ASSIGNMENT 2 | ARC61804 GREEN STRATEGIES FOR BUILDING DESIGN

TAYLOR'S UNIVERSITY
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PASSIVE GREEN BUILDING STRATEGIES REPORT

SCHOOL OF ARCHITECTURE AND BUILDING DESIGN (SABD)
BACHELORS OF SCIENCES (HONS) IN ARCHITECTURE

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1.1 SITE INFORMATION & CLIMATIC PROFILE

Location: Kebun Community USJ 7 Subang Jaya, Selangor.
Coordinates: 3°02'50"N 101°35'36"E

SITE INFORMATION

USJ7 Subang Jaya is a neighbourhood that sits within the urban landscape. A unique farming community has made efforts to transform the concrete jungle of Subang Jaya into a one-stop location for fresh produce and communal harmony. However, due to many issues faced in the site, the farming community struggles to turn this dream of a gardening haven into a reality. Small steps have been made, but bigger measures have to be taken in order for this feat to become a success.

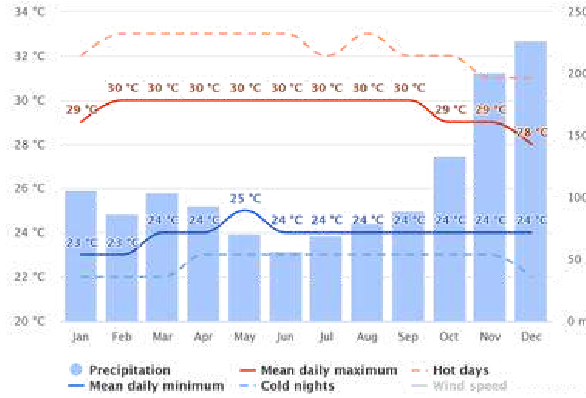
SITE ISSUES

Among the issues that the site faces is the **lack of community occupancy** in the site, **poor maintenance of public spaces** and **rainwater retention**.

1. **Lack of community occupancy** suggests that residents may not be actively engaging with one another or participating in communal activities. This could lead to social isolation and a weakened sense of community.
2. **Poor maintenance of public spaces**, such as parks, sidewalks, and recreational areas, suffer from neglect, leading to issues like broken equipment, unkempt greenery, and damaged infrastructure. This neglect can affect the aesthetic appeal and functionality of these spaces, making them less inviting for community use.
3. **Inadequate rainwater retention** measures can lead to increased surface runoff. Without proper systems in place, rainwater may flow over impermeable surfaces like roads and pavements. This can lead to localized flooding and water quality issues.

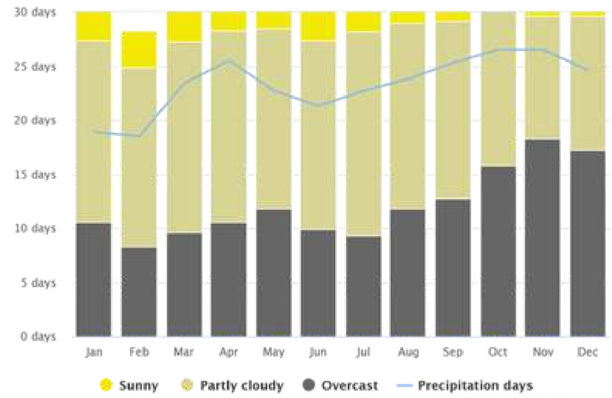
TEMPERATURE RANGES IN SUBANG JAYA

On a daily basis, Subang Jaya has a high of 30°C and a low of 23°C, causing hot and humid weather during the day and cooler temperatures at night. It rains most often during the monsoon season at the end of the year.



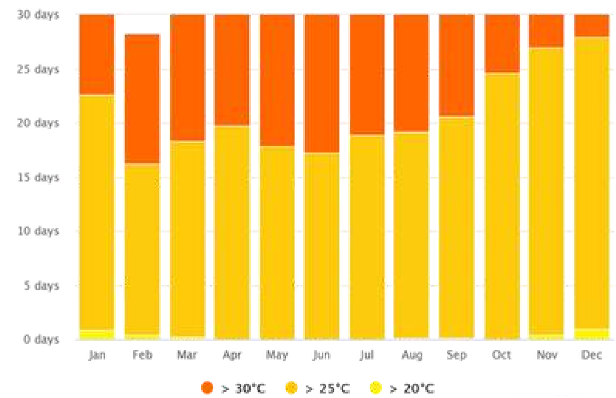
SKY COVER IN SUBANG JAYA

With more than 25 cloudy days in a month, around a third of those days are overcast with the rest of the days being sunny. The sky is mostly gloomy from October until December.



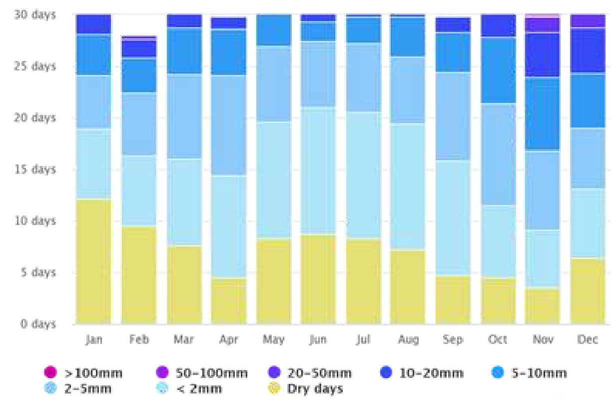
AVERAGE DAILY TEMPERATURES IN SUBANG JAYA

Most days in Subang Jaya are more than 25°C, with some days exceeding 30°C. With more than 10 days of hot temperatures, February and June would be the hottest months of the year while November till January are the coldest months of the year, during the monsoon season.



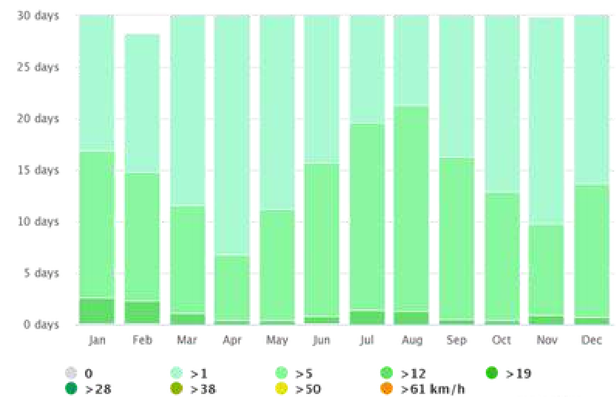
PRECIPITATION LEVELS IN SUBANG JAYA

Subang Jaya receives a lot of downpour in a year, with only an average of 7-8 days being dry in a month. The wettest months are at the end of the year due to the monsoon season, with November having the most wet days.



