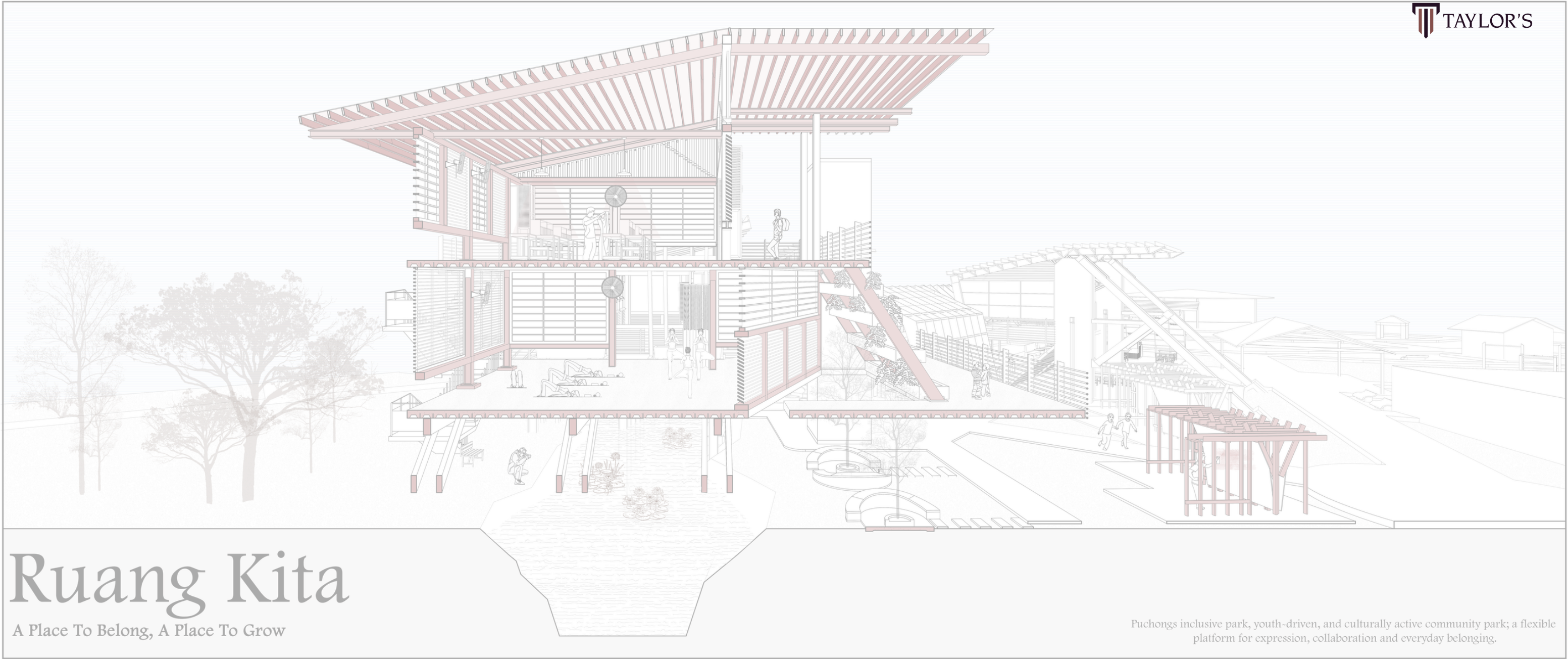


Assignment 2B - PASSIVE GREEN BUILDING STRATEGIES REPORT

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0356522



Ruang Kita

A Place To Belong, A Place To Grow

Puchongs inclusive park, youth-driven, and culturally active community park; a flexible platform for expression, collaboration and everyday belonging.

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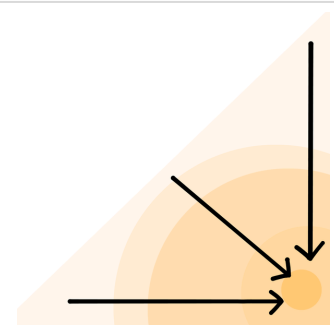


1.1 Introduction to Taman Wawasan Recreational Park

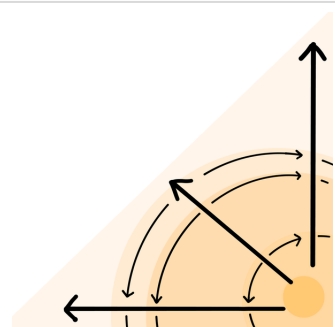


Taman Wawasan Recreational Park in Puchong is a well-maintained community park featuring a 1.4 km jogging and cycling loop around a scenic lake, shaded by mature trees. It offers facilities like basketball courts, a futsal field, outdoor gym stations, a children’s playground, and even mini public libraries. Popular among joggers, families, and fitness groups, the park is clean, peaceful, and ideal for morning or evening visits. While entry is free, parking is limited and lighting is minimal after dark, so daytime use is recommended.

Feature	Details
Size	~20-25 acres
Loop Trail	~1.4 km (0.9 mi) cycling/jogging loop
Facilities	Playground, outdoor gym, courts, benches
Amenities	Toilets, mini library booths, recycling bins
Best For	Family outings, exercise, quiet walks
Potential Downsides	Muddy patches after rain, no lights at night, busy parking
Visitor Rating	~4.3-4.4 out of 5



Amphitheatre as a **main root** for the park. It has strong axes from the main entrance on park circulation that **converge** into the centre.



From the "main root", the users spread into various **small roots** via **interconnected routes**. Create easy access between spaces to enhance the social connectivity.

Design strategies



Gradual **green improvement** for the park. Harmonise integration between build environment and natural

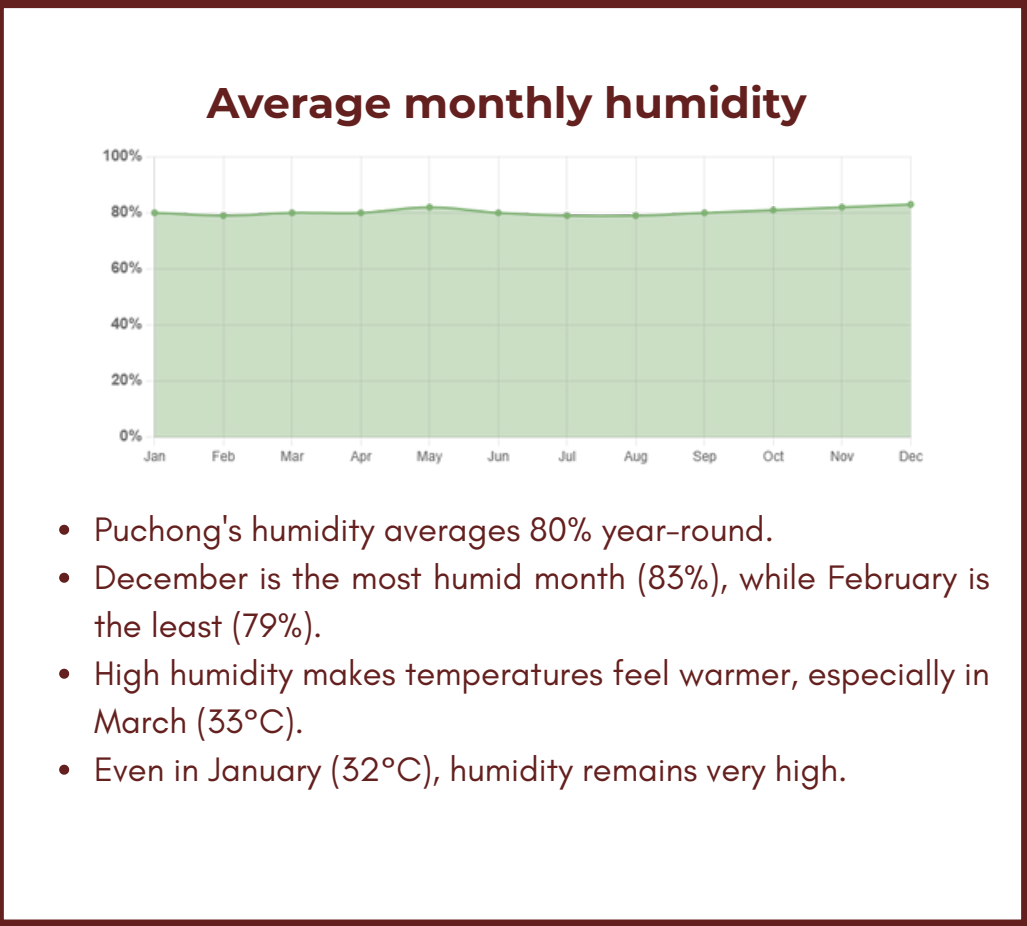
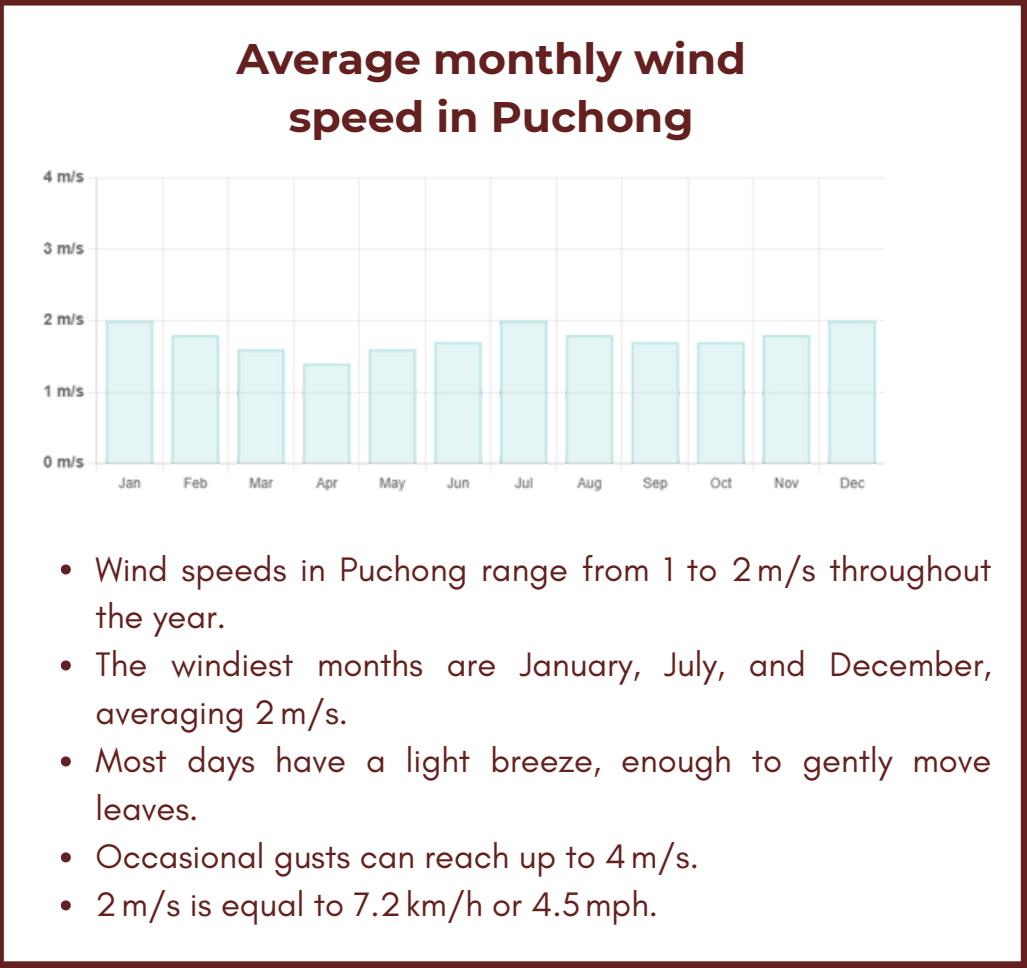
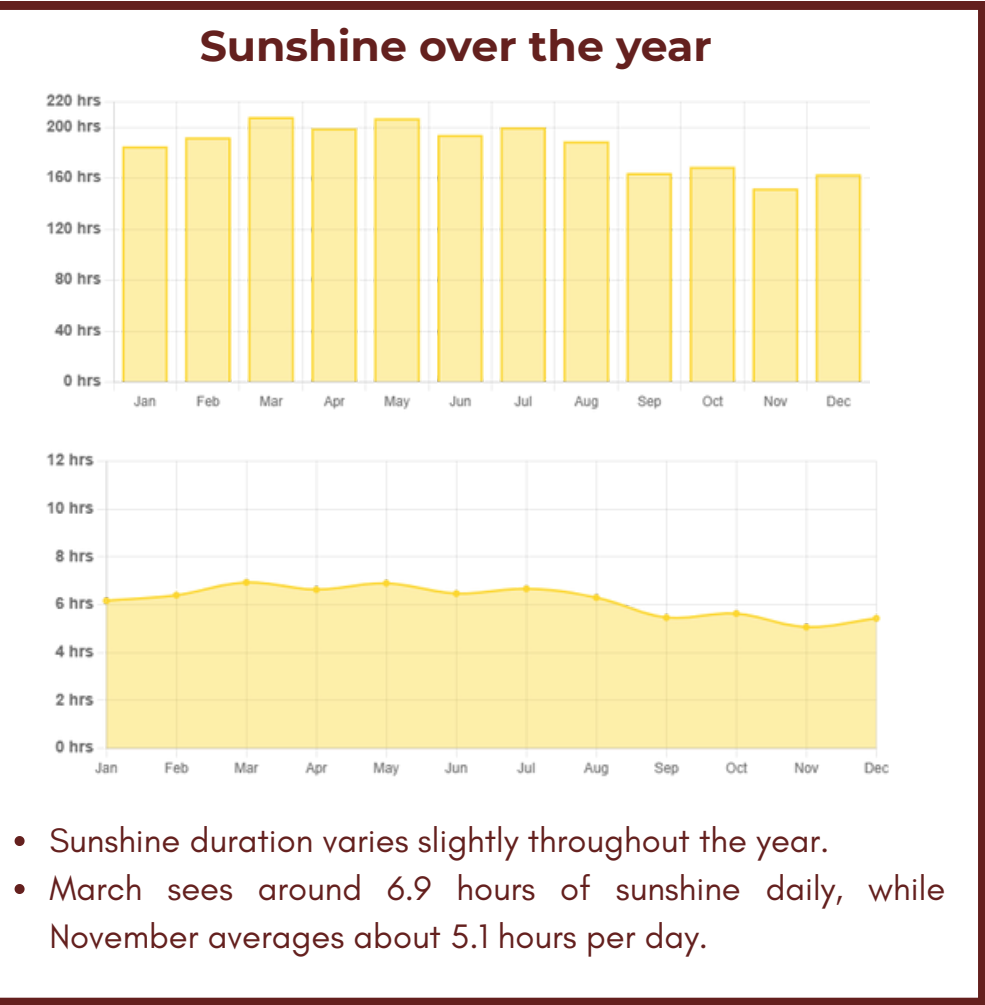
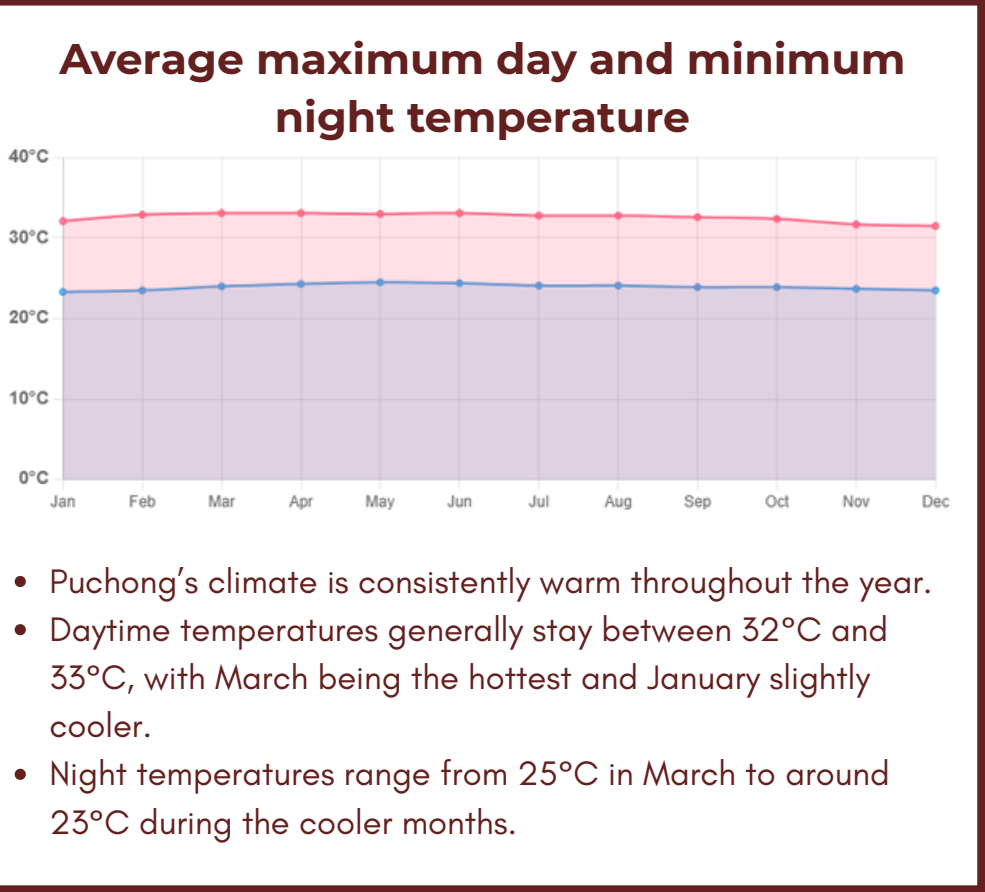


Sustainability: From user to user Enhance engagement between park communities with garden community



Urban Integration **Farming** woven into the park experience, offering both leisure and learning.

