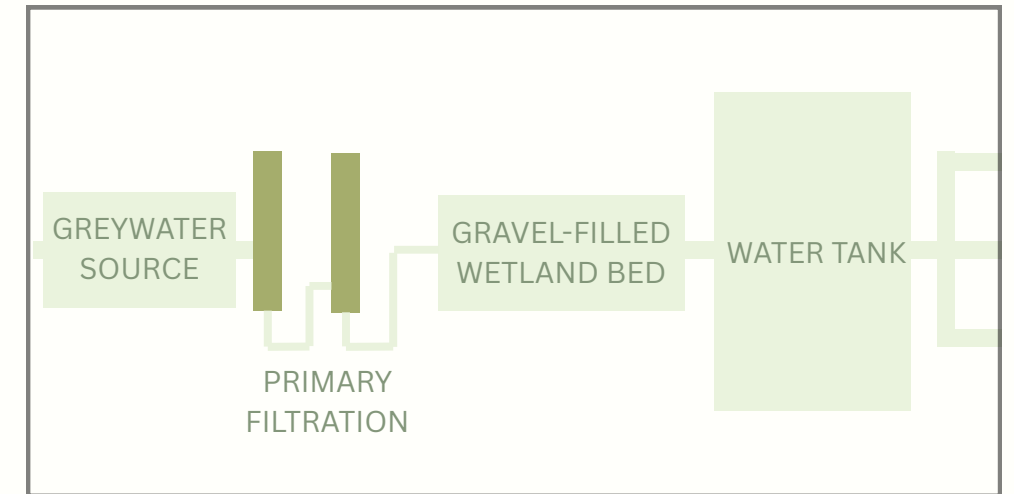
- Rainwater is collected from the sloped standing seam metal roofs, including the green roofs, and directed into roof gutters and downpipes. This water is then stored in a rainwater harvesting tank located under the M&E room
- This helps reduce water consumption by reusing rainwater for irrigation and toilets.

GREEN ROOF



- The structure features intensive green roofs where they're more shallow and low-maintenance compared to extensive green roofs. They are placed mostly on top of toilets and M&E room
- The green roofs act as a natural thermal insulator, reducing heat gain and stabilize indoor temperature
- It also helps with rain water absorption and delay runoff, reducing the pressure on drainage infrastructure
- They reduce the urban heat island effect by replacing reflective, heat-trapping material with vegetation
- The green roofs act as a biodiversity support and could host native, pollinator-friendly plants

GREYWATER TREATMENT



- Greywater from washbasin and sinks is channeled to an on-site treatment unit, such as a gravel-based filtration system.
- This helps to recycle wastewater for landscape use, reducing fresh water demand.

QUALITY & SPATIAL EXPERIENCES

SITE PLANNING



Optimized Orientation

- maximize natural light and wind access, enhancing interior comfort.

Soft, diffused natural light

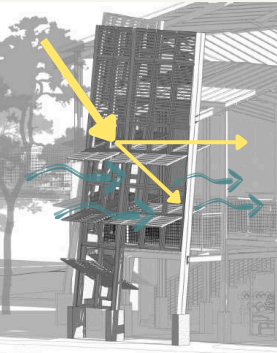


Open, Circulation

- Supports passive ventilation and connection to nature

cool microclimate

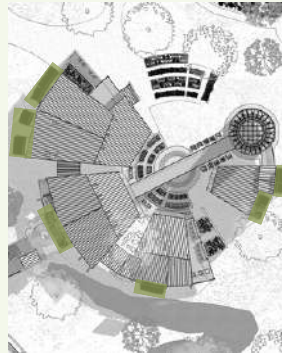
FACADE DESIGN



Second Skin with Timber Louvers

- maximize natural light and wind access, enhancing interior comfort.