WIND SPEED IN SUBANG JAYA

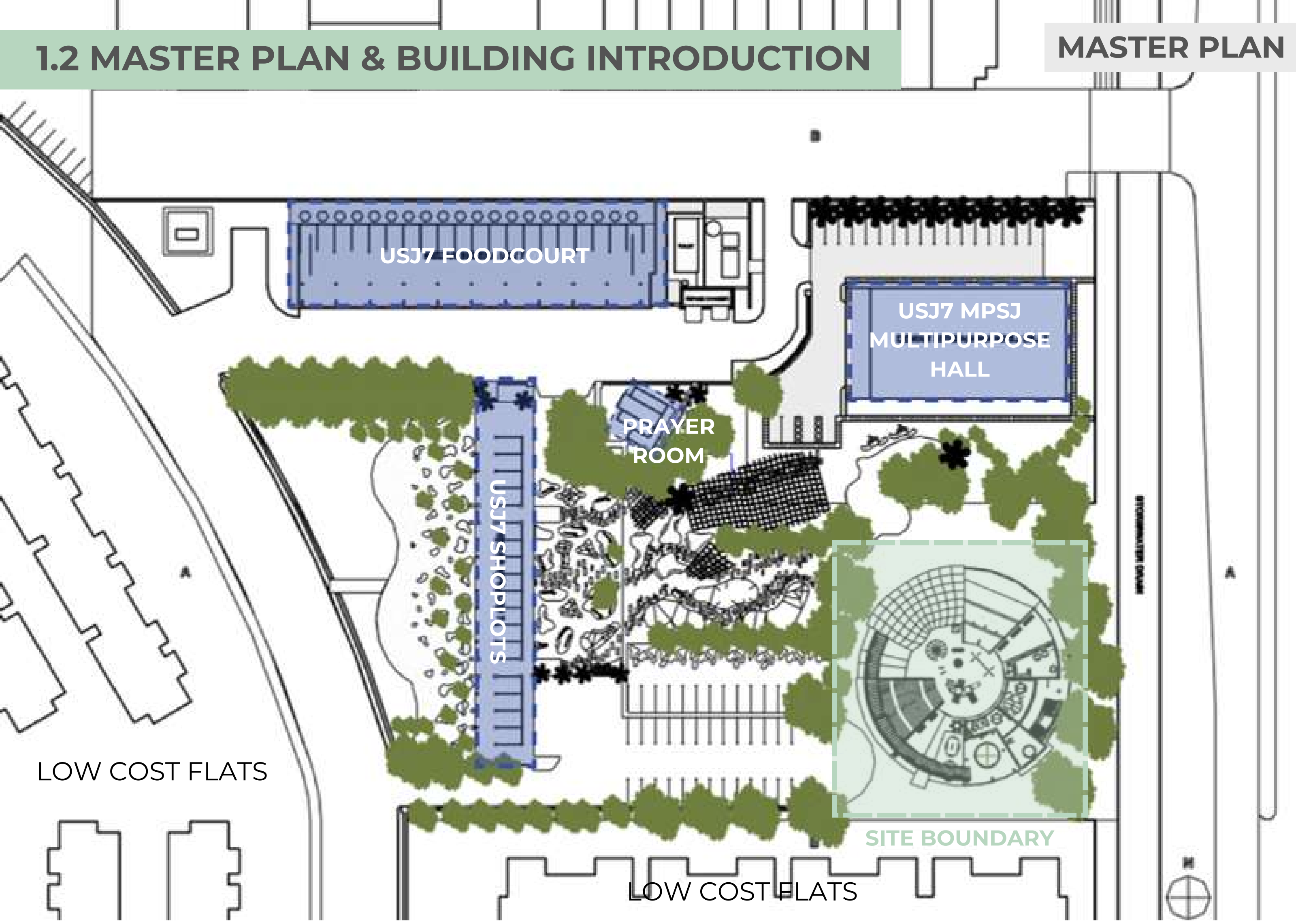
The strongest winds only reach less than 19km/h with the most winds coming from January to February and July to August. The average annual wind speed varies around 1-12km/h.

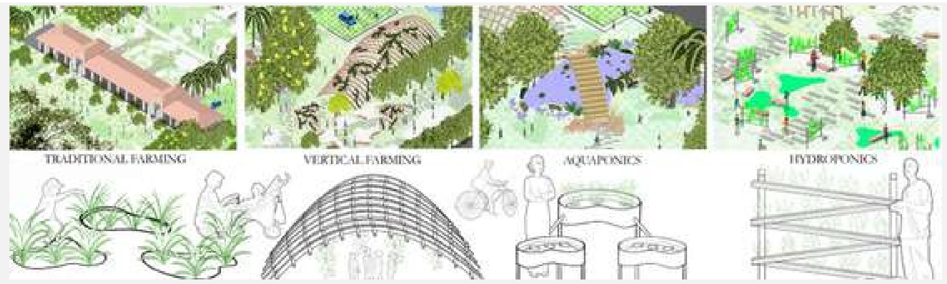


WIND ROSE CHART IN SUBANG JAYA

Subang Jaya receives prevailing winds from the South, West and North East direction; with regular wind speeds of 5-19km/h.

1.2 MASTER PLAN & BUILDING INTRODUCTION





THE OASIS - *THE WATERINGHOLE OF USJ7*

Function: Community Centre for Kebun Komuniti of USJ7

Description: Nestled in the heart of Subang Jaya, amidst the hustle and bustle of urban life, “The Oasis” emerges as a beacon of tranquility and community spirit. This innovative community building is a sanctuary tailored for the gardening community, designed with a special emphasis on creating an inviting space for families and fostering a sense of togetherness.

This structure envisions a harmonious blend of greenery, interactive spaces, and child-centric design elements to cultivate a vibrant community hub. The Oasis stands as a testament to the power of community-centric design, where a focus on gardening and nature serves as the catalyst for fostering relationships and creating shared experiences. This architectural narrative envisions a vibrant and harmonious community hub that not only brings together gardening enthusiasts but also embraces the diversity and joy of family life in the city.