1.2 Climatic Analysis of Puchong

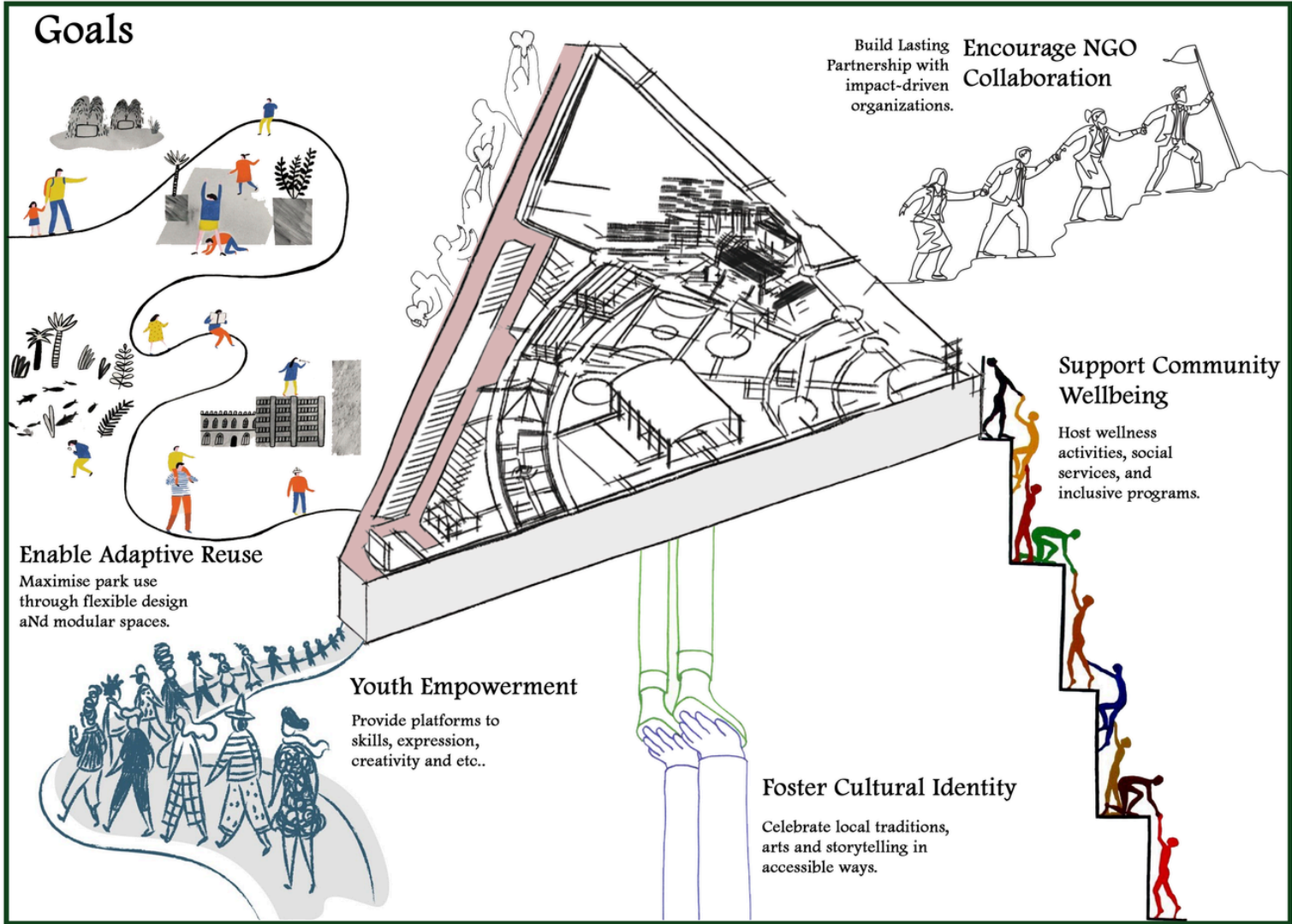
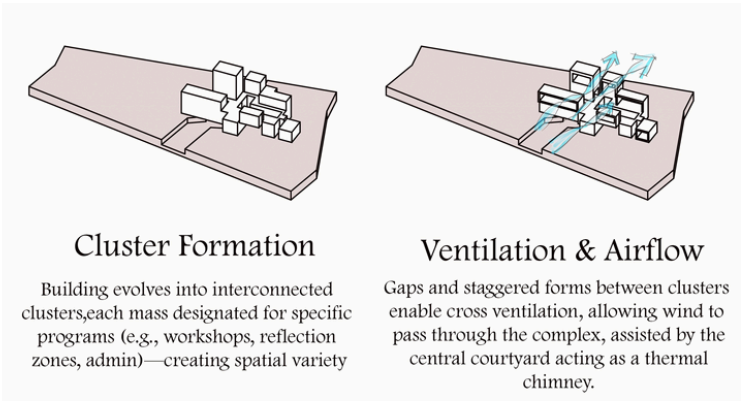
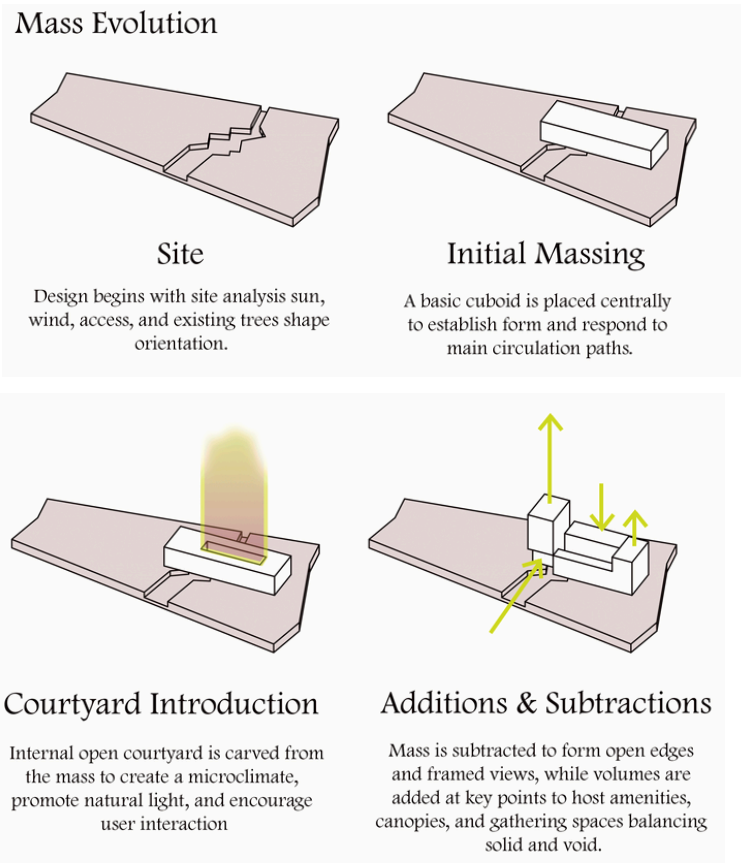


My wellness centre design responds to Puchong’s hot and humid climate by maximizing natural ventilation, using shaded open-air spaces, and incorporating wide roof overhangs for rain protection. High humidity and temperatures are managed through breezeways and cross-ventilation, while light winds (1-2 m/s) help cool the space naturally. The layout also considers seasonal rain and sun patterns to ensure year-round comfort.

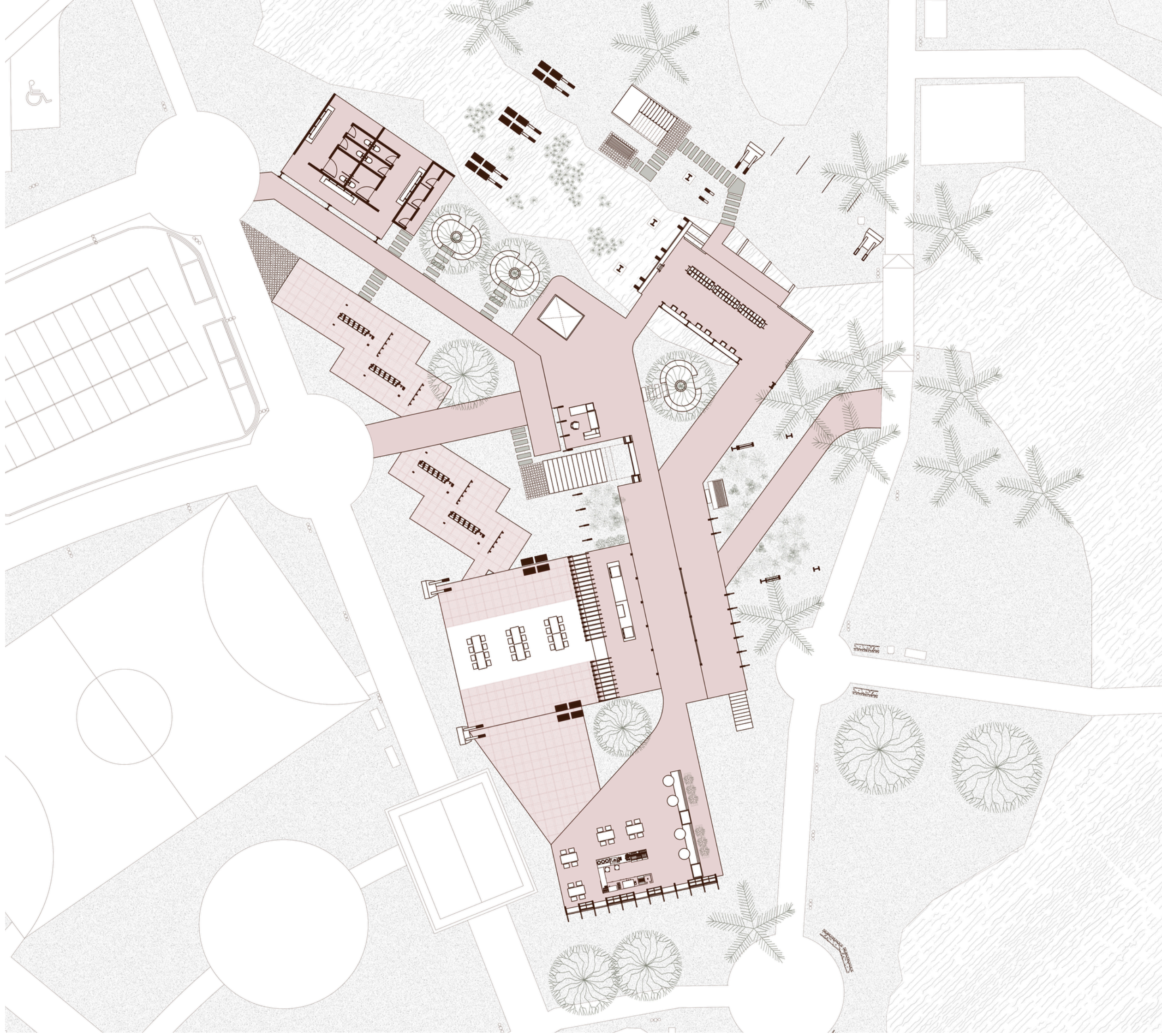
1.3 Introduction to Building

Ruang Kita

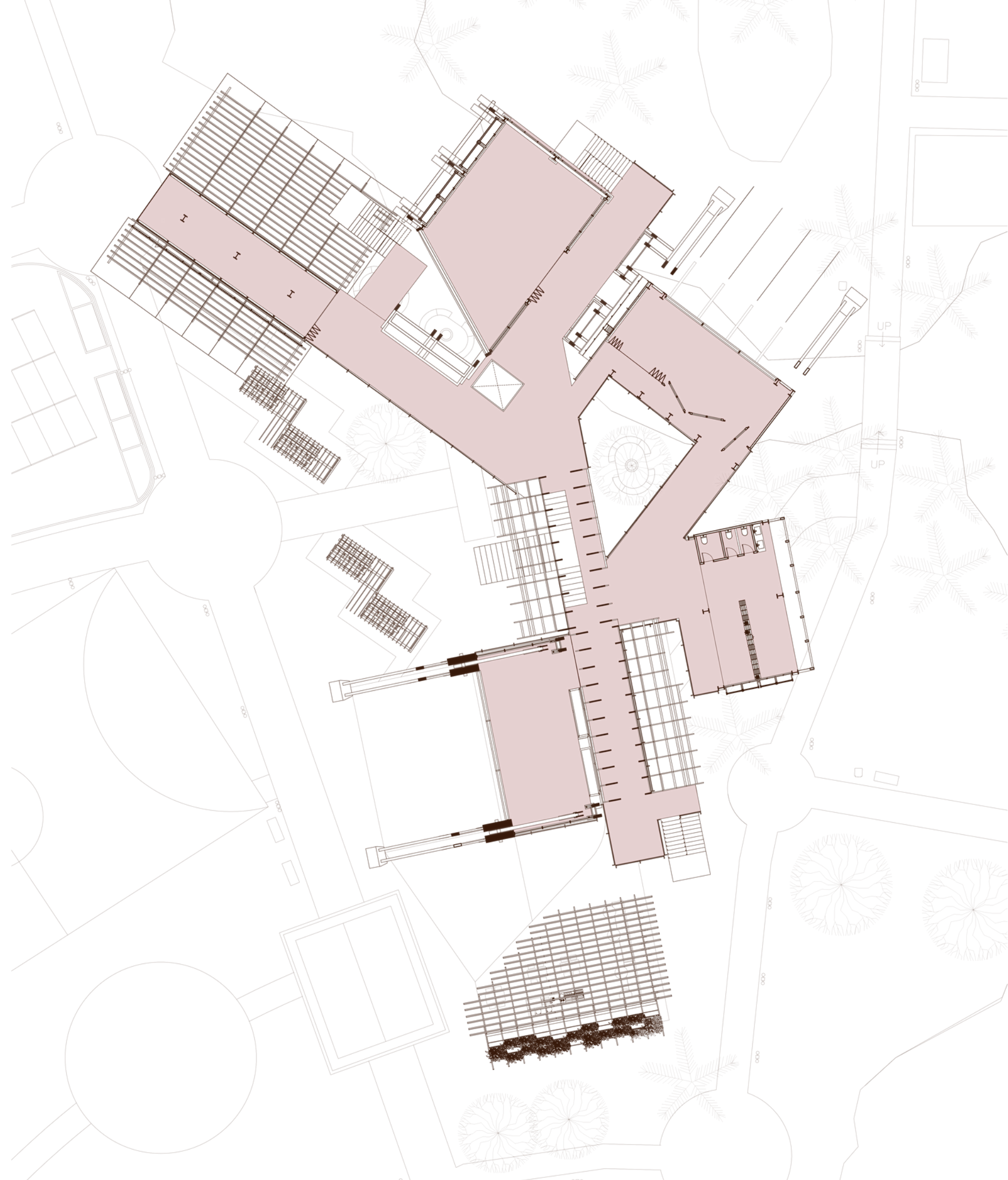
Puchong inclusive park, youth-driven, and culturally active community park; a flexible platform for expression, collaboration and everyday belonging.