Stable temperature

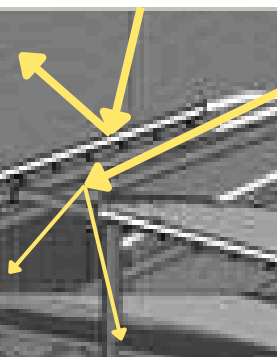


Responsive Orientation

- East and west facades are heavily shaded; north and south remain more open for daylight

Soft, diffused natural light

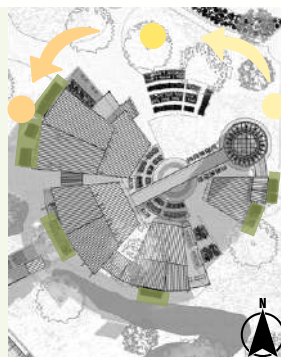
DAYLIGHTING



Openings Between Overlapping Roofs

- Brings diffused daylight into the core without heat gain

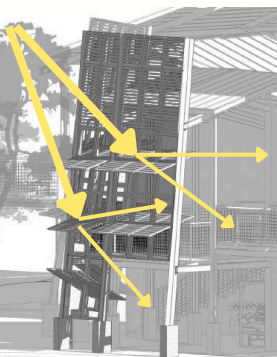
Soft, diffused natural light



Facade Openings Oriented by Sun Path

- louvers are placed to welcome indirect light, reducing glare.

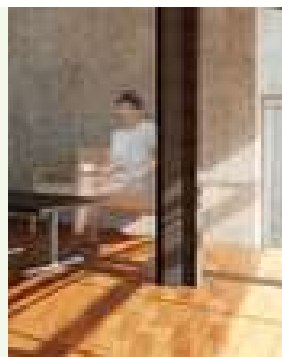
Glare free natural light



Filtered Light through Louvers

- Controls solar gain while preserving daylight quality.

Natural light in the building

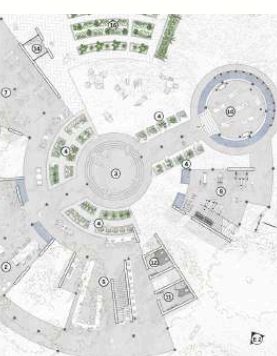


Daylit Circulation Spaces

- Open corridors and semi-outdoor paths use natural light

Soft, diffused natural light

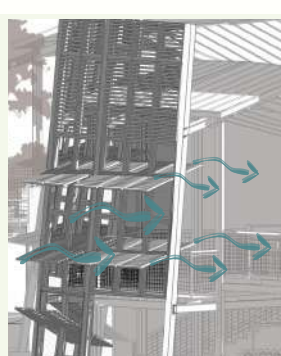
NATURAL VENTILATION



Cooling from Water Features & Landscape

- Microclimate cooling through evapotranspiration.

cool microclimate



Double-Skin Facade with Operable Louvers

- Adjustable airflow and shading, enhances passive cooling

Stable temperature



Ventilation Towers & Roof Vents

- Hot air escapes through stack ventilation systems

Reduce heat gain

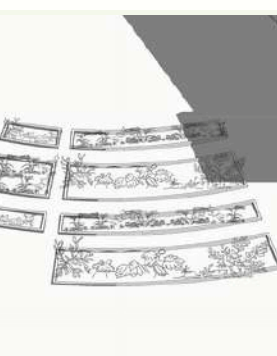


Open Ground Floor and Semi-Outdoor Zones

- Promotes cross ventilation and reduces heat buildup

sensational air breeze

STRATEGIC LANDSCAPING



Bioswales and Rain Gardens

- Supports stormwater management and biodiversity.

cool microclimate



Herb Garden as Sensory and Interactive Space

- Promotes urban agriculture and microclimate cooling.

lush greenery plants

CONCLUSION

The project integrates green strategies to create a climate-responsive and enriching spatial experience. Through careful site planning, natural ventilation, and daylighting, the design reduces environmental impact while enhancing user comfort. The facade and landscaping elements, such as the operable louvers, bioswales, rain gardens, and green roofs, support passive cooling, water management, and biodiversity. Together, these strategies form a sustainable, engaging, and environmentally conscious architectural experience.

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