1.3 BUILDING CONTEXTUAL DRAWINGS

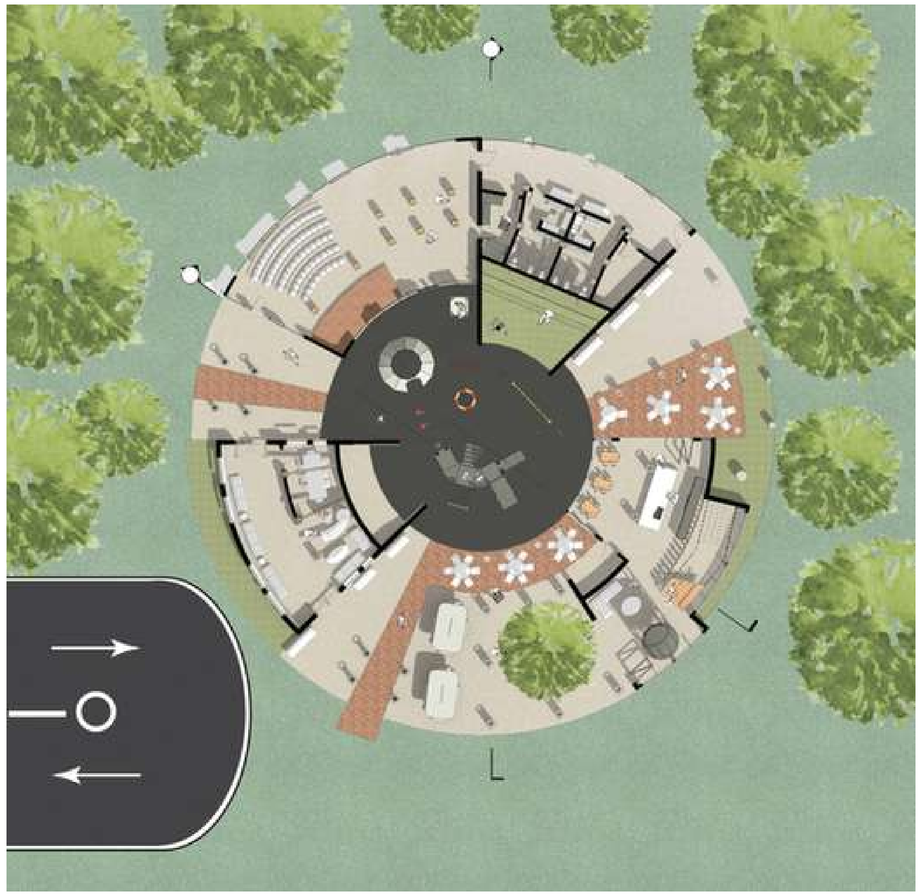
SOUTH ELEVATION

EAST ELEVATION

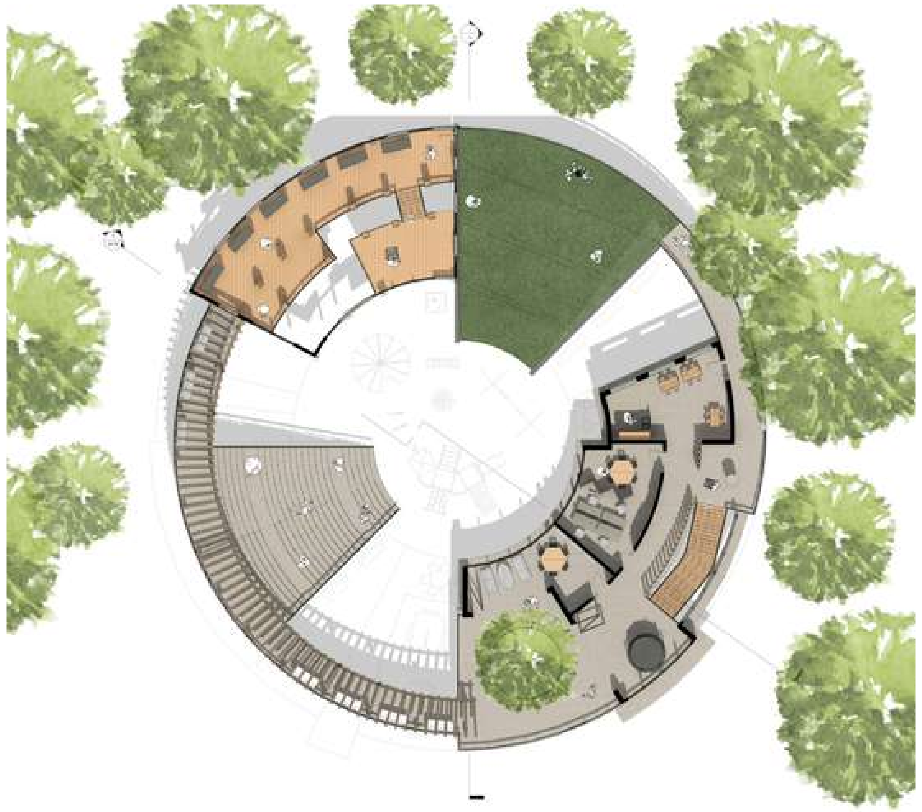
NORTH ELEVATION

WEST ELEVATION

SECTIONAL PERSPECTIVE



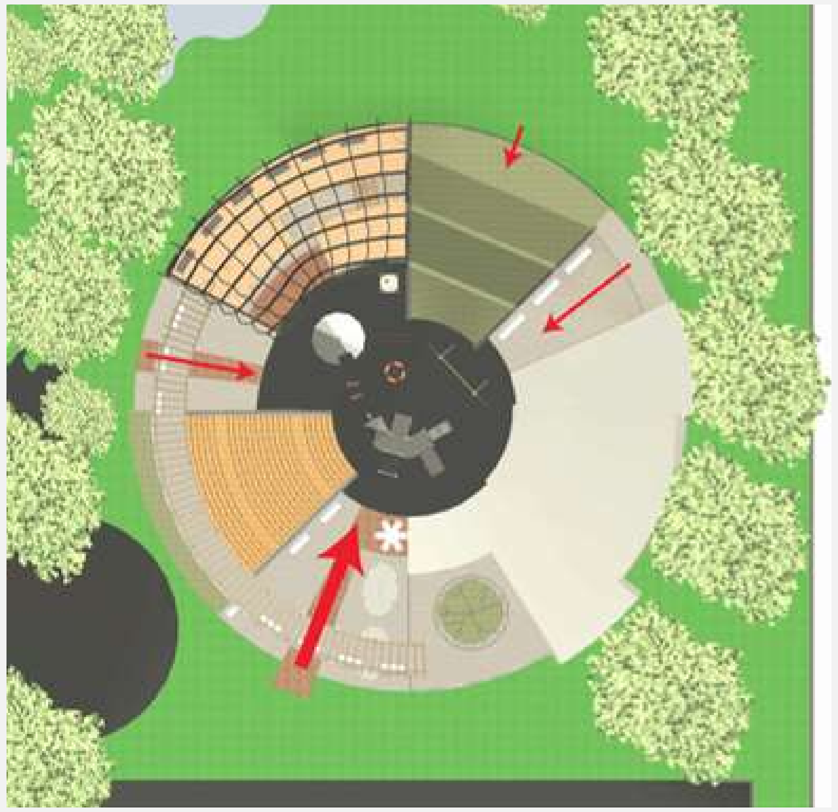
GROUND FLOOR PLAN



FIRST FLOOR PLAN

2.1 SITE PLANNING DIAGRAMS

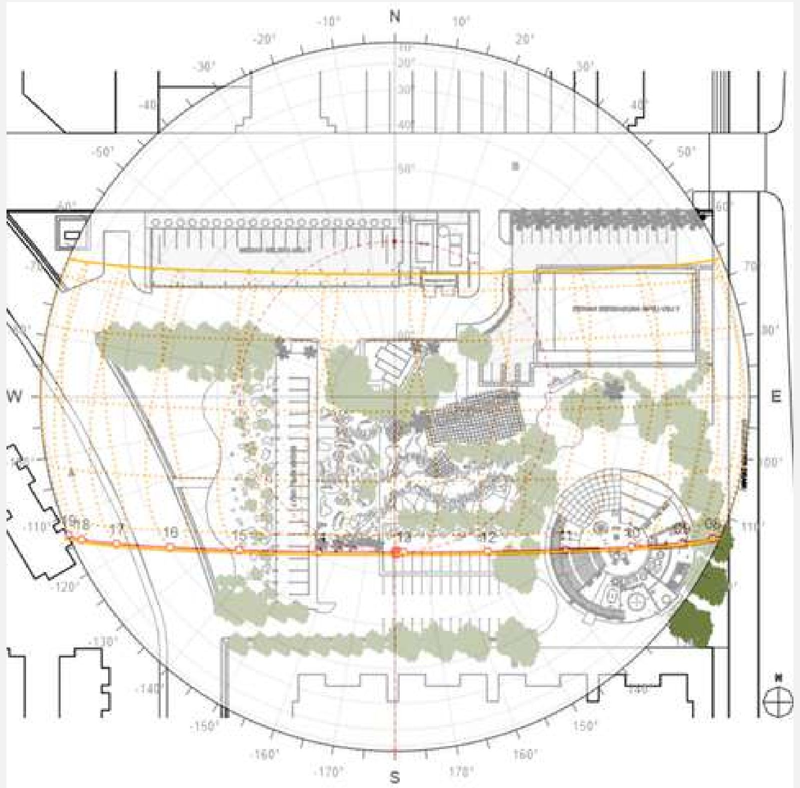
SITE CIRCULATION



MULTIPLE INGRESS & EGRESS OPTIONS

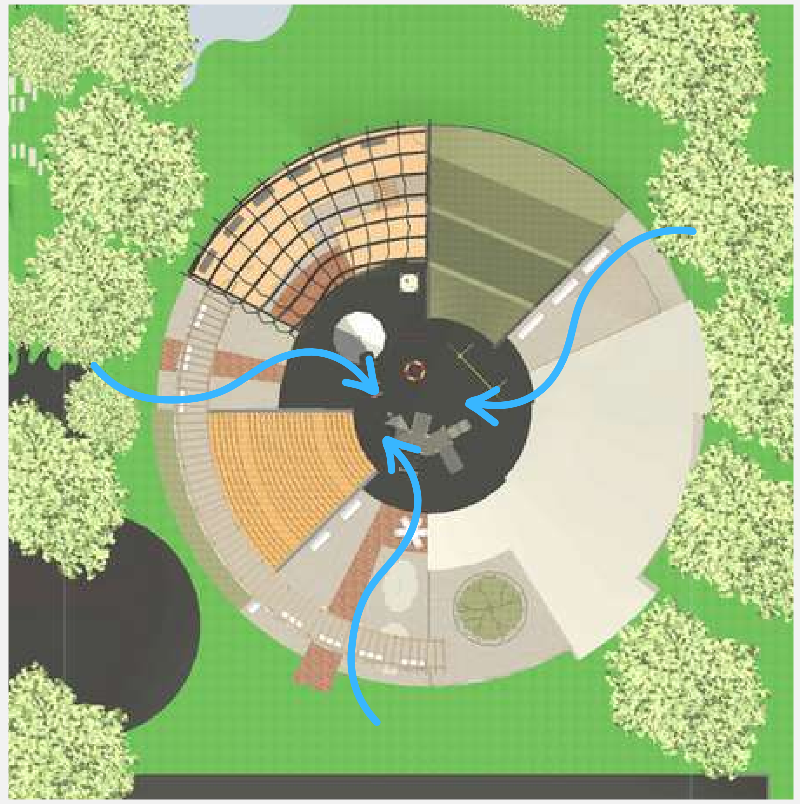
The building has 1 main entrance at the south end, with 2 alternative entrances/exits at the west and north-east side. This promotes multiple ingress and egress options that connects the building with the elements of the macrosite.