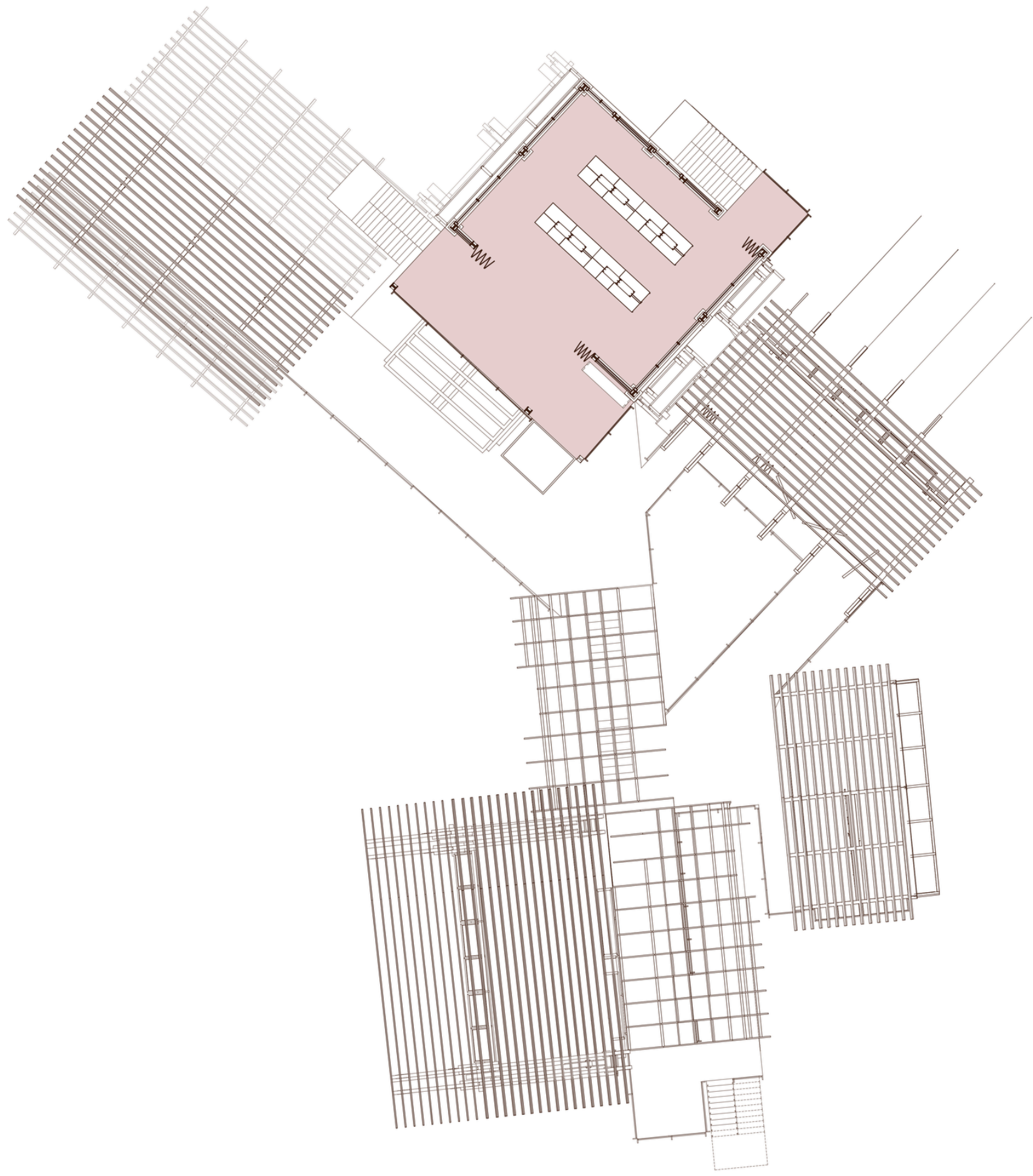
Ground Floor Plan

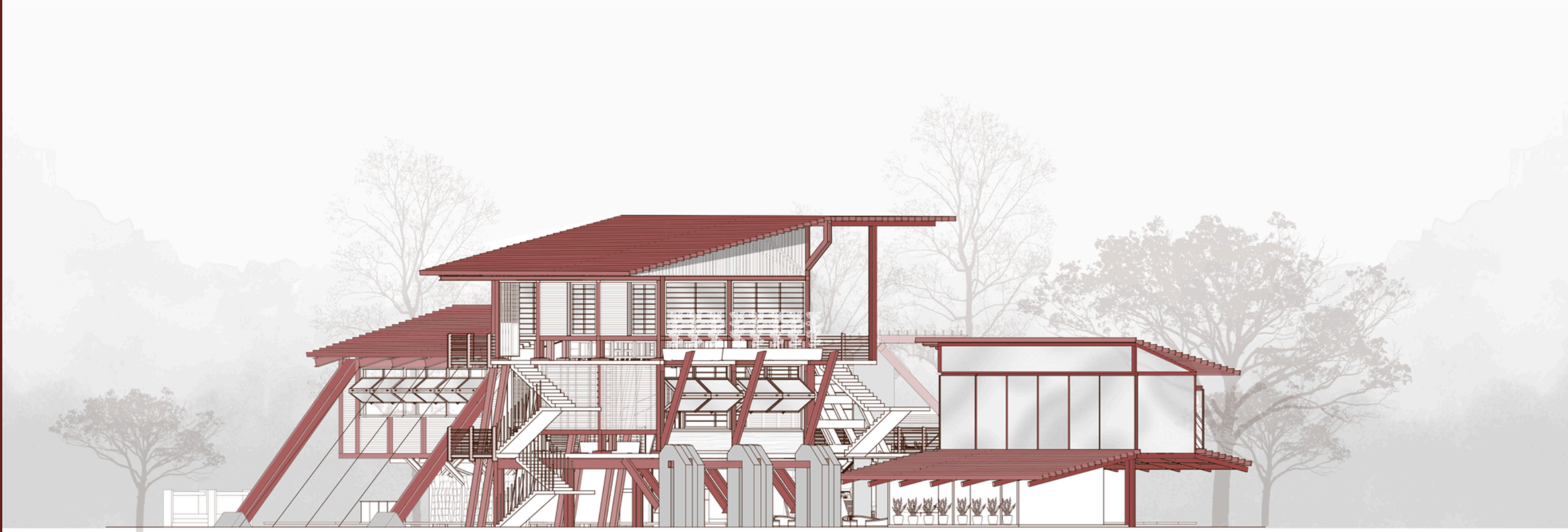
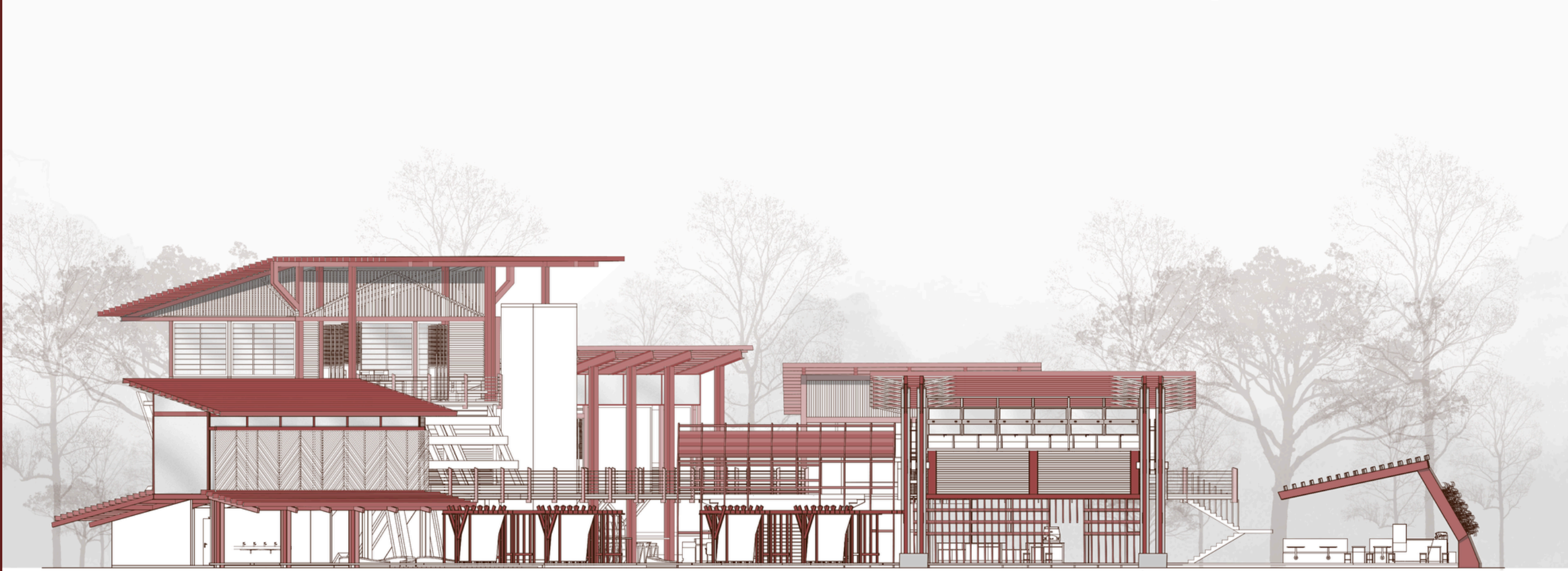


First Floor Plan

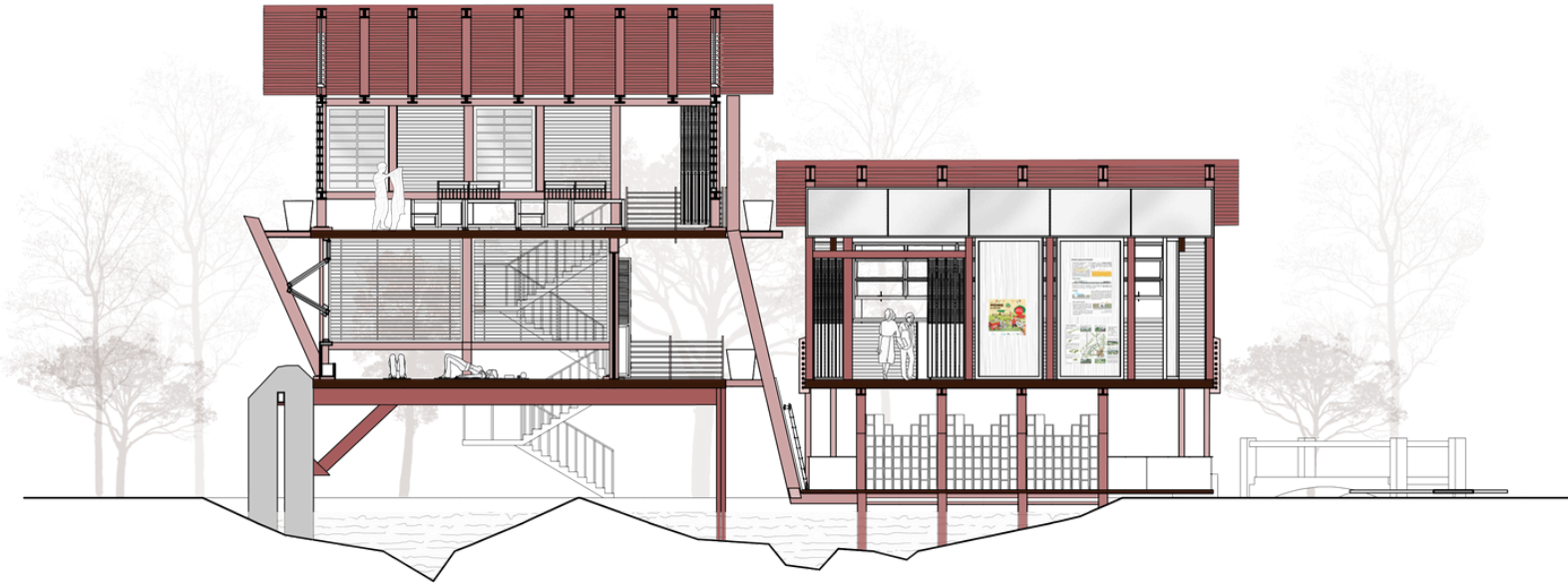
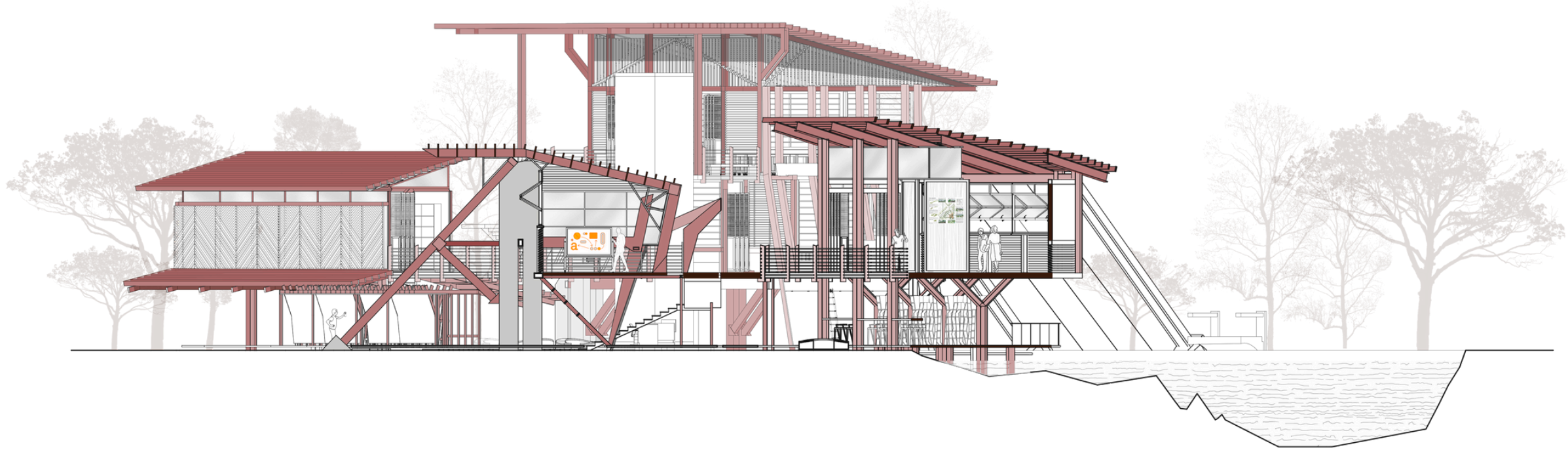