BUILDING ORIENTATION



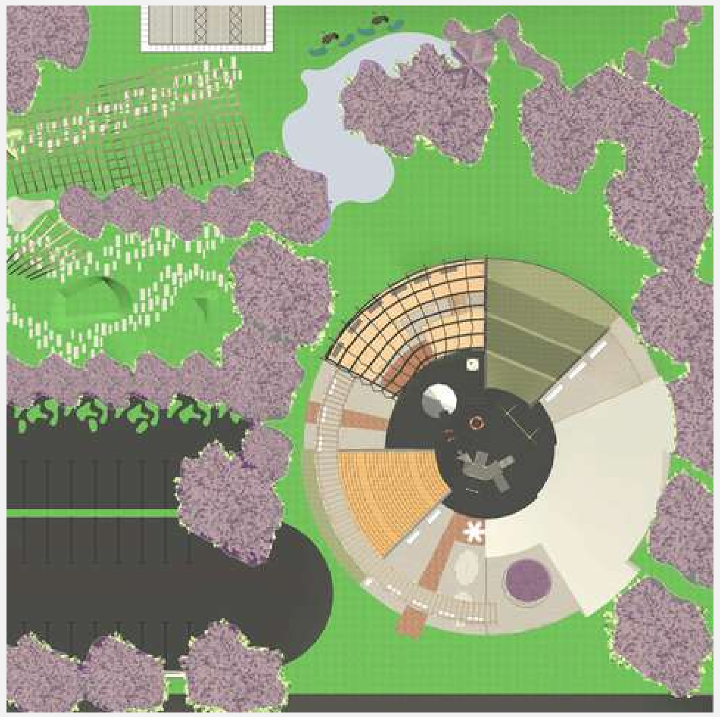
SUNPATH OF THE SITE

The building orientation is based on a radial grid from the centre, which surrounds the site and has an open courtyard in the middle of the site to promote a great amount of natural sunlight throughout the structure.



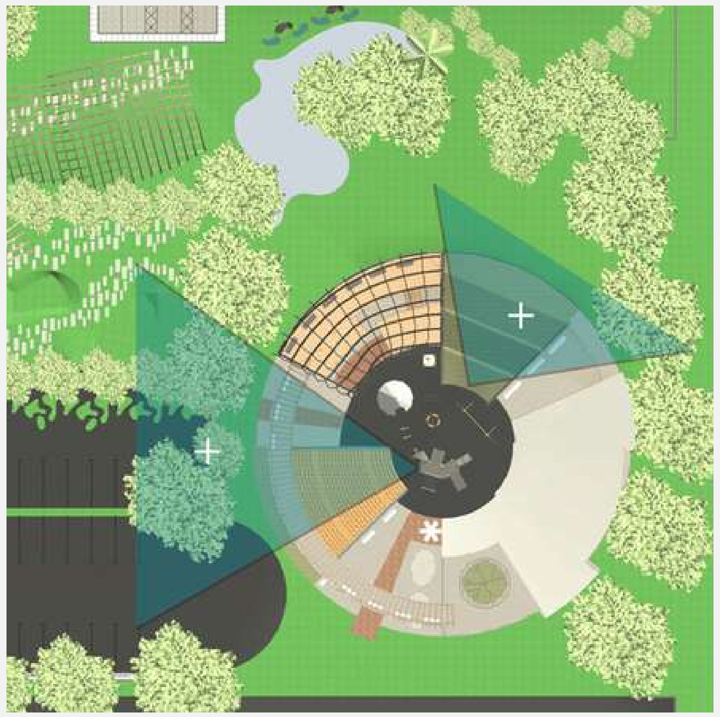
VENTILATION THROUGHOUT THE SITE

The building's round shape allows for each structure to experience a high amount of natural ventilation due to the prevailing winds from the south, west and north-east. The design of creating openings at the direction of the prevailing winds allows for maximum ventilation in the courtyard and throughout the building.



VEGETATION WITHIN & OUTSIDE THE BUILDING

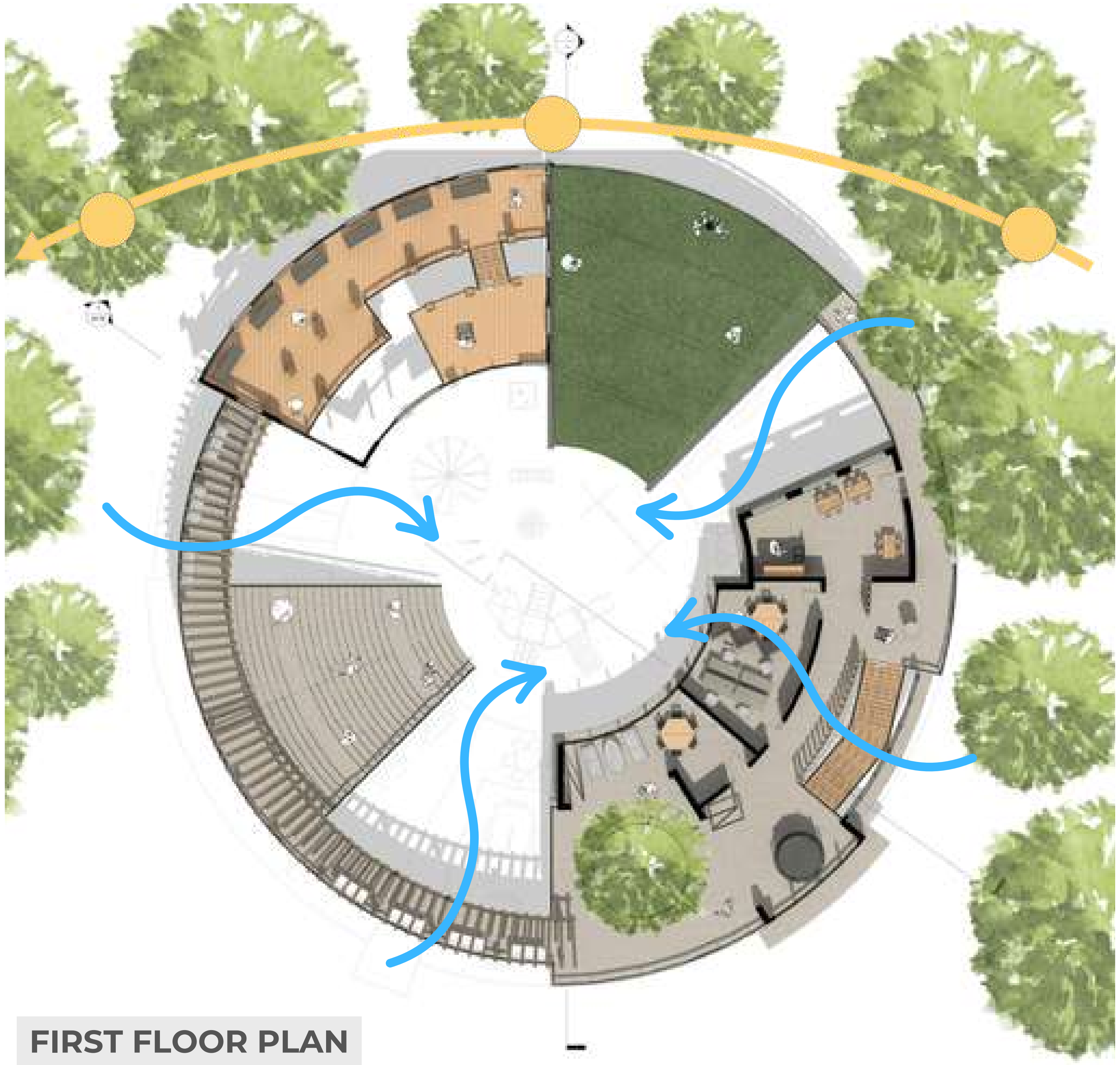
The masterplan of the project includes thick and lush vegetation like trees and palms that surrounds the site to create a forest like feel in a urban setting. The vegetation within the site exists at the main entrance, the greenhouse and the green roof slope too.



POSITIVE VIEWS THROUGHOUT THE SITE

The building contains 2 main positive views that are maximised based of the shape of the radial structure. The structure of the site encourages free roaming walkways around the site, which helps promote more positive views within the micro-site as well as throughout the macro-site. The buildings also utilise big windows facing the courtyard to watch the activities in the middle.

2.2 SPACE PLANNING

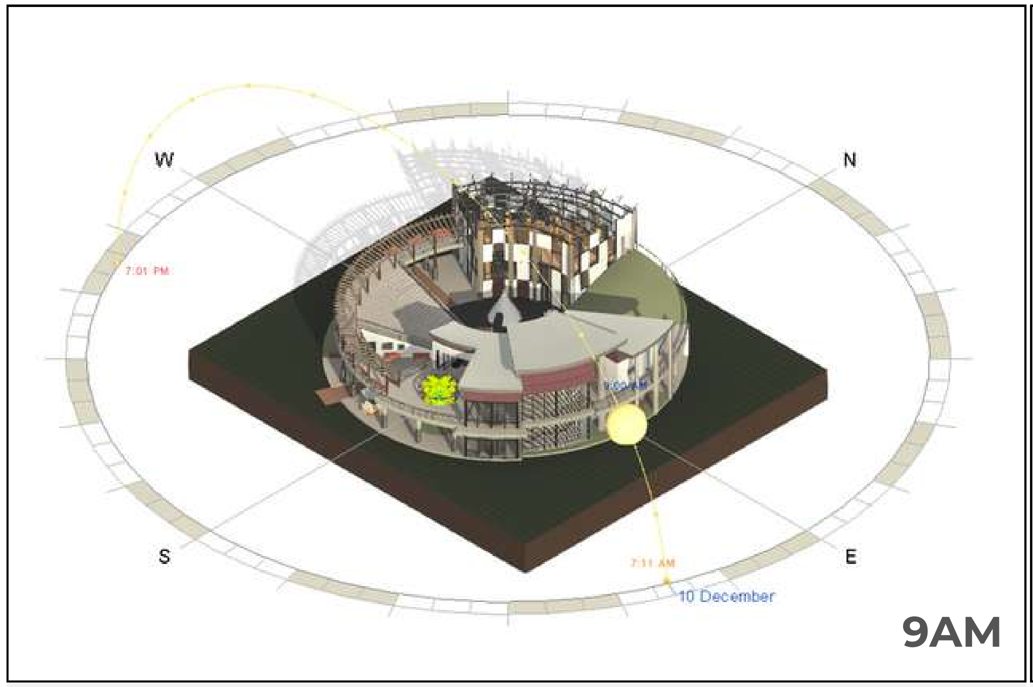


Designing for daylighting and optimizing wind paths in a site like Subang Jaya, characterized by prevailing winds from the south, west, and northeast, requires a nuanced understanding of the local climate and site context. The contextual spaces, strategically positioned within the site, play pivotal roles in both harnessing natural light and facilitating efficient wind flow. Placing the community building in the south-west allows for generous daylight exposure throughout the day, ensuring a well-lit and inviting communal space.

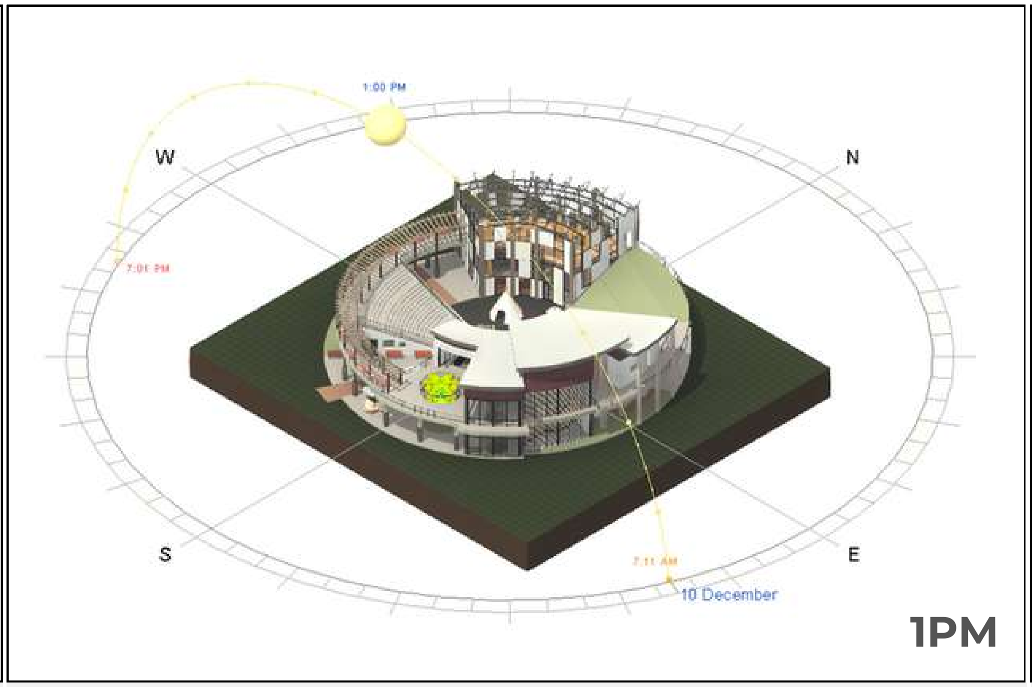
Concurrently, the office block on the west side leverages prevailing winds, employing design features like open courtyards or ventilation structures to encourage cross-ventilation, promoting a comfortable working environment. The greenhouse building, strategically located in the northwest, can benefit from ample sunlight, fostering optimal conditions for plant growth, while thoughtful design considerations enhance natural ventilation for the occupants.

The incorporation of a green roof structure on the east part not only serves as an aesthetically pleasing element but also contributes to thermal insulation, mitigating heat gain, and providing a sustainable approach to building design. This holistic integration of daylighting and wind paths reflects a conscientious effort to harmonize architecture with the natural environment, creating spaces that prioritize both occupant well-being and sustainable practices.