Second Floor Plan

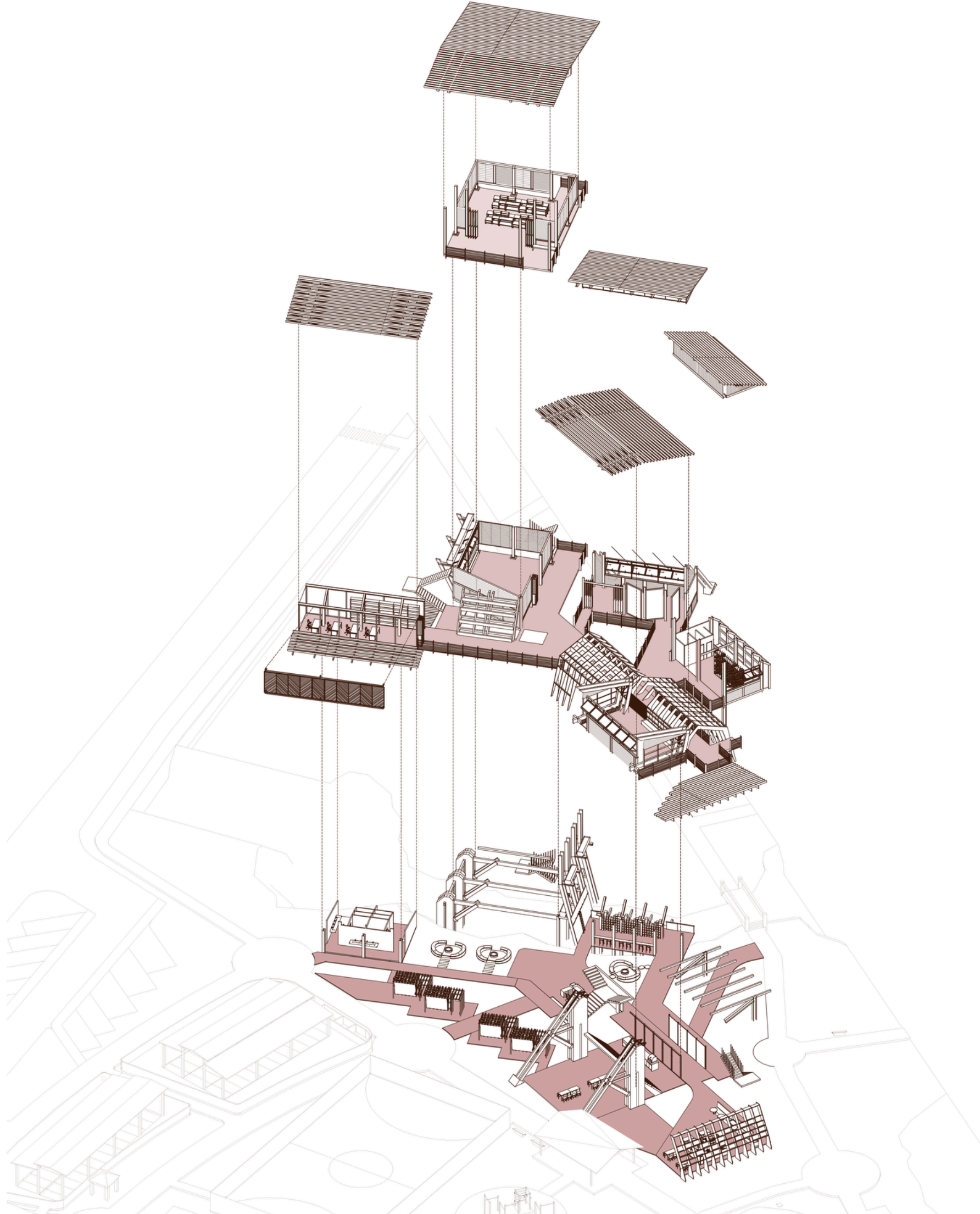




Sections

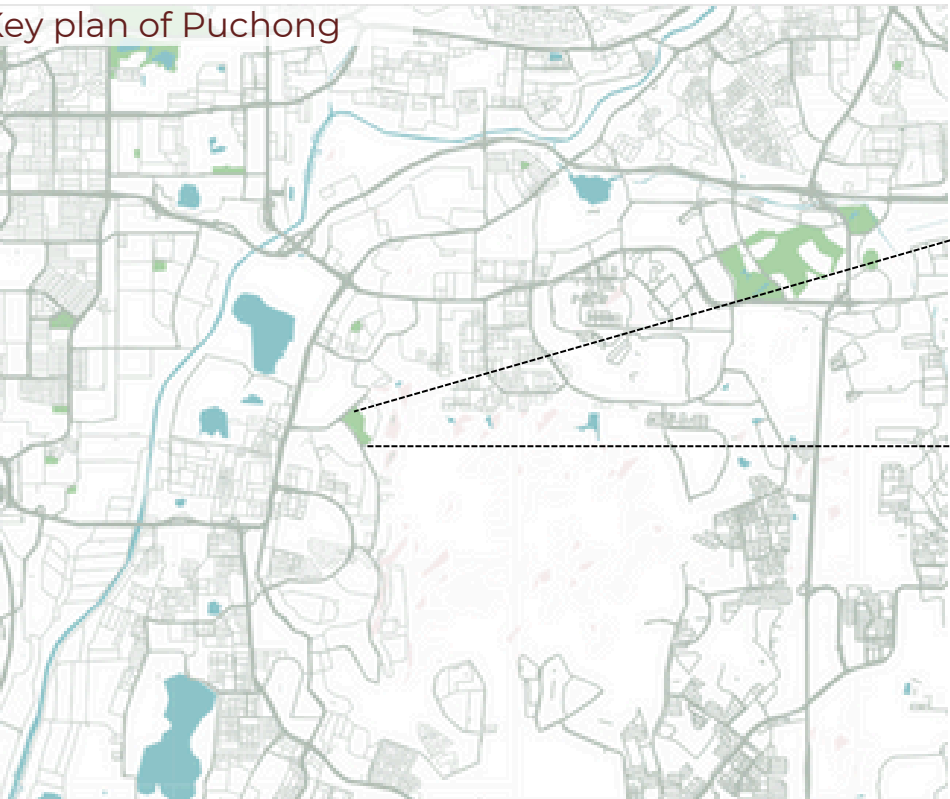


Exploded Axo



2.0 Site Planning

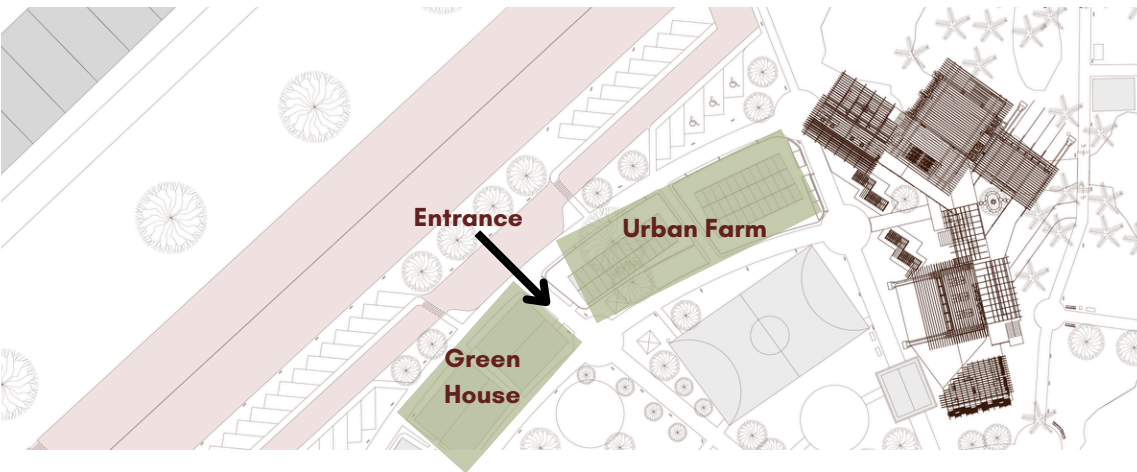
Key plan of Puchong



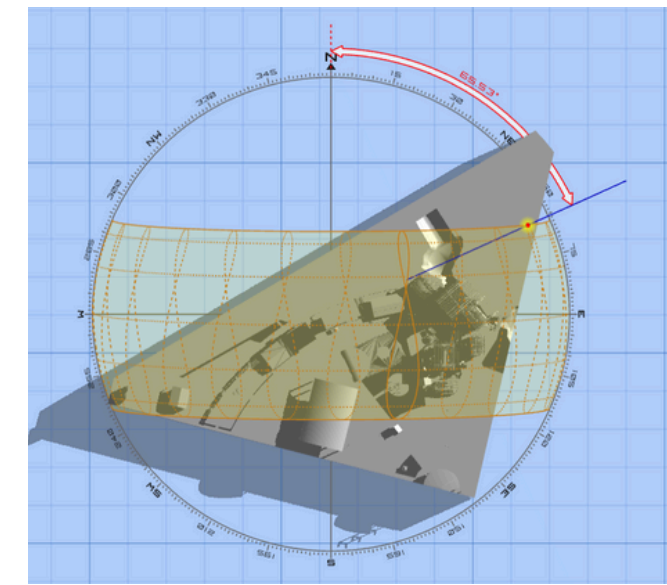
Location plan



Selected site located at the northern side of the park. Although the northern side of Taman Wawasan is more active due to popular park features and community activities, this vibrancy can be an advantage. It makes the location easily accessible, visually prominent, and more likely to attract community participation in wellness programs. With careful spatial planning—such as buffer zones, green screening, and layered zoning—the wellness centre can balance serenity within a lively environment.

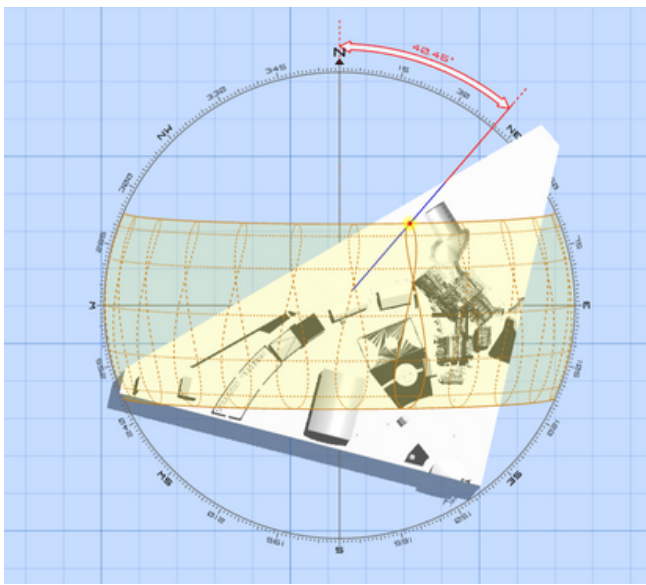


Sun Path Analysis



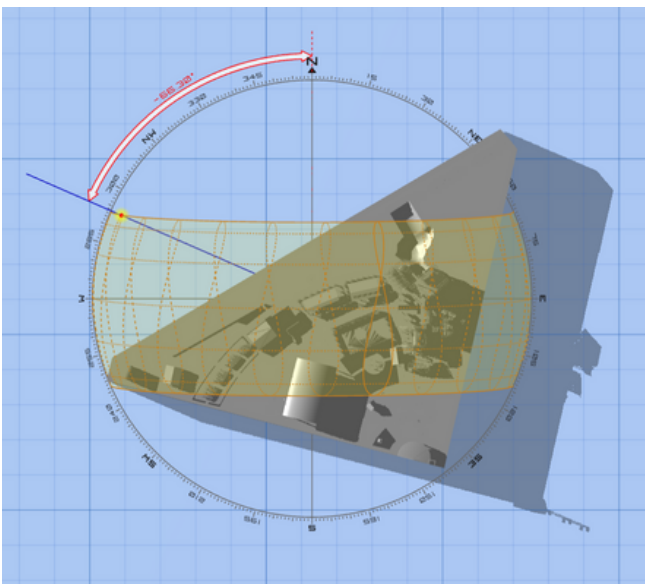
9am

The morning sun from the east casts long shadows westward, shading the northwest edge while the south and centre receive moderate light—ideal for light morning activities.



12pm

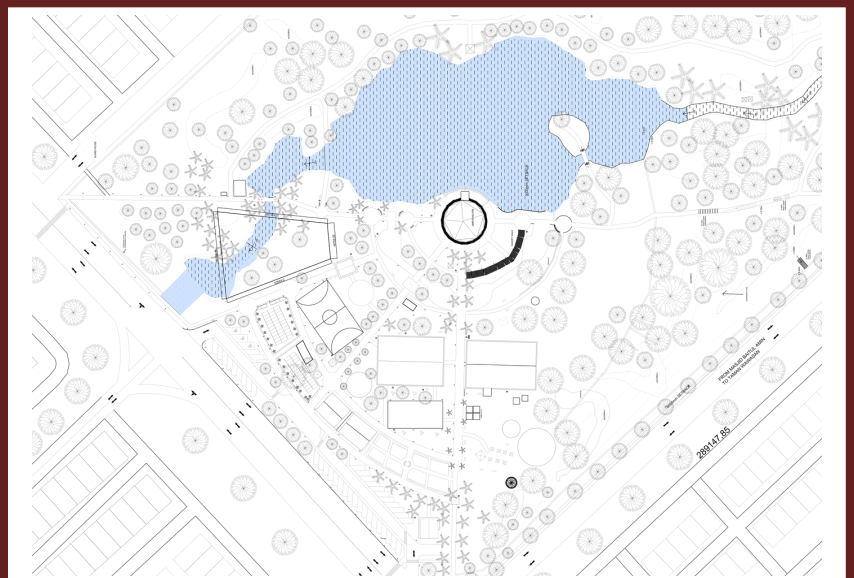
The sun is almost overhead, slightly south, resulting in direct sunlight across most of the site. Shadows are short, making it the hottest time—shaded areas or sun protection are essential.



6pm

The low western sun casts long shadows eastward, shading the eastern site while the west remains partly lit—perfect for cooler, comfortable evening strolls.

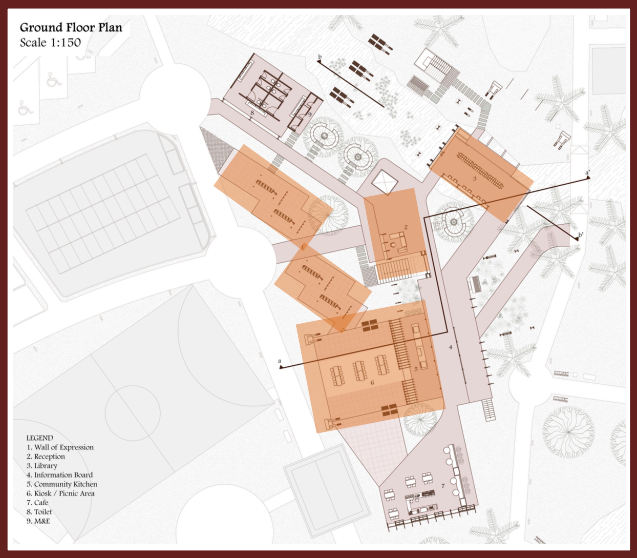
Water Body



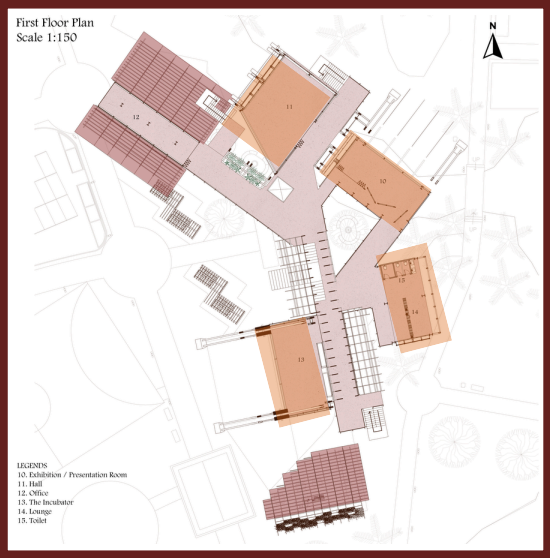
- Cools the air through evaporative effect.
- Improves microclimate around the centre.
- Supports biodiversity and natural aesthetics.
- Creates calming space for community use.

Space Planning (Building Layout)

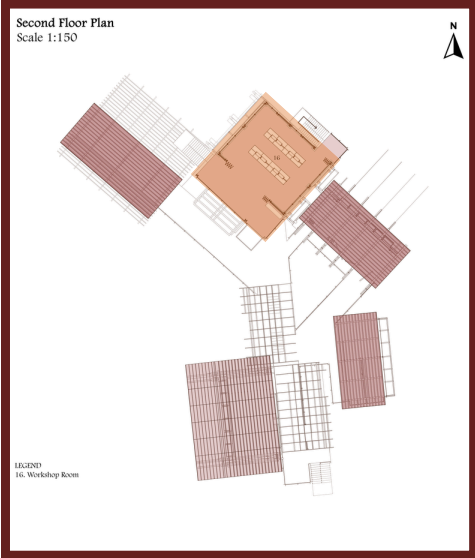
By analysing the sun path, the space planning and building layout are strategically optimized.



Ground Floor Plan



First Floor Plan



Second Floor Plan

Reception (Northwest corner)

The northwest reception stays cool in the morning, lightly sunlit at noon, and warmly illuminated by direct sunlight in the evening.

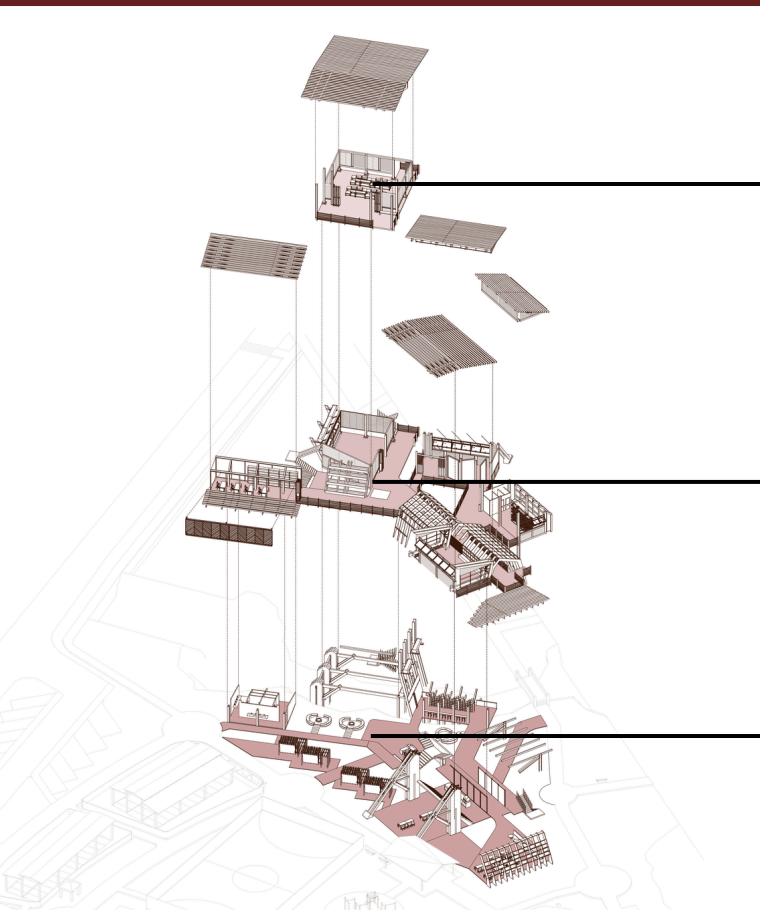
Wall of Expression, Library & Community Board placed where morning light and afternoon shade support calm, reflective use.

Multipurpose Room: Morning light, greenery, cross-ventilation.

Presentation Room: Shaded, ventilated, acoustically buffered.

Circulation: Ventilated, cool entry with green shading.

The **workshop room** is placed on the upper floor for privacy and focus, where it benefits from morning light, natural ventilation, and green shading to reduce heat and glare.



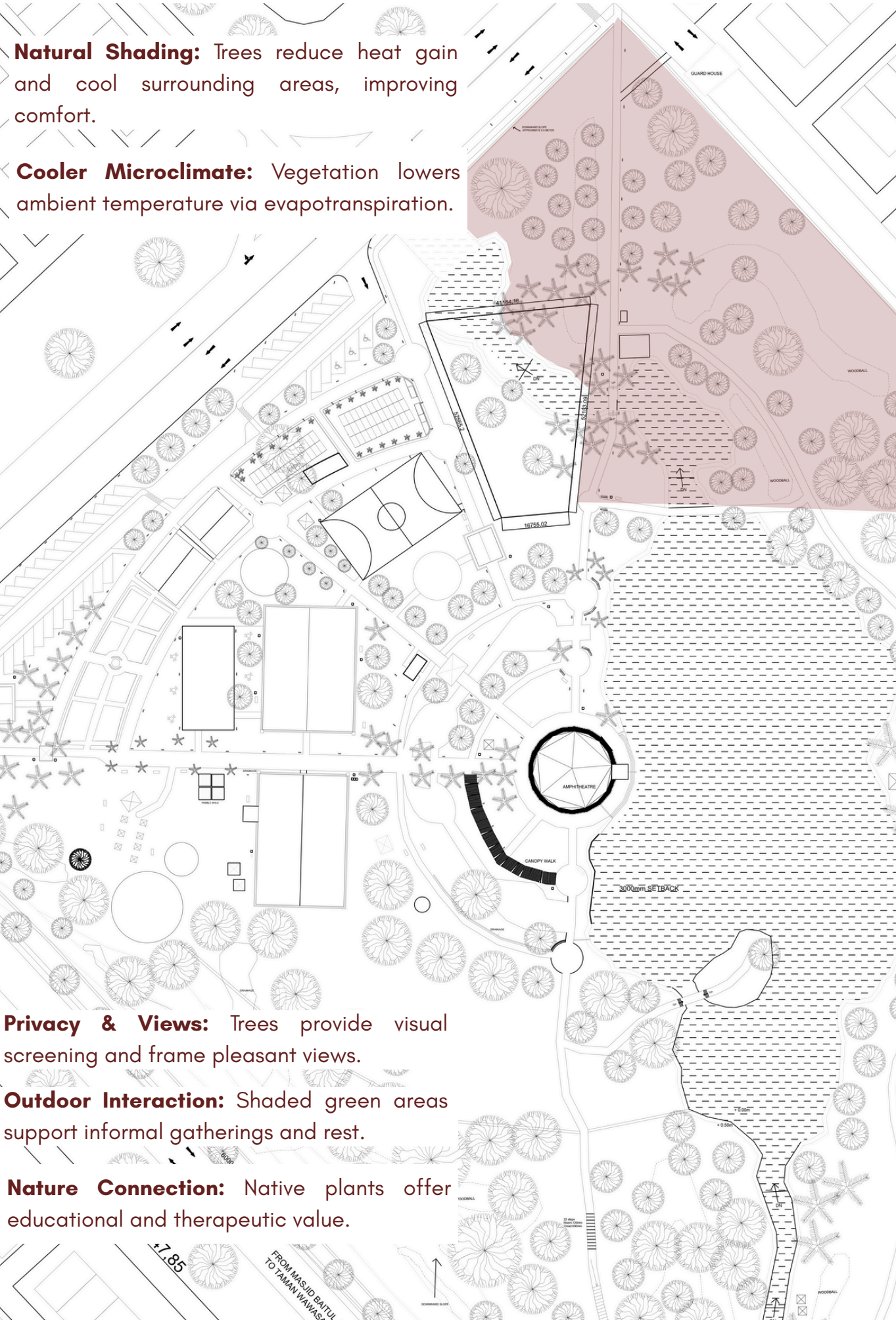
A secluded space designed to provide privacy and quiet for focused activities, while maximizing natural daylight for comfort and concentration.

A semi-open multipurpose area positioned to optimise natural ventilation and daylight, supported by surrounding greenery for passive cooling and thermal comfort.