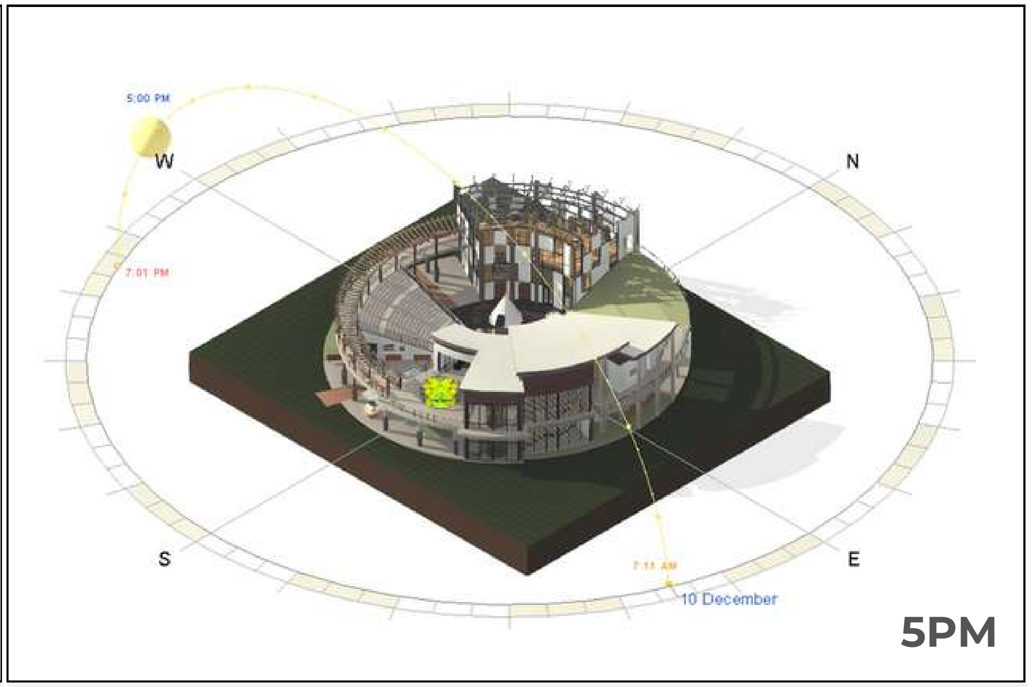
3.1 DAYLIGHTING ANALYSIS



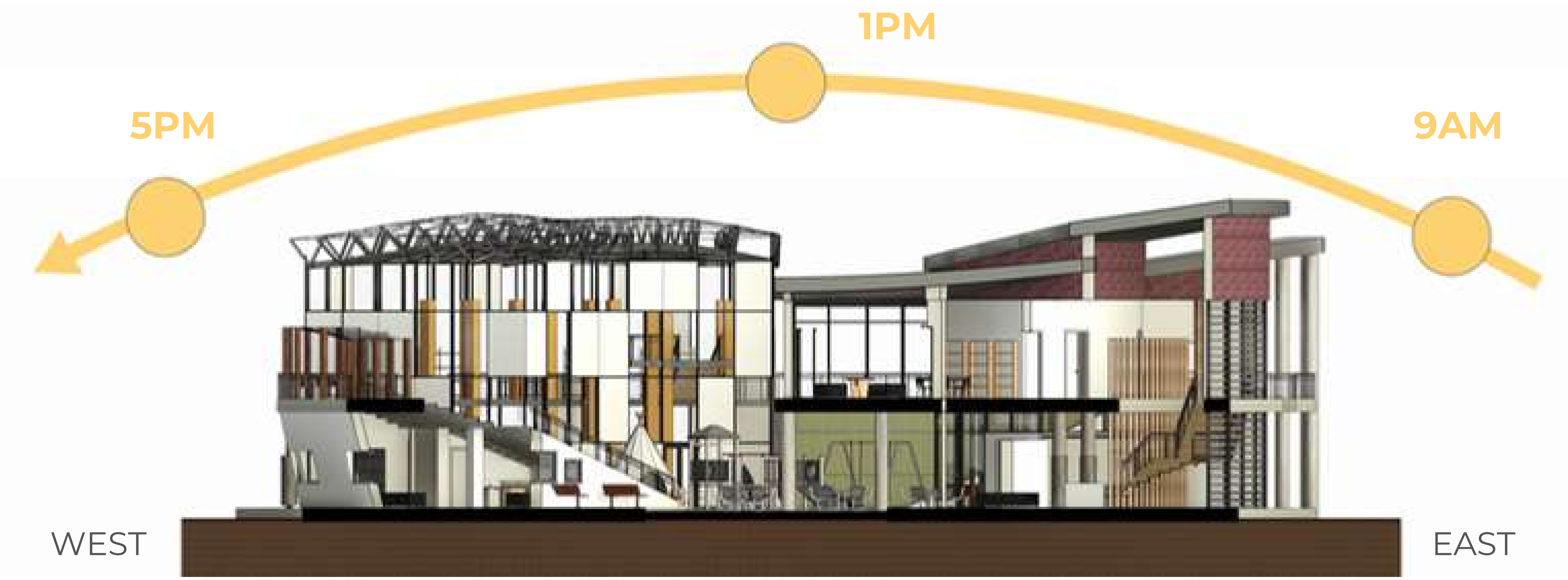
The morning sun casts a shadow across the north western side of the building. The building receives direct sunlight on their east-facing facades at 9 am, as the sun rises in the east. The south-facing facade receives sunlight but at a lower angle compared to later in the day. This can contribute to natural lighting inside the building.



The afternoon sun casts minimal shadow and the main spaces are covered, while the middle courtyard receives the most sunlight. The south-facing facade receives direct sunlight, with the sun at a higher angle compared to earlier in the day. This can contribute to ample natural lighting inside the building through the big windows located around the building.



Shadows cast by the building are longer at 5 pm, indicating that the sun is lower in the sky. Sunlight and shadows can be seen filtering through the taller structures onto the ground and walls. Spaces facing the west receive strong natural light, potentially reducing the need for artificial lighting. The southern spaces may still receive some sunlight, although the angle is decreasing.

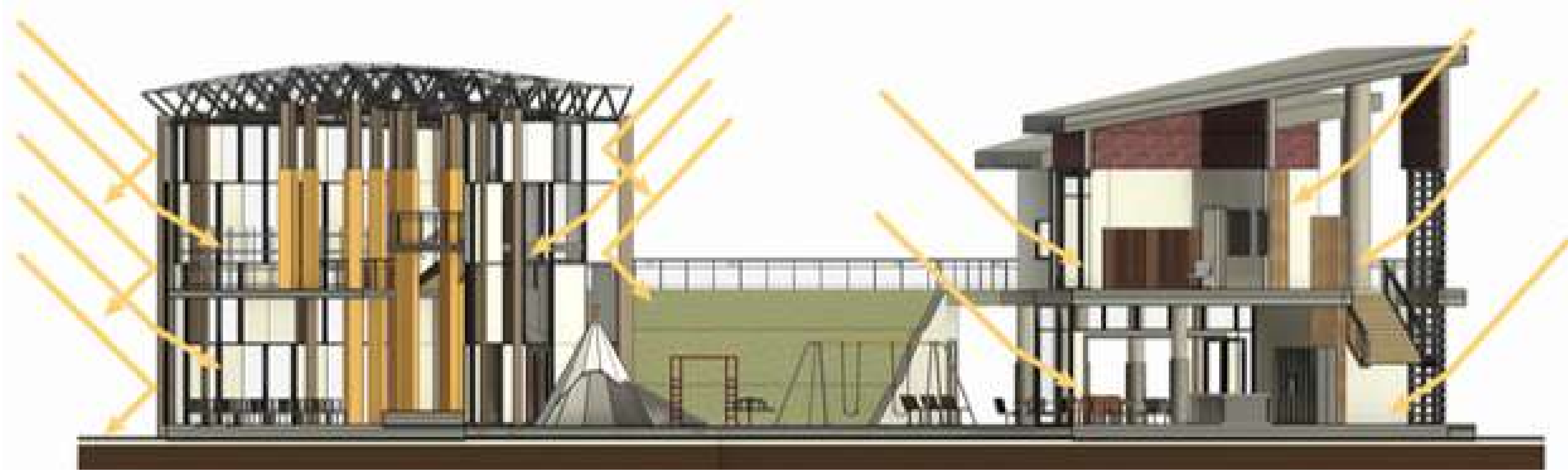


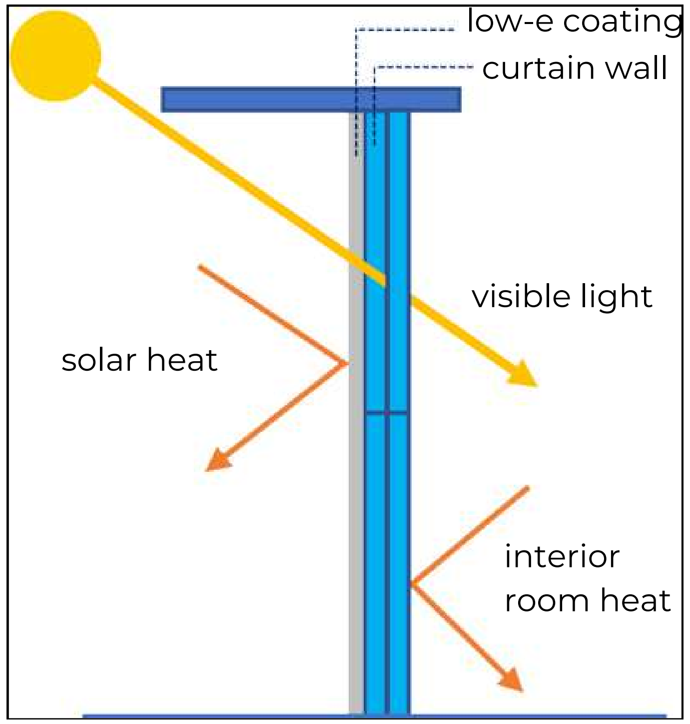
The building's design, including the placement and size of windows, can significantly impact daylighting. South-facing windows can maximize natural light, while proper shading elements can control glare and heat gain.

Trees and landscaping elements can influence shadows and contribute to a comfortable microclimate. Deciduous trees may provide shade during warmer months while allowing sunlight during colder months.

Interior finishes and surfaces can affect the distribution of light. Light-colored surfaces reflect more light, contributing to a brighter interior.

3.2 DAYLIGHTING STRATEGIES





The intentional design choices for the community building, situated in the southwest, epitomize this approach. The implementation of a steel louvre system on the southeast side adeptly manages the strong southern sun, providing shade and preventing glare, while large windows on the opposite side invite a flood of natural light, creating a harmonious balance between illumination and shading.

The greenhouse building, nestled in the northwest, ingeniously combines a mixed panelling facade. This strategic fusion of polycarbonate and low-e glass panels not only allows diffused sunlight to nurture the plants within but also ensures optimal thermal control, striking a balance between illumination and temperature regulation.

Low-emissivity (low-e) glass is a type of glass that has a thin coating of metallic oxide, typically applied to one or more surfaces of the glass. This coating helps control the transfer of heat and light through the glass. Low-e glass windows facilitate natural daylighting while managing the effects of shadows and heat transfer. The careful selection and placement of windows, along with the use of low-e coatings, contribute to an energy-efficient, comfortable, and well-lit indoor environment.