An open, publicly accessible area designed to foster community interaction, strategically placed near main circulation routes and shaded by existing trees to enhance comfort and encourage passive social engagement

Natural Shading: Trees reduce heat gain and cool surrounding areas, improving comfort.

Cooler Microclimate: Vegetation lowers ambient temperature via evapotranspiration.



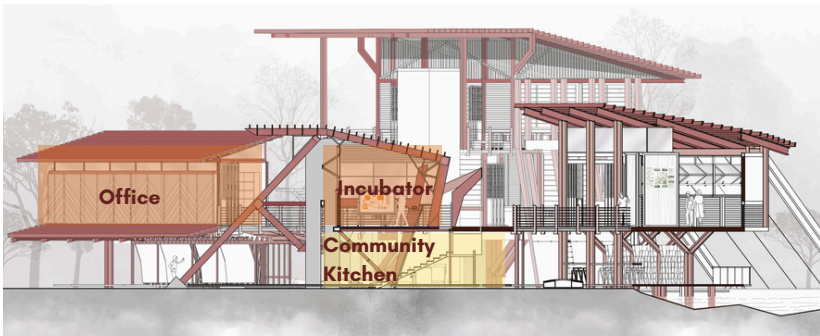
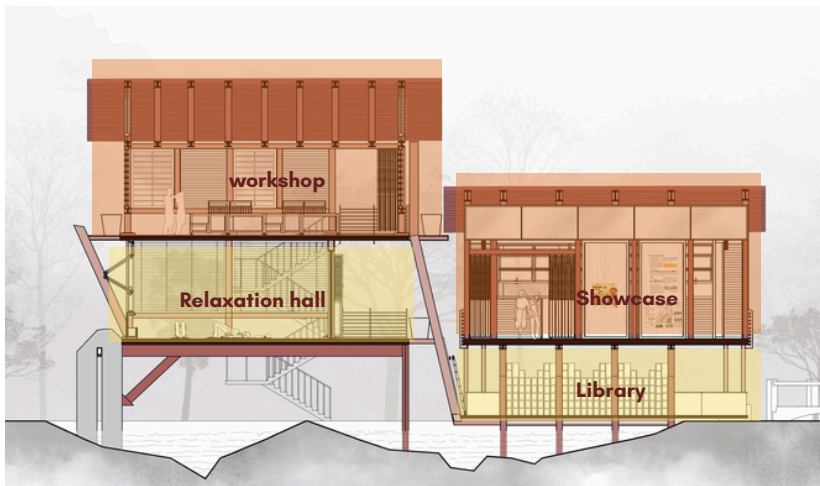
Privacy & Views: Trees provide visual screening and frame pleasant views.

Outdoor Interaction: Shaded green areas support informal gatherings and rest.

Nature Connection: Native plants offer educational and therapeutic value.

Landscape Design

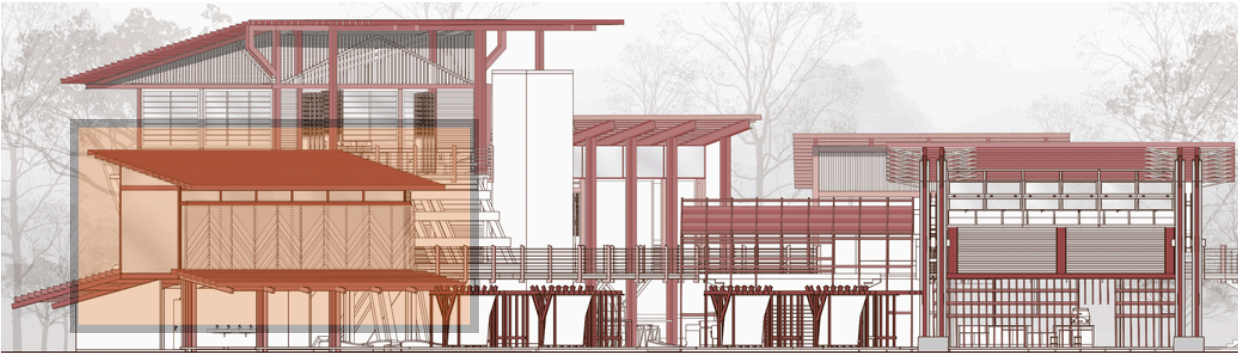
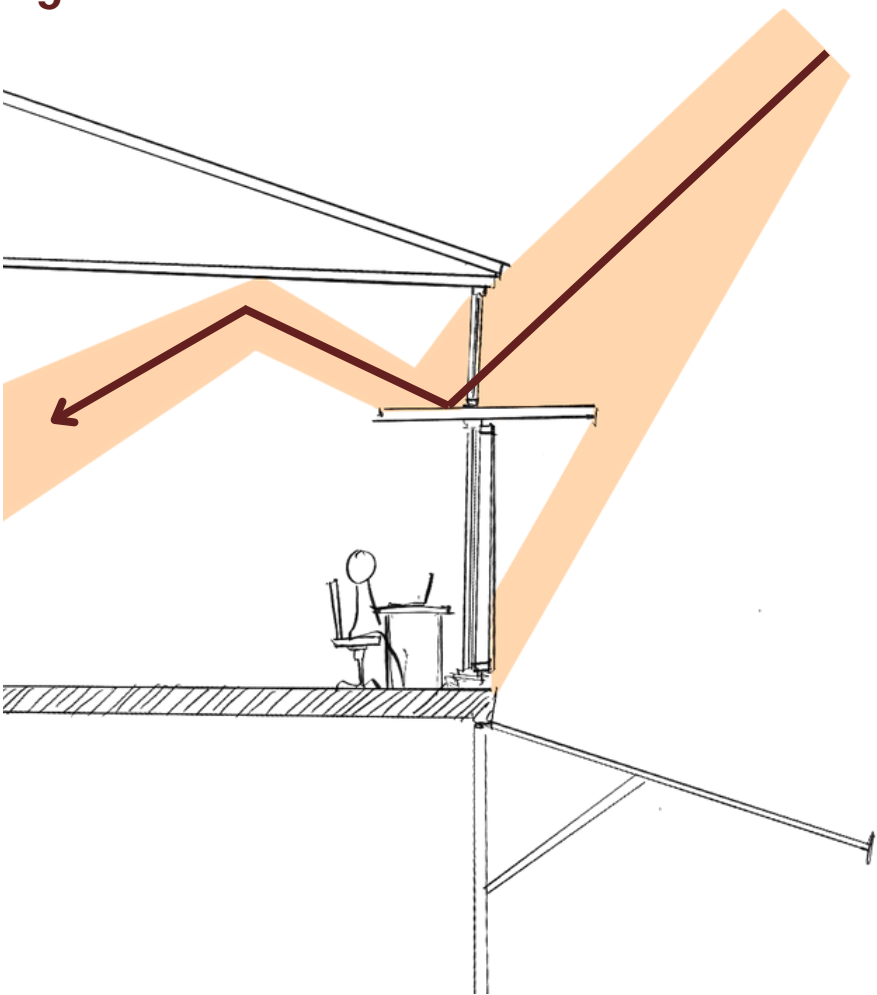
3.0 Daylighting



 Moderate  Light

- **Upper floors** (workshop, showcase) receive maximum daylight from large openings and high rooflines → reduces artificial lighting.
- **Mid zones** (office, incubator) get moderate daylight through shading elements and filtered facades → balances comfort and energy use.
- **Lower levels** (library, community kitchen) placed in naturally lit zones with open sides → improves user experience.

Light Shelves



Enhance Natural Light Distribution

- Reflect sunlight deeper into the room, reducing reliance on artificial lighting.

Reduce Glare Near Windows

- Block direct overhead sunlight at eye level while bouncing diffused light onto the ceiling.

Improve Visual Comfort

- Provide even lighting levels across workspaces, minimizing contrast and eye strain.

Increase Productivity

- Balanced natural lighting improves user comfort and concentration



Shading Louvers

First Floor Plan
Scale 1:150



Support Activity Needs

- Provide consistent lighting for tasks like reading, working, or therapy without harsh light interruptions.

Enhance Energy Efficiency

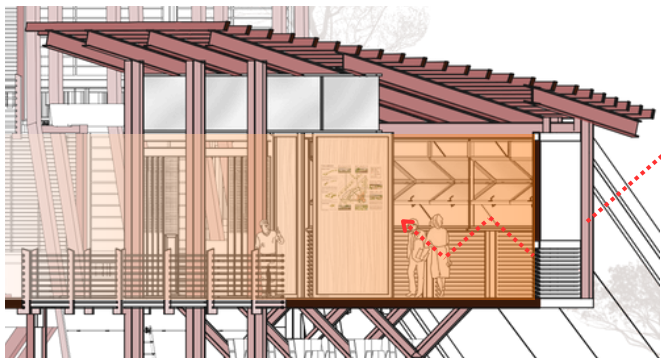
- Reduce the need for artificial lighting and cooling, cutting down on energy use.

Durable and Low Maintenance

- Functional year-round, especially when fixed at optimal angles based on the site's sunpath.

Control Direct Sunlight

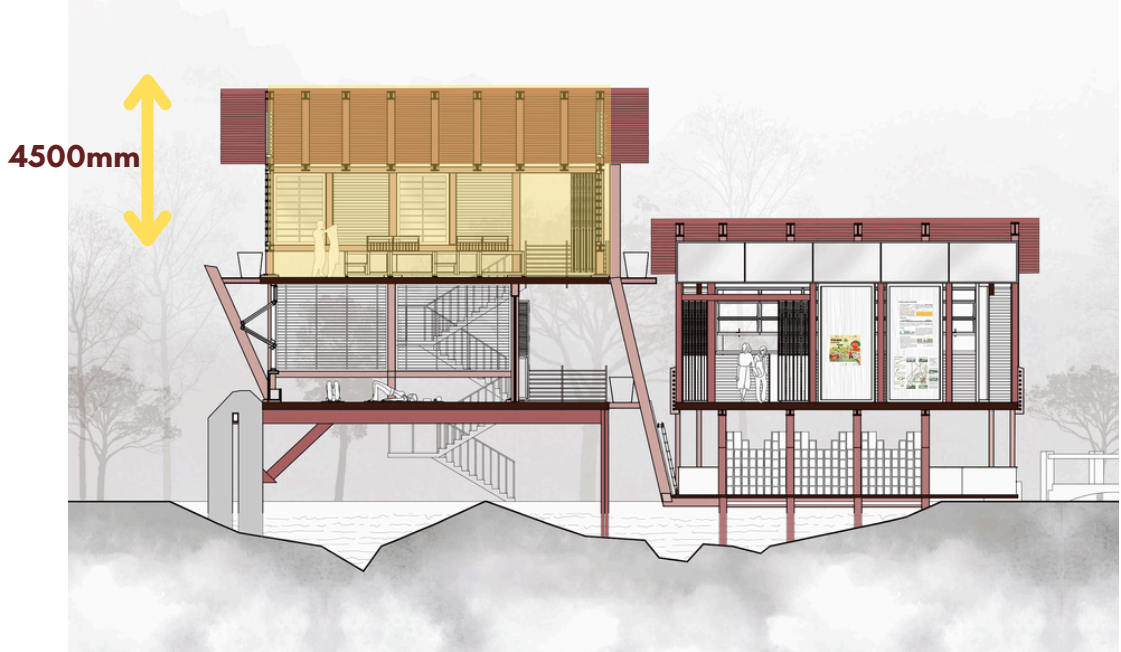
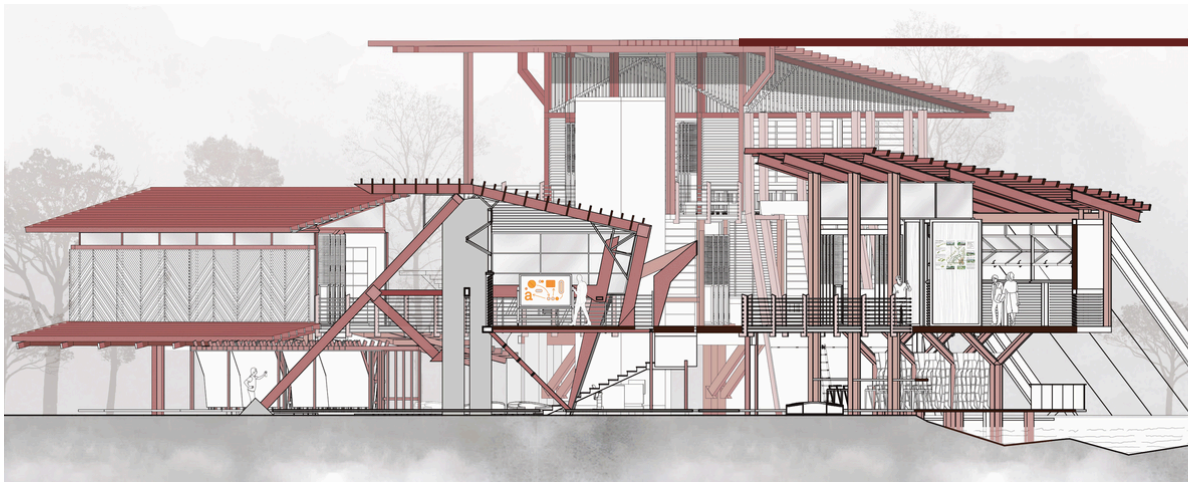
- Block high-angle sun (especially midday) to reduce glare and heat gain while allowing ambient light in.



3.0 Daylighting

Printed ETFE Roof

To optimize natural daylight within the workshop using a printed ETFE roof system, reducing reliance on artificial lighting while minimizing solar heat gain, glare, and energy consumption.



Enhanced Daylight Distribution

- The fritted pattern scatters direct sunlight, spreading light evenly across the interior.
- Reduces the need for artificial lighting during the day by up to 60-80%

Glare Control

- Printed patterns cut down on harsh direct sunlight, making it ideal for visual comfort in a working environment.

Comfortable Environment

- Keeps indoor temperatures and light levels consistent for relaxation and focus-based programs (e.g. workshops, multipurpose events).

Visual Connection to Nature

- Maintains transparency or semi-transparency, allowing views of the sky or treetops—supporting biophilic design.

ETFE Advantages

- lightness
- high heat insulation
- high light transmission
- self-cleaning
- durable

Plant buffers

Replace or complement hard barriers (like solid walls or fences) with living, breathable green systems.



Improves Daylighting

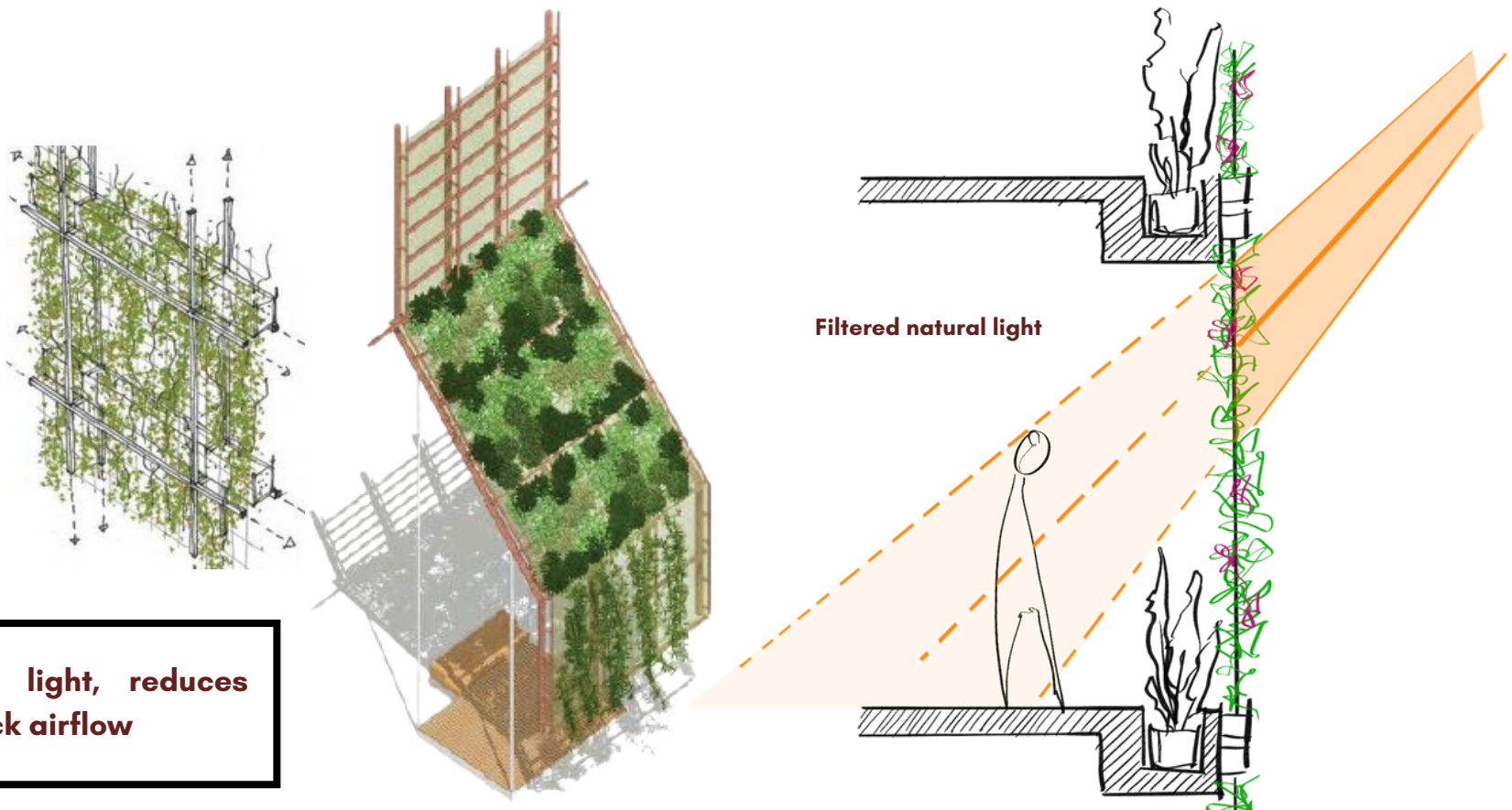
- Allows soft, filtered natural light to enter.
- Reduces the need for artificial lighting during the day.