USER EXPERIENCES

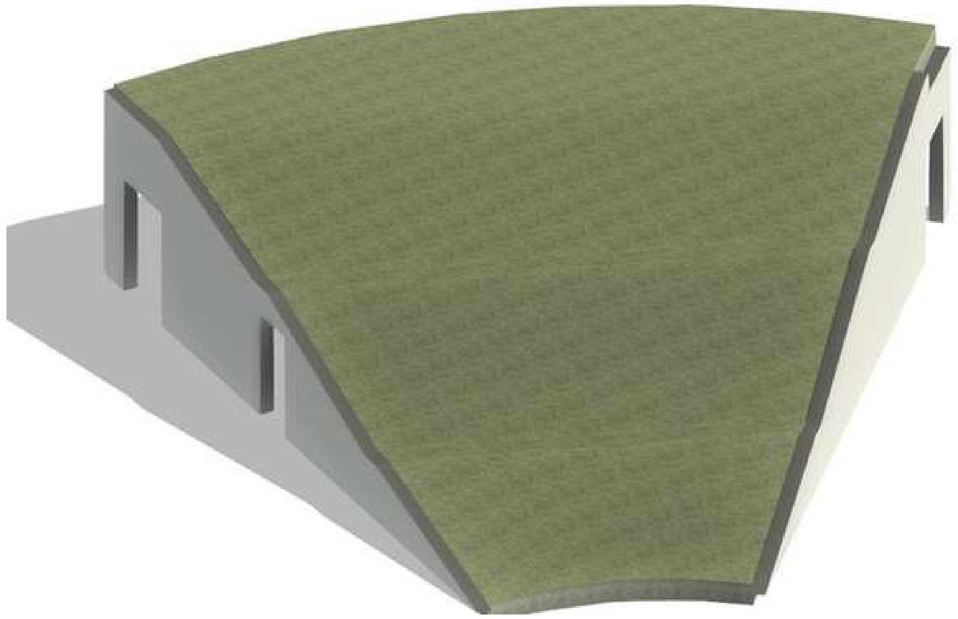
The pergola surrounding the walking pathway that connects the greenhouse to the main community building works as a shading device that casts a shadow on the ground. The size and length of the shadow depends with the time of day.

The steel louvres located on the south-west part of the building receives most sunlight during the morning. As the day progresses, the midday sunlight is blocked using the shading devices, and shadows are cast on the ground.

The combination of polycarbonate and glass panels in the greenhouse allow for maximum sunlight into the greenhouse spaces, thus allowing plants to grow to their full potential in any location. Steel frames of the facade wall casts shadows that vary throughout the day.

The staircase connecting the ground floor to the first floor of the community building receives natural daylighting from the sun throughout the day due to the open space design, thus reducing reliance of artificial lighting in the space.

4.1 FACADE DESIGN 1 (GREEN ROOF)



GREEN ROOF FACADE

In theory, a rooftop garden can be created on nearly any flat-roofed building. However, it's crucial to conduct a professional structural analysis to ensure the building can support the added weight. Once structural integrity and safety concerns are addressed, and there's a sufficient budget, landscaping elements can be introduced to the rooftop. However, there are additional considerations. Careful selection of the location is essential to optimize sunlight and shade, ensuring that plants can grow well and flourish. Particularly during the initial growth period and dry spells, having a nearby water source is important for providing extra moisture as needed.

GREEN ROOF FACADE FUNCTIONS

1. **Stormwater Management**
   - Water Absorption: Green roofs absorb rainwater, reducing stormwater runoff and the risk of flooding. The plants and growing medium act as a natural sponge, slowing down the flow of water.
2. **Energy Efficiency**
   - Cooling Effect: By reducing the heat absorbed by the building, green roofs can decrease the need for air conditioning, leading to energy savings and lower utility costs.
3. **Air Quality Improvement**
   - Air Filtration: The vegetation on green roofs acts as a natural air filter, trapping pollutants and particulate matter. This can result in improved air quality in and around the building.
4. **Aesthetic Enhancement**
   - Visual Appeal: Green roofs add aesthetic value to buildings, transforming them into visually pleasing and sustainable structures. They can be designed with a variety of plants, colors, and textures, enhancing the overall aesthetics of the building and its surroundings.

GREEN ROOF FACADE BENEFITS

Environmental Sustainability

- Carbon Sequestration: Green roofs contribute to carbon sequestration, helping offset the carbon footprint of the building. The plants absorb carbon dioxide during photosynthesis, acting as a natural carbon sink.

Urban Heat Island Mitigation

- Cooling Effect: Green roofs help mitigate the urban heat island effect by absorbing and reflecting solar radiation, reducing the overall temperature in urban areas.

In conclusion, the installation of green roofs in building design goes beyond mere aesthetics. It serves as a multifunctional and sustainable strategy, contributing to environmental conservation, energy efficiency, and the overall well-being of both the building and its surrounding ecosystem.

4.2 FACADE DESIGN 2 (STEEL LOUVRES)

STAINLESS STEEL LOUVRES WITH STEEL FRAMES

Stainless steel louvres are affixed to sub-frames, which are subsequently mounted onto the steel framework as panels. This design promotes the infiltration of wind and sunlight into the building, fostering a space that is both well-ventilated and naturally illuminated.

STEEL LOUVRES FACADE

In the pursuit of sustainable architecture, steel louvres emerge as integral components in the design of green buildings. These precisely crafted structures play a dual role by harmonizing form and function. Beyond their practical benefits, these sleek, modern louvres add a touch of architectural elegance, seamlessly integrating with the green ethos. Functionality meets aesthetics as steel louvres not only enhance visual comfort through effective daylight management but also symbolize a commitment to sustainable design, embodying the principles of energy efficiency and a conscious relationship with the environment.

STEEL LOUVRES FACADE FUNCTIONS

1. **Solar Heat Control**
   - Shading: Steel louvres and shading devices are designed to control the amount of sunlight entering a building. They effectively reduce solar heat gain during peak sunlight hours, preventing excessive heat buildup and reducing the need for artificial cooling.
2. **Daylight Management**
   - Glare Reduction: Louvres help manage daylight, minimizing glare and creating a comfortable and visually appealing interior environment. This enhances the overall quality of natural lighting within the building.
3. **Ventilation Enhancement**
   - Airflow Regulation: Louvres can be strategically placed to allow for natural ventilation. By permitting controlled airflow, they help improve indoor air quality and decrease reliance on mechanical ventilation systems, especially in mild weather conditions.

STEEL LOUVRES FACADE BENEFITS

1. **Sustainable Design**
   - Reduced Environmental Impact: By minimizing the need for artificial heating and cooling, steel louvres contribute to a reduction in the building's overall environmental impact. This aligns with sustainable design principles by promoting energy efficiency.
2. **Occupant Comfort**
   - Visual and Thermal Comfort: Louvres enhance occupant comfort by maintaining a comfortable indoor temperature and reducing glare. This creates a more pleasant and productive environment for building occupants.
3. **Preservation of Interior Furnishings**
   - UV Protection: Louvres can block harmful ultraviolet (UV) rays from entering the building, helping to preserve interior furnishings, artwork, and materials that may be sensitive to sun exposure.

4.3 ROOF FACADE DETAILS

STANDING SEAM GALVANISED STEEL ROOFING

Standing seam roofs feature raised seams that interlock to create a continuous vertical line. The profile of the seams can vary, with some roofs having a more pronounced seam for a distinct architectural look. The roof's structural system must be capable of supporting the weight of the standing seam metal panels. This involves considering the spacing and size of purlins or other support structures.

METALLIC ROOF FACADE

Integrating standing seam galvanized steel roofing into a green building design exemplifies a commitment to both durability and environmental responsibility. The sleek, modern profile of standing seam roofing not only enhances the building's aesthetic appeal but also provides a robust and long-lasting solution. The galvanized steel, known for its corrosion resistance, ensures the roof's durability and longevity, reducing the need for frequent replacements and minimizing environmental impact. Beyond its structural advantages, the reflective properties of the galvanized steel contribute to energy efficiency by mitigating heat absorption. This sustainable roofing choice not only aligns with green building principles but also represents a pragmatic and visually striking approach to creating structures that stand the test of time while minimizing their ecological footprint.