Reduces Glare & Heat Gain

- Blocks harsh direct sunlight while allowing brightness.
- Keeps interiors cooler without full shading.

Adds Thermal Buffer

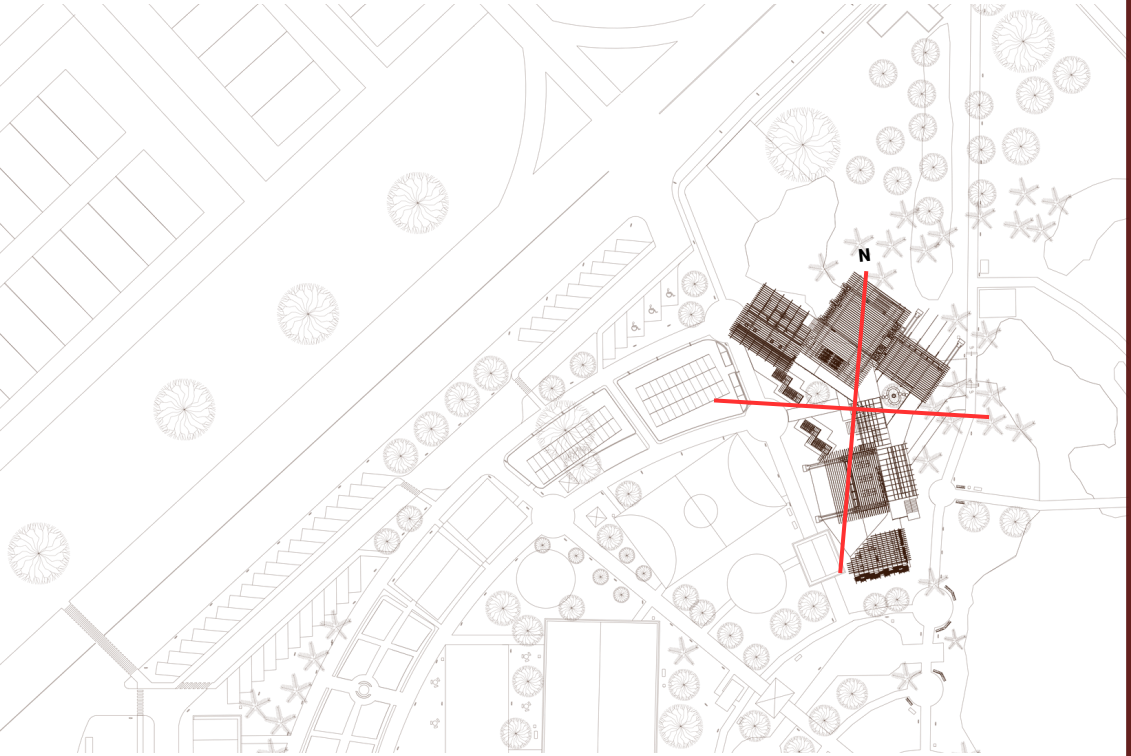
- Acts as a natural insulation layer against heat.
- Lowers surface temperature around the wall.



Creepers ; Curtain Creeper, Climbing Fig	Vertical filter	Lets in dappled light, reduces glare, doesn't block airflow
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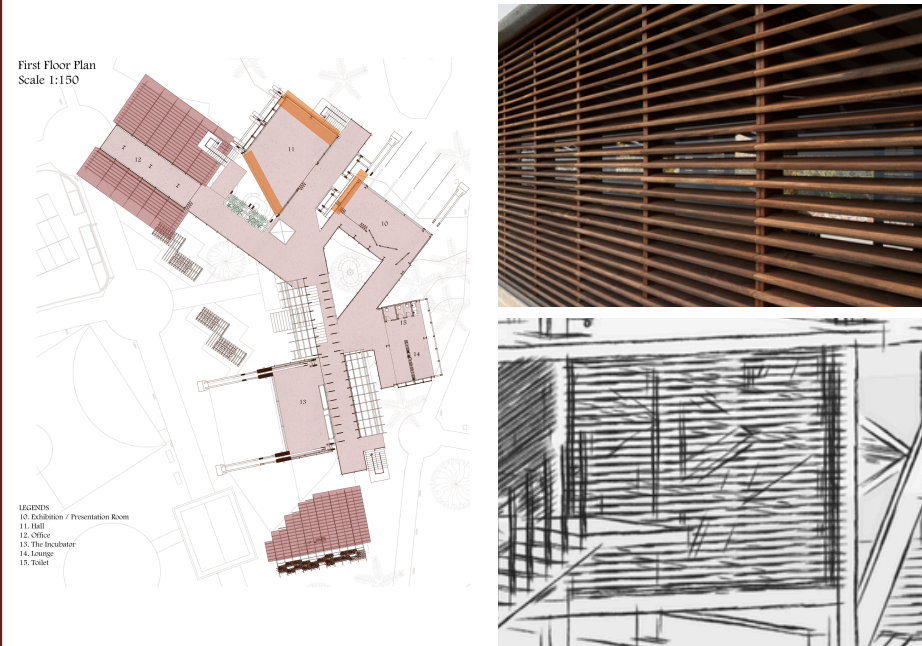
4.0 Facade Design

This wellness centre’s façade is designed to cater to biophilic principles and to optimise natural daylight, ventilation, and visual connectivity with the surrounding greenery—creating a calming, health-supportive environment that blends seamlessly with the park’s natural setting.

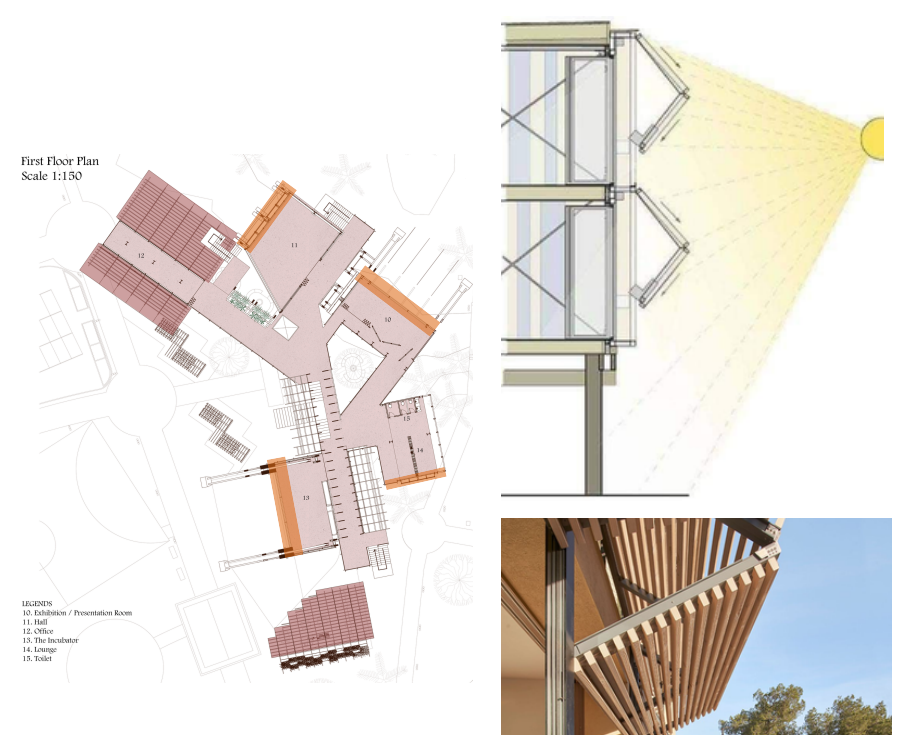


- Orientation: North-South Elongation**
- The building’s long axis runs north-south, which is ideal for Puchong’s hot, humid climate because:
- **Minimizes East/West Exposure:** Reduces heat gain from harsh low-angle sun, especially in the afternoon.
 - **Supports Biophilic Design:** Orientation opens up to surrounding greenery and allows consistent daylight without glare, enhancing comfort and connection to nature.

Timber Screens

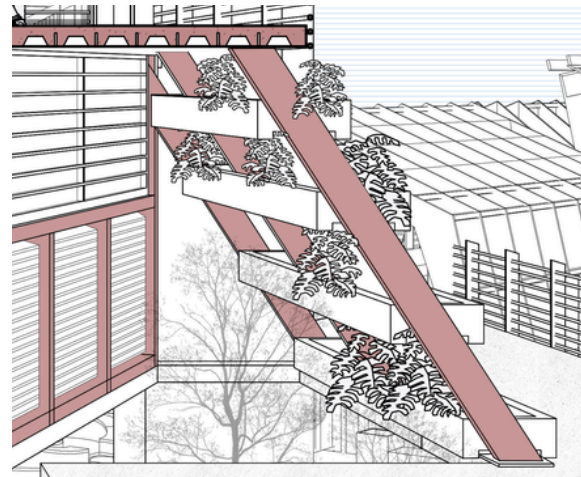


- 1. Fixed Timber Screens**
- **Consistent Shading:** Provides permanent protection from harsh sun, especially useful on east and west façades.
 - **Reduces Heat Gain:** Blocks direct solar radiation, helping to lower indoor temperature passively.
 - **Encourages Diffused Daylighting:** Allows soft light penetration while reducing glare and UV exposure.
 - **Low Maintenance:** No moving parts; ideal for areas where frequent adjustment isn’t necessary.
 - **Durability:** When placed correctly, it shields glass and walls from rain and sun, prolonging façade lifespan.

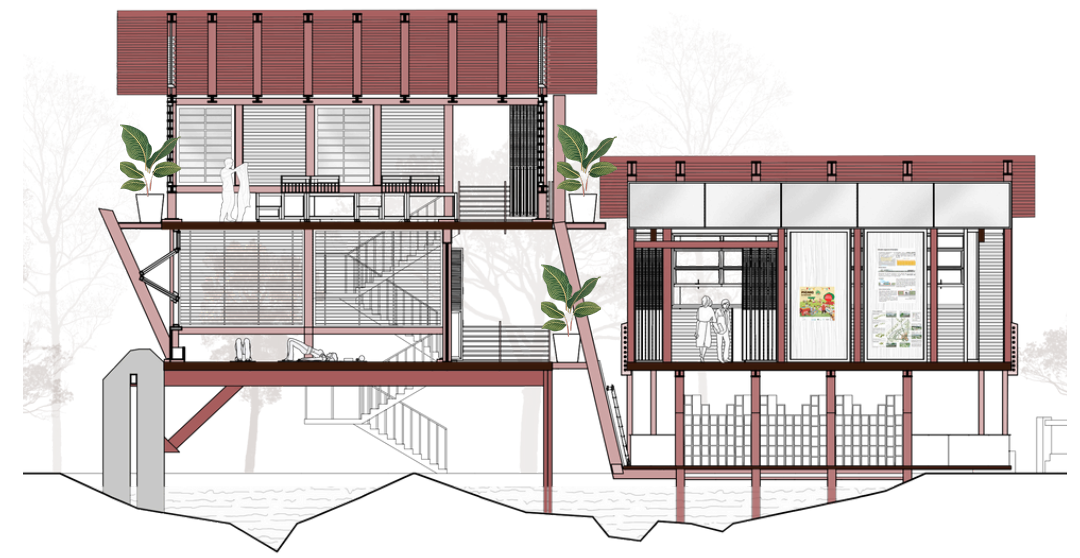


- 2. Foldable Timber Screens (Operable)**
- **Adjustable Solar Control:** Users can open or close based on sun position, activity needs, or weather—maximizing comfort and energy efficiency.
 - **Enhanced Ventilation:** Can be opened to allow full cross-ventilation when conditions are favorable, reducing reliance on mechanical cooling.
 - **Adaptive Comfort:** Useful in multi-use spaces, can offer privacy, shade, or openness when desired.
 - **Material Efficiency:** When closed, protects internal finishes and glass; when open, reduces overuse of artificial lighting.

Integrated Planter Box

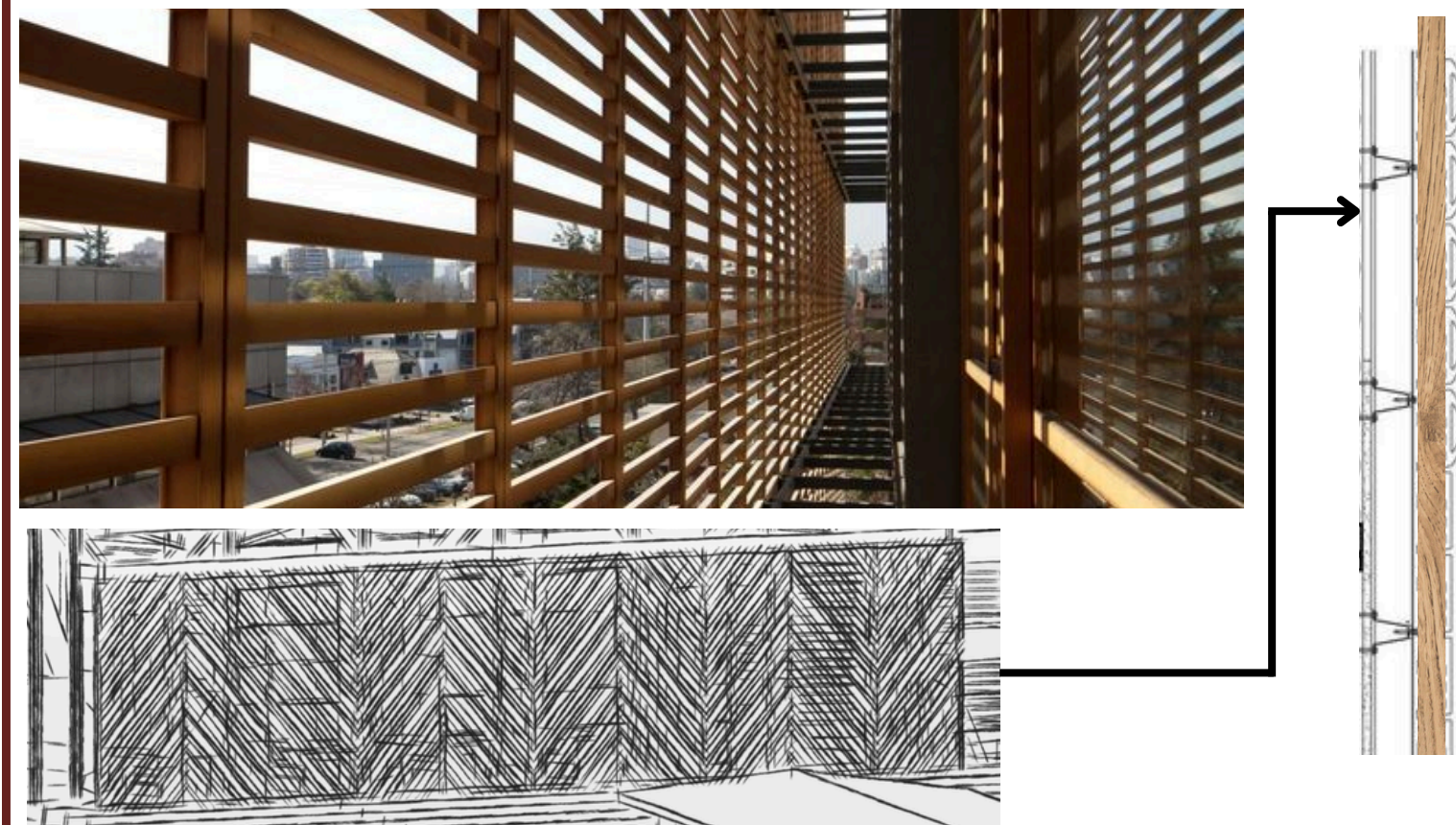


- **Thermal Buffer:** Vegetation in planter boxes shades building surfaces and act as a barrier; reducing direct heat absorption and lowering indoor temperatures.
- **Improved Air Quality:** Plants naturally filter dust and pollutants, improving air quality near openings and breathing zones.
- **Evaporative Cooling:** Moisture from soil and foliage cools surrounding air, creating a microclimate that enhances thermal comfort.
- **Daylight Filtering:** Strategically placed foliage filters harsh sunlight, allowing soft, diffused daylight into indoor spaces—reducing glare and the need for artificial lighting.



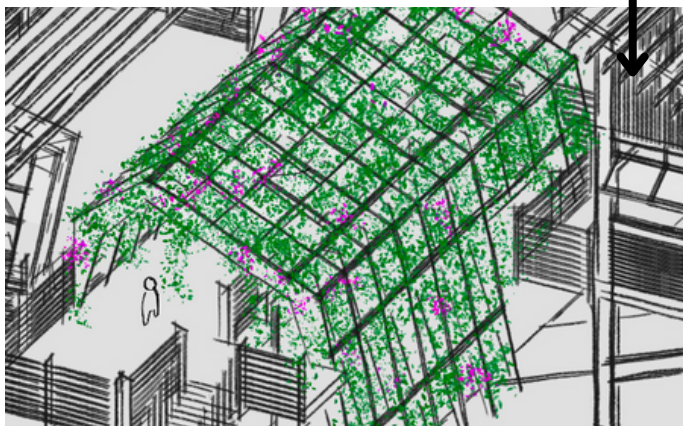
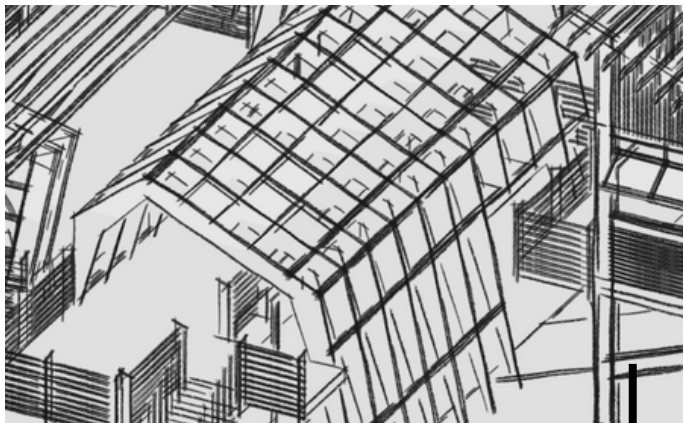
4.0 Facade Design

Timber Double-Skin Façade



- Thermal Buffer: Creates an air gap that acts as insulation, lowering indoor temperatures and reducing the need for air conditioning.
- Ventilated Cavity: Enhances stack ventilation—hot air rises between the two layers and escapes, drawing cooler air inside.
- Moisture Protection: Outer layer shields the building from direct rain, while inner layer stays dry, increasing material longevity.
- Energy Efficiency: Minimizes artificial cooling load by regulating heat transfer.
- Natural Material: Encourages lower environmental impact with renewable, biodegradable timber options.

Shaded Green Portals (for Walkways)



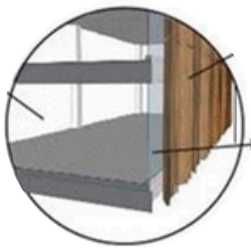
- Evaporative Cooling: Living plants release moisture into the air, reducing surrounding temperatures naturally.
- Filtered Light: Vines and climbers reduce glare and direct sun while letting diffused light pass through.
- Dust & Noise Mitigation: Dense plantings trap dust and muffle sounds, improving air and acoustic quality.
- Carbon Sink: Living plants absorb CO₂, improving the building's microclimate and reducing environmental impact.
- Rainwater Use: These green portals can integrate rainwater irrigation systems for low-maintenance upkeep.

Types and Materials



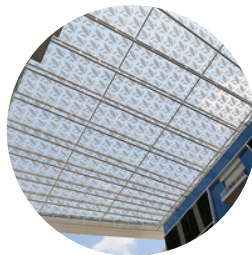
Integrated Planter Boxes (Façade Design)

- Material: Concrete, metal, or timber planter modules
- Benefits:**
- Provides insulation to façade walls
 - Encourages biodiversity and natural aesthetics



Timber Double-Skin Façade

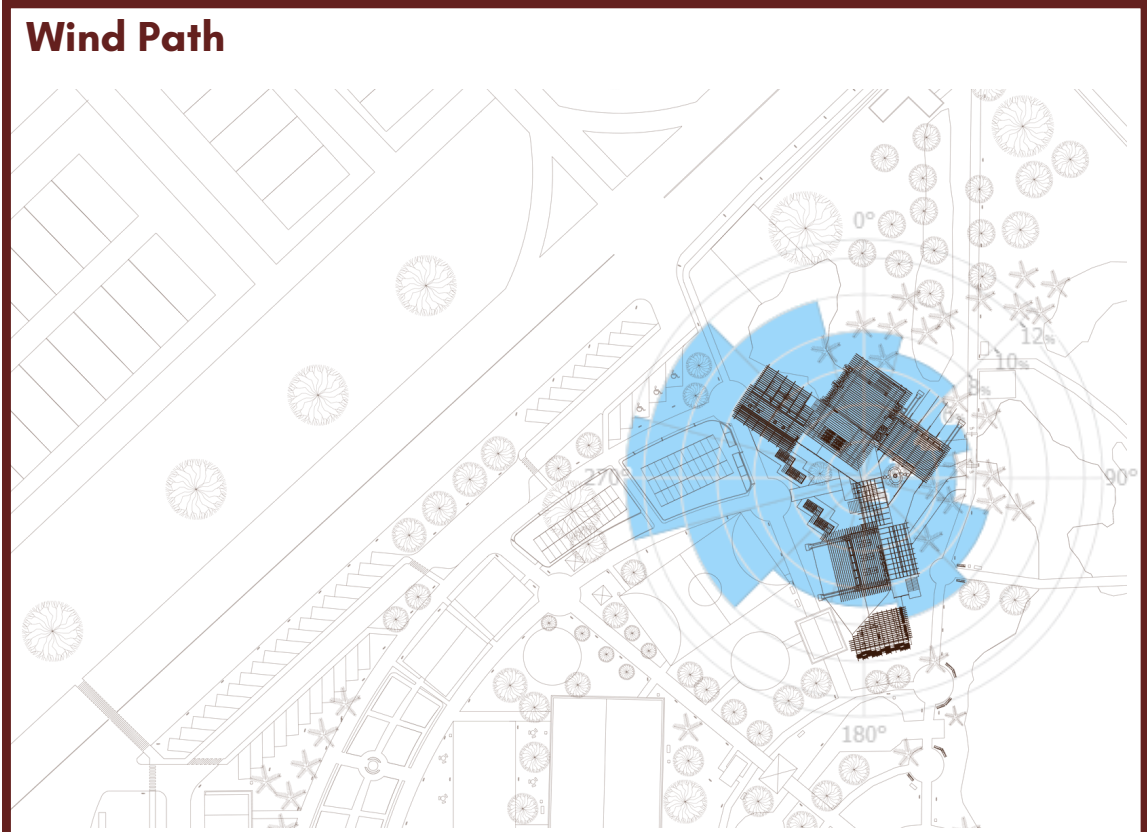
- Material: Timber outer screen + glazed inner façade
- Benefits:**
- Creates buffer zone for heat insulation
 - Encourages stack effect for passive ventilation
 - Controls glare while allowing daylight



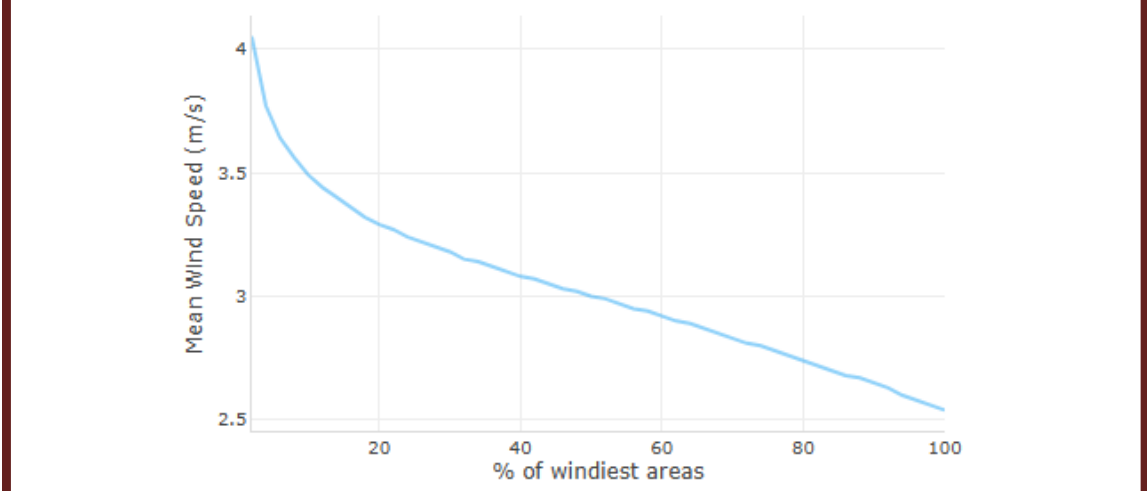
ETFE Roof (Printed)

- Material: ETFE membrane
- Benefits:**
- Allows diffused daylight → reduces artificial lighting
 - Printed surface controls glare & heat
 - Lightweight → less structural material
 - Durable & recyclable

5.0 Natural Ventilation

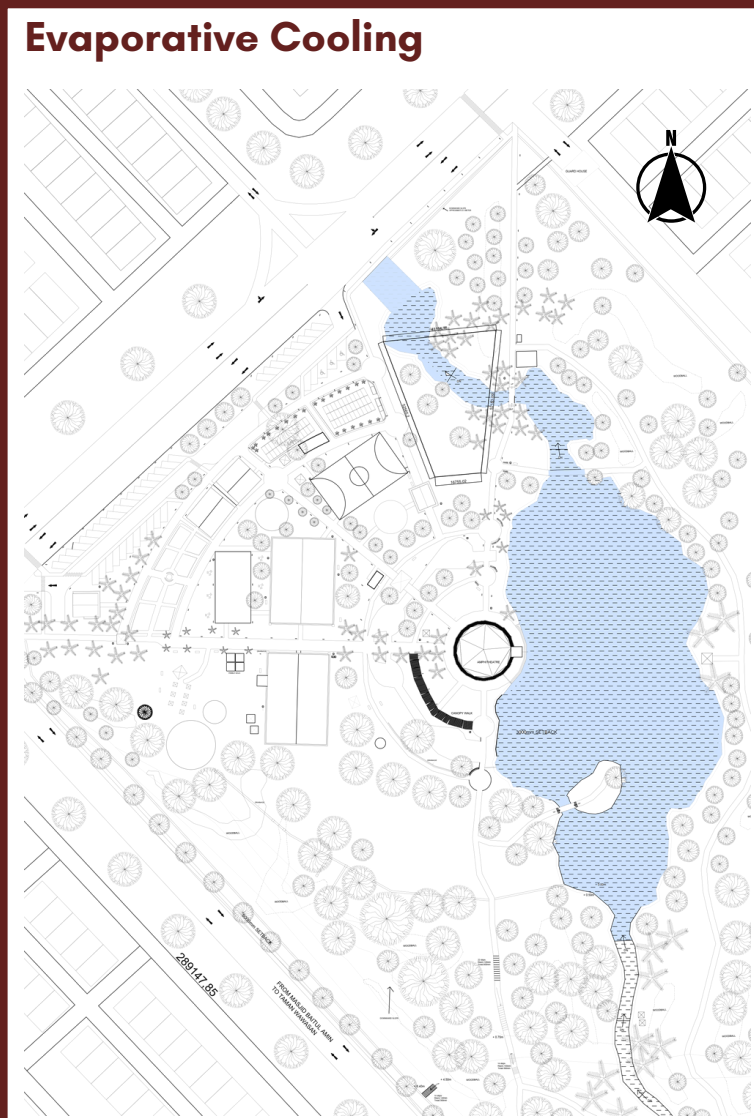


Intense North, South and West winds facilitate natural ventilation as the building is oriented to be penetrated from multiple semi-open spaces. Fewer wind enter from the Eastern facade.



Building is elongated along Northern and Southern direction to ensure most efficient cross Ventilation

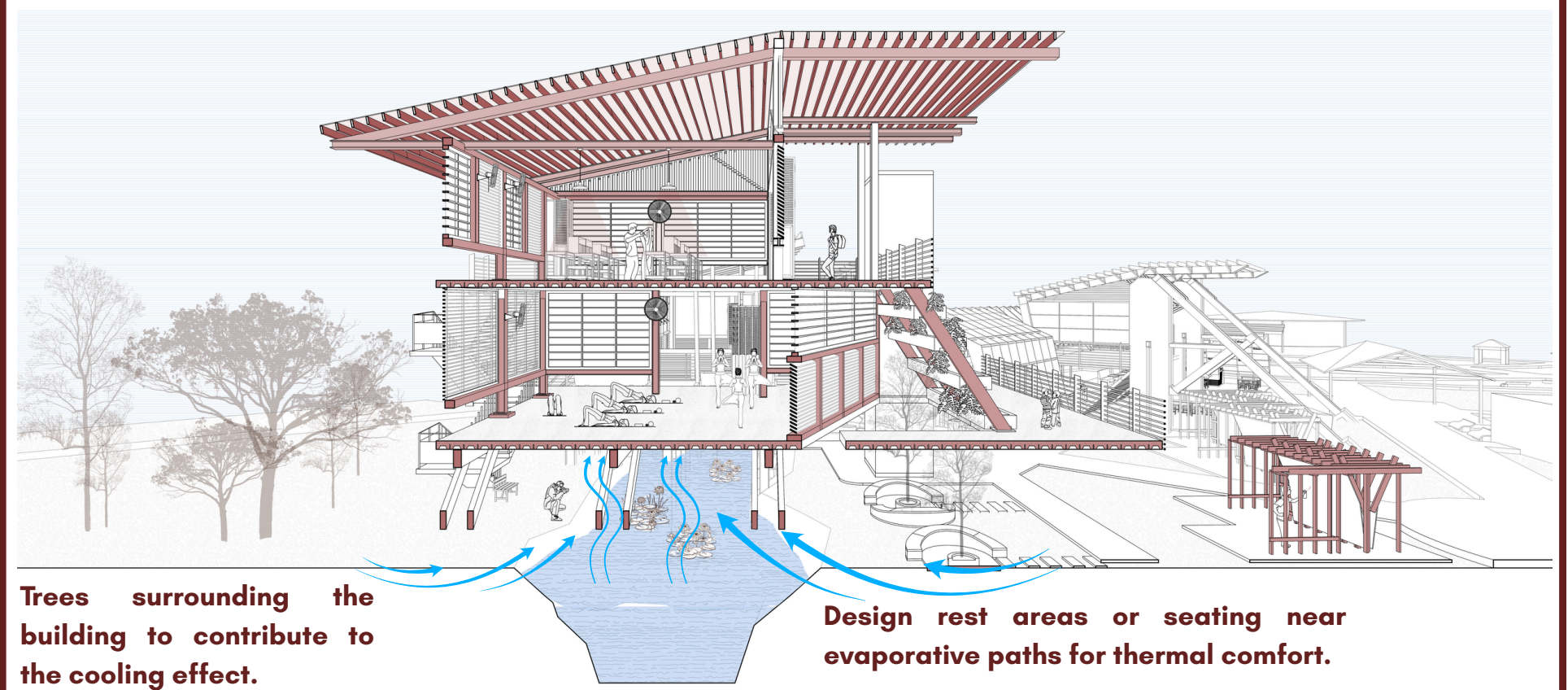
- Green Strategy Benefits (Natural Ventilation):**
- Reduces energy demand by minimizing reliance on mechanical cooling.
 - Improves indoor comfort and air quality naturally.
 - Supports climate-responsive design tailored to local wind patterns.



- Prevailing winds pass over the water surface, picking up moisture and cooler temperatures.
- Creates a natural evaporative cooling effect, lowering the temperature of air entering the building.
- Helps maintain a cooler indoor environment without heavy use of mechanical cooling.
- Supports thermal comfort for occupants in hot and humid weather
- Enhances the building’s energy efficiency and aligns with passive green strategies.

- Material Choices**
- Use high thermal mass materials like concrete inside; they store the cooler air longer.
 - Surfaces near water features is light-colored to reduce heat gain and keep air cooler.

Health & Wellness Connection:
Cool, moist air enhances comfort and reduces fatigue, while water, wind, and greenery support mental well-being.



5.0 Natural Ventilation

Airwell (Mini Courtyard)



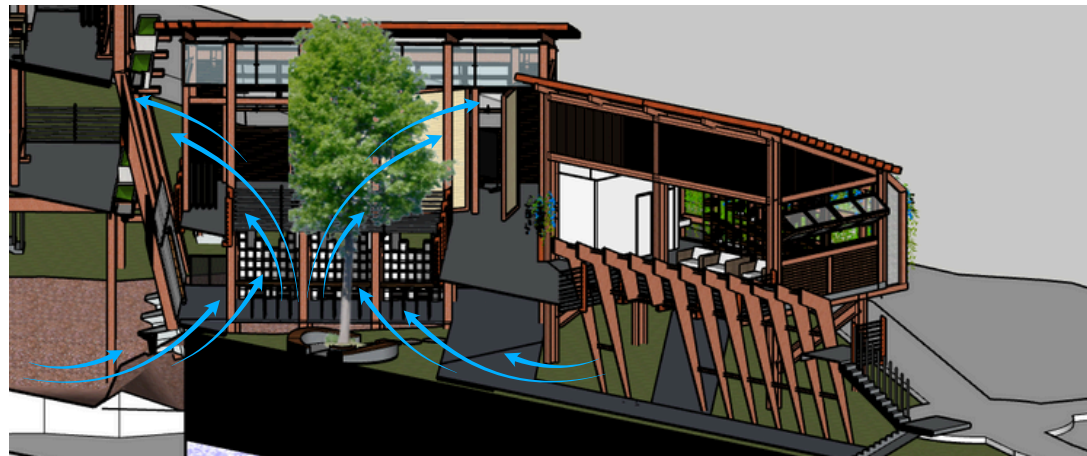
Airwell is a small, open-to-sky courtyard or vertical void within the building footprint that allows light and air to circulate between indoor spaces.

Improves Indoor Air Quality

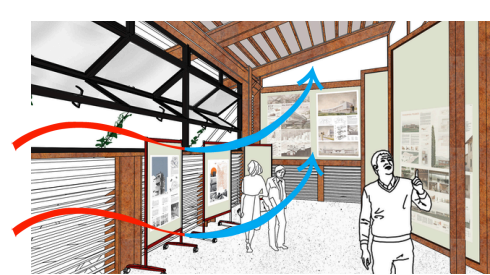
- Allows stale air and heat to escape from internal spaces.
- Encourages fresh air inflow, reducing the need for mechanical ventilation.

Microclimate Creation

- Planted with lush greenery with closer water features to cool air passing through.
- Enhances evaporative cooling and creates a calm, shaded environment.

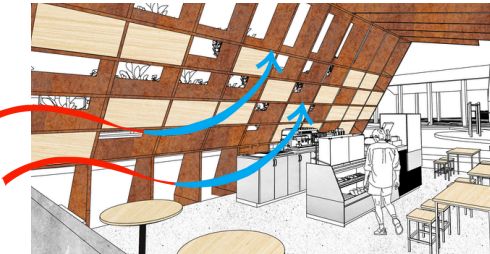


Cross Ventilation



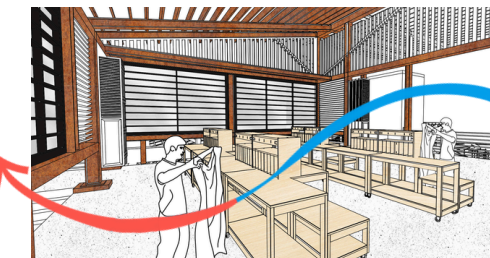
Paired Openings (Windows, Timber Screens, Louvers)

→ Openings on opposite sides of each room allow wind to enter and exit freely, cooling interior spaces without mechanical aid.



Open Floor Planning

→ Visuals show unobstructed internal layouts, enabling wind to flow through multiple rooms.
→ Great for shared spaces like dining, workshops, or yoga zones.

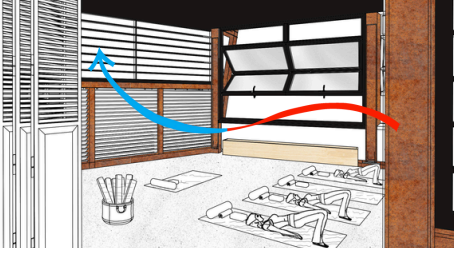
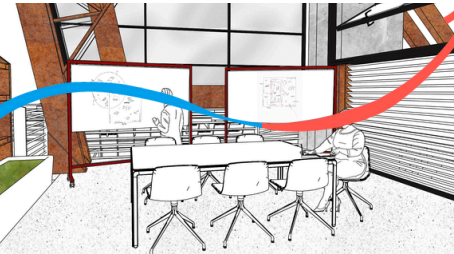
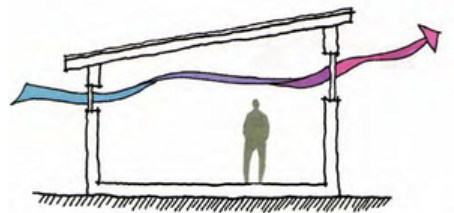


Height Variation in Openings

→ Lower-level intakes and higher-level outlets enhance thermal uplift, drawing warm air out more efficiently.

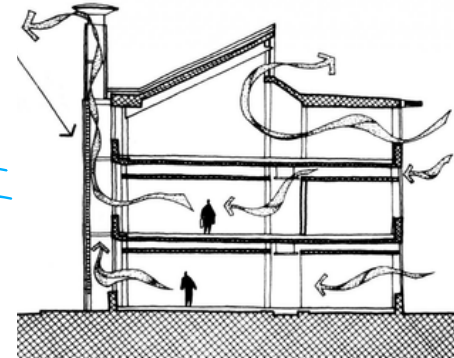
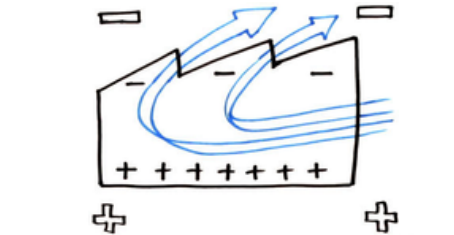
Adjustable Timber Screens and Louvers

→ Allow controlled airflow depending on weather conditions and desired comfort.
→ Especially helpful in Malaysia's tropical climate to manage rain and humidity.

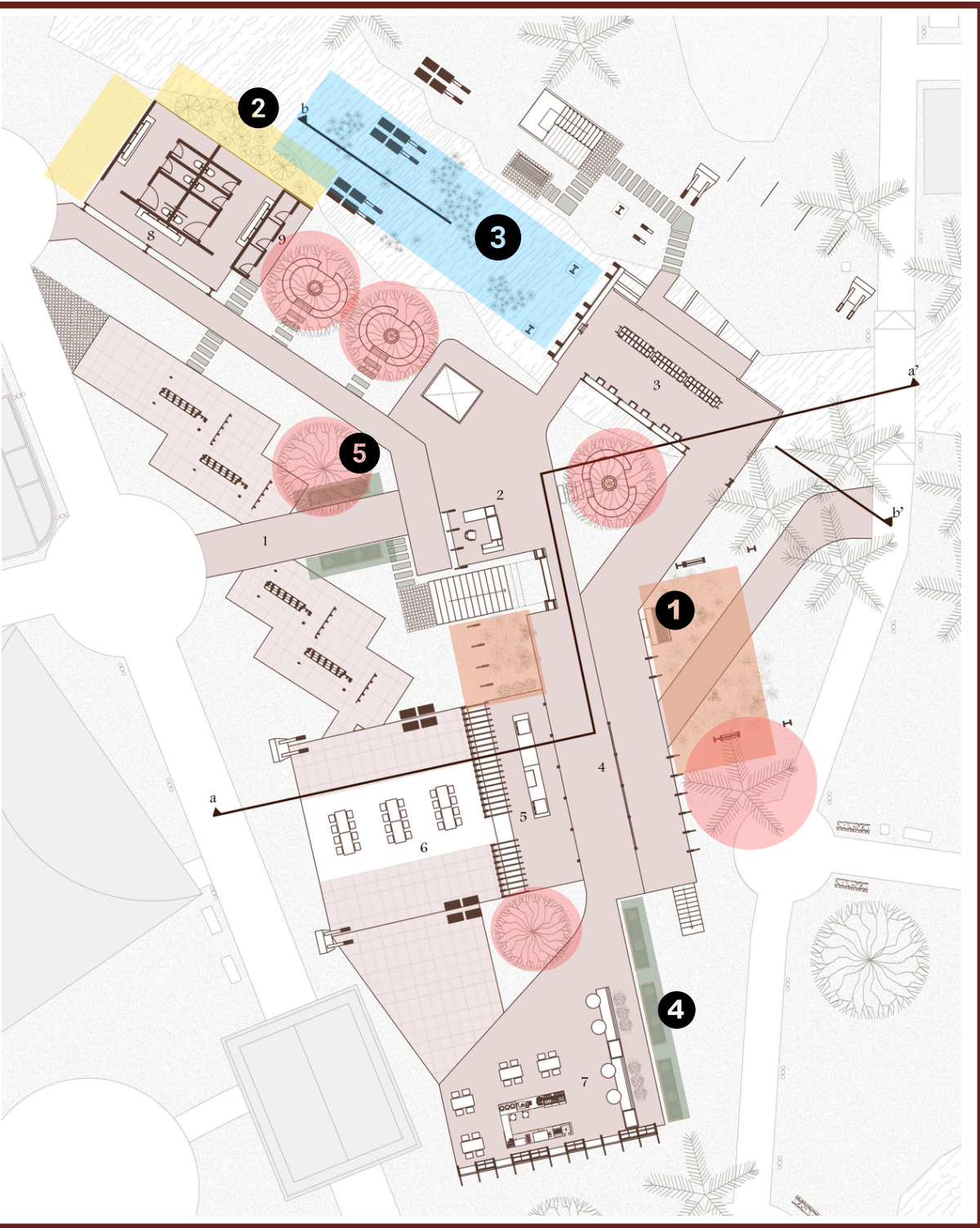


Stacked Ventilation

- **Cool air** enters from low-level openings — shaded, open-air pathways, underfloor voids, and open facades.
- As this air warms inside the building , it rises naturally due to reduced density.
- **Warm air** is then expelled through high-level vents, clerestories, open gables — creating continuous airflow upward and out.
- This pressure difference between low and high zones drives passive ventilation through all levels.



6.0 Strategic Landscaping



1 Shade-Tolerant Plants

- Enhances microclimate cooling through transpiration even in low-sun areas.
- Increases green surface coverage without needing direct sunlight.
- Reduces soil erosion in hard-to-plant shaded areas.
- Improves air quality and visual softness in shaded courtyards or walkways.



- *Asplenium nidus* (Bird's Nest Fern) – thrives in damp, shaded areas



- *Calathea* spp. – vibrant leaf patterns, low light tolerance



- *Philodendron* spp. – hardy and great for under-canopy zones



- *Dieffenbachia* spp. (Dumb Cane) – robust and decorative

2 Fragrance Plants

- Natural deodorizer – masks undesirable odors in functional zones like toilets.
- Improves user comfort and experience, especially in semi-outdoor spaces.
- Attracts beneficial insects like bees, improving local biodiversity.
- Reduces the need for artificial air fresheners, making it low-energy passive aromatherapy.



- *Kemboja* (Plumeria) – iconic, fragrant, and low-maintenance

- *Pandan* – natural aroma, culinary & cultural value



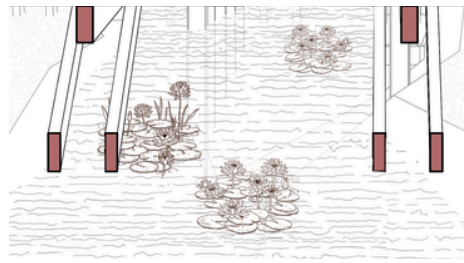
- *Jasminum sambac* (Melur) – compact and highly fragrant

- *Banana Shrub* – small flowers with a fruity scent



3 Water Lilies

- Promotes evaporative cooling in the microclimate.
- Improves air humidity and reduces dust.
- Supports aquatic biodiversity and filters water naturally.



4 Bioswale

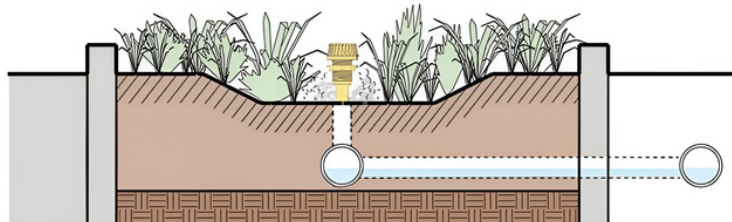
- Filters stormwater runoff, removing pollutants before reaching natural waterways.
- Slows water movement, reducing erosion.
- Recharges groundwater table and prevents flash floods.
- Enhances ecological connectivity.



Vetiveria zizanioides
(Vetiver Grass)

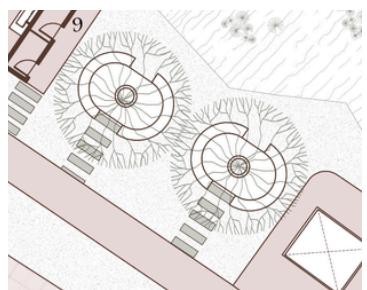


Hymenocallis littoralis
(Spider Lily)



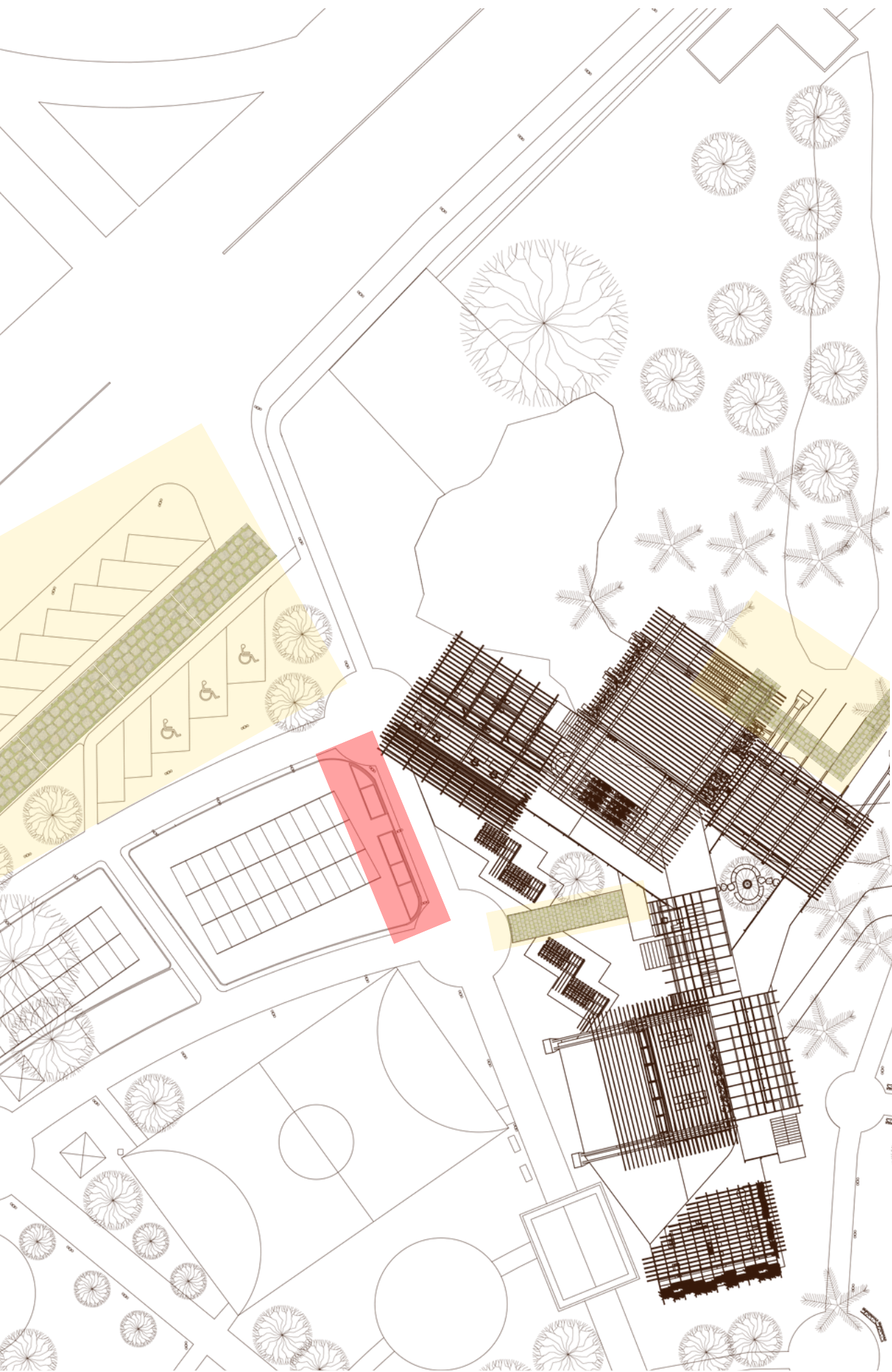
5 Preserved Trees

- Reduces the carbon footprint by conserving existing mature vegetation.
- Maintains local ecology and fauna habitats.
- Provides immediate shade and climate regulation.
- Retains cultural or site memory if trees are native/meaningful.



Preserve trees by introducing seating/resting area; trees also act as shading.

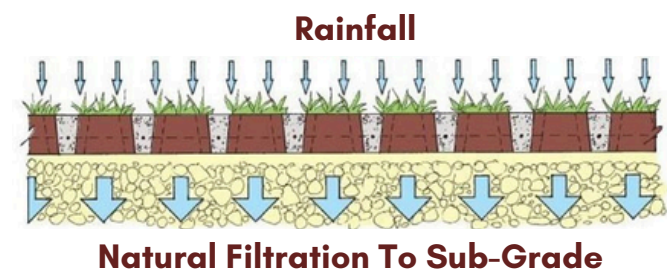
6.0 Strategic Landscaping



1 Grasscrete as a Green Strategy in Landscaping

1. Stormwater Management

- Permeability: Unlike asphalt, grasscrete allows water to infiltrate the ground.
- Reduces surface runoff, lowering the risk of flash flooding and erosion.
- Recharges groundwater naturally, supporting local water cycles.



2. Reduction of Urban Heat Island Effect

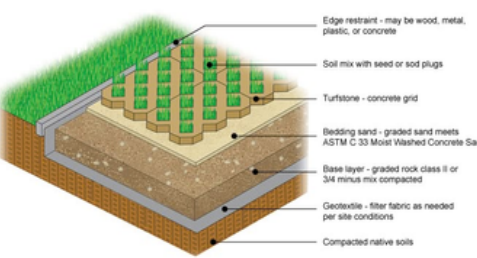
- Grasscrete absorbs less heat compared to dark, heat-retaining asphalt.
- Vegetation within the pavers helps keep surrounding temperatures lower.

3. Air Quality Improvement

- Vegetated surfaces can filter dust and pollutants from the air.
- Grass in grasscrete can absorb CO₂, contributing to a healthier microclimate.

4. Sustainable Construction Material

- Grasscrete systems often use recycled concrete or modular blocks.
- Low-maintenance and long-lasting, reducing the need for frequent repairs or replacements.



2 Dried Leaves Crate

On-Site Organic Waste Recycling

- Collects dried leaves from the surrounding vegetation instead of sending them to landfill.
- Encourages low-carbon, closed-loop waste management within the site.

Composting into Fertiliser

- Over time, the dried leaves naturally decompose inside the crate.
- The resulting organic compost becomes a chemical-free fertiliser, ideal for:
 - Shade-tolerant plants
 - Fragrance plants
 - Trees and bioswales around the Wellness Centre



7.0 Conclusion and Reflection

Working on this wellness centre project within the context of Taman Wawasan Recreational Park has deepened my understanding of how green strategies are essential in shaping environmentally responsive and human-centered design. From the early stages of site analysis, I've learned how to interpret climate data, sun paths, wind directions, and natural site features to inform decisions that promote sustainability and passive performance.

I now clearly understand how natural ventilation systems—such as cross ventilation, stack effect, and airwells—can be strategically applied based on wind flow diagrams and site orientation to reduce reliance on mechanical cooling. Similarly, evaporative cooling, facilitated through nearby water bodies and shaded vegetation, became a critical passive cooling strategy I was able to incorporate thoughtfully into my space planning.

I also developed a strong appreciation for daylighting techniques such as ETFE roofs, light shelves, timber screening, and double-skin facades, all of which not only reduce energy consumption but also improve indoor comfort and mental well-being. Integrating these elements taught me that energy efficiency and spatial quality can work hand in hand. This project also made me realise how landscape elements, like strategically placed trees, plant buffers, bioswales, and composting systems, can contribute far beyond aesthetics—they play a critical role in thermal comfort, waste reduction, biodiversity, and community interaction.

Most importantly, this project helped me shift my mindset from thinking of green features as “add-ons” to viewing them as core design principles. I now understand that green strategies must be embedded at every level—from site planning to material selection—especially in Malaysia's tropical climate, where nature should be embraced, not resisted.



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