METALLIC ROOF FACADE FUNCTIONS

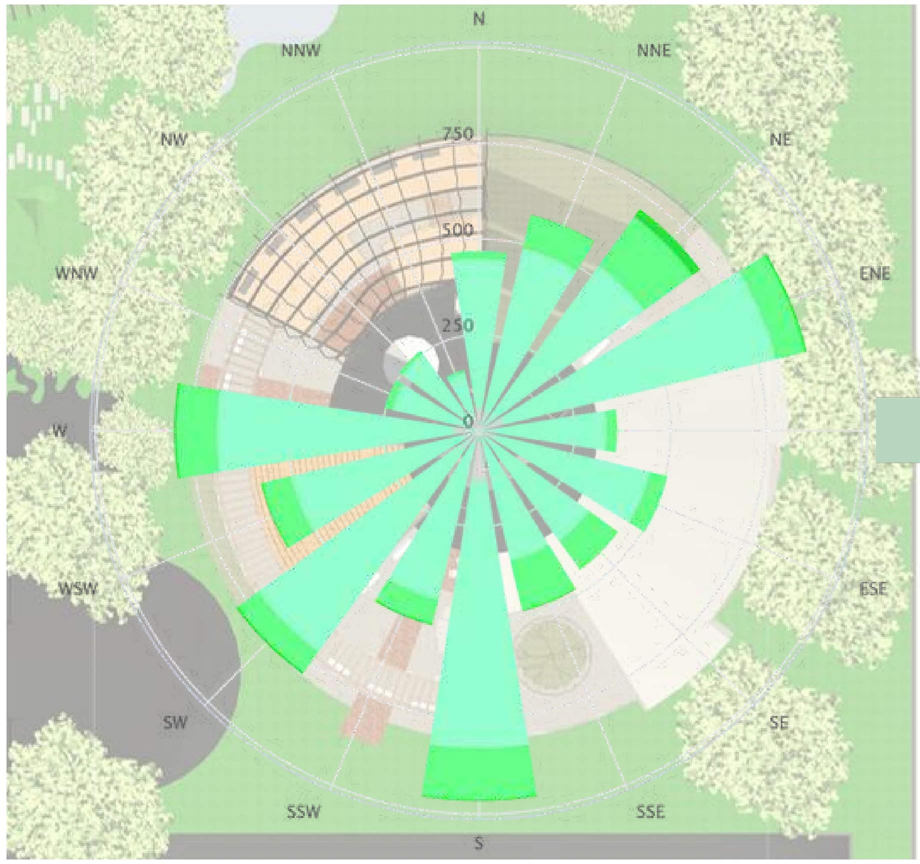
1. **Durability and Longevity**
   - Corrosion Resistance: Galvanized zinc roofing is highly durable, with excellent corrosion resistance. This ensures a long lifespan for the roofing material, reducing the need for frequent replacements and minimizing waste.
2. **Energy Efficiency**
   - Reflectivity: The reflective nature of galvanized zinc helps in bouncing off a significant amount of solar radiation, reducing heat absorption. This reflective quality contributes to lower energy consumption for cooling purposes, promoting energy efficiency within the building.
3. **Water Management**
   - Water Shedding: Standing seam roofing is designed with a profile that promotes effective water shedding. This helps prevent water stagnation, reducing the risk of leaks and water damage, and contributing to overall building resilience.

METALLIC ROOF FACADE BENEFITS

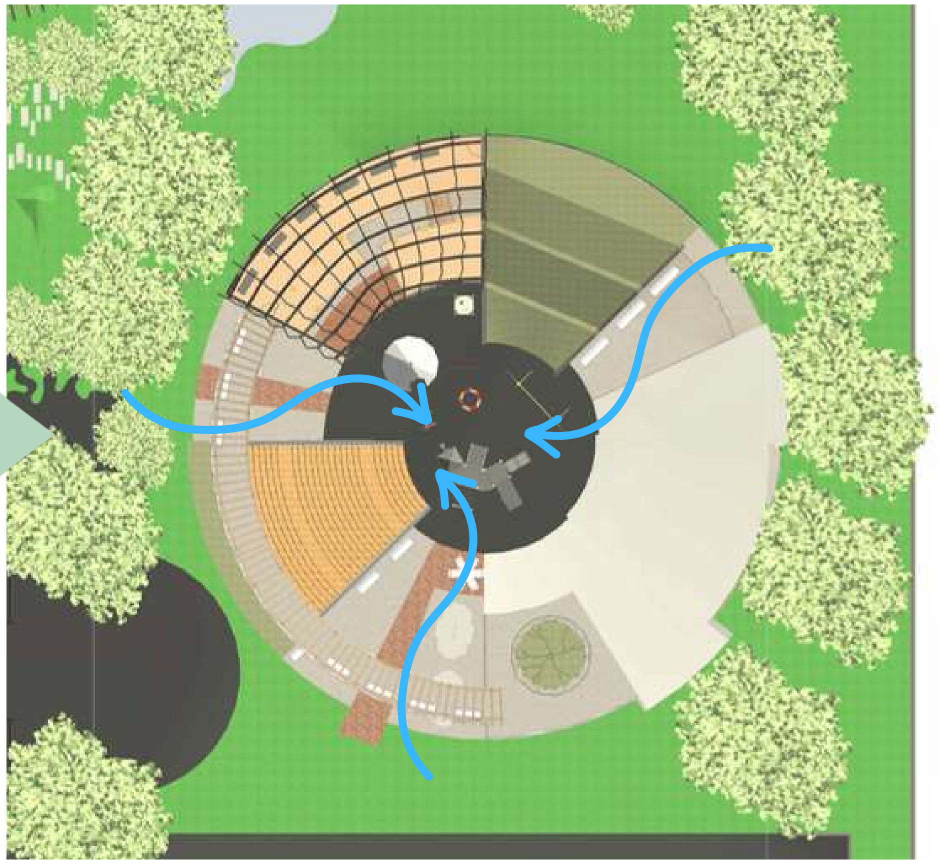
1. **Environmental Sustainability**
   - Recyclability: Galvanized zinc is a recyclable material, aligning with green building principles by reducing the demand for new raw materials and minimizing the environmental impact associated with traditional roofing materials.
2. **Reduced Maintenance Needs**
   - Low Maintenance: The corrosion-resistant properties of galvanized zinc result in low maintenance requirements. This not only saves on maintenance costs but also reduces the need for the use of additional resources over the building's lifespan.
3. **Cool Roofing Benefits**
   - Heat Island Mitigation: The reflective surface of galvanized zinc contributes to the mitigation of urban heat island effects by reflecting sunlight, preventing the absorption of excess heat, and maintaining lower temperatures in the building's surroundings.

5.1 NATURAL VENTILATION & WIND PATH ANALYSIS

WINDROSE CHART ON SITE



PREVAILING WINDS ON SITE



UTILISING PASSIVE DESIGN & VENTILATION DEVICES

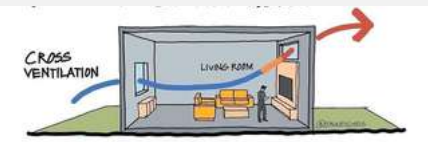
A building with open spaces, such as a central courtyard, designed to allow prevailing winds to enter, combined with ventilation structures like steel louvres and shading devices, can effectively maximize natural ventilation throughout the structure.

1. **Wind Channeling and Capture**: The open courtyard serves as a wind channel, guiding prevailing winds into the heart of the building. This layout facilitates the natural flow of air through the structure.
2. **Cross-Ventilation**: Steel louvres, strategically positioned around the perimeter of the courtyard or building, allow for controlled cross-ventilation. The louvres can be adjusted to capture and direct incoming winds into the interior spaces, promoting the exchange of stale indoor air with fresh outdoor air.
3. **Natural Stack Effect**: The design of open spaces, combined with ventilation structures, promotes the natural stack effect. Hot air tends to rise, and as it does, it creates a pressure difference that encourages the entry of cooler air from the courtyard. Louvres play a role in guiding this airflow, enhancing the stack effect for improved ventilation.

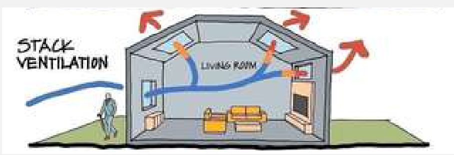
NATURAL VENTILATION WITH PREVAILING WINDS

Prevailing winds from the south, west and north-east are maximised by creating open passage ways that enter into the middle courtyard. The cool winds that enter through the passage ways help guide the other prevailing winds that enter the rest of the site, thus making the centre courtyard a thermal sink that would be displaced to the atmosphere due to stack ventilation.

Cross ventilation occurs when wind enters through one space and leaves the space through voids and openings. Natural breezes get cooled by the waterscapes within the building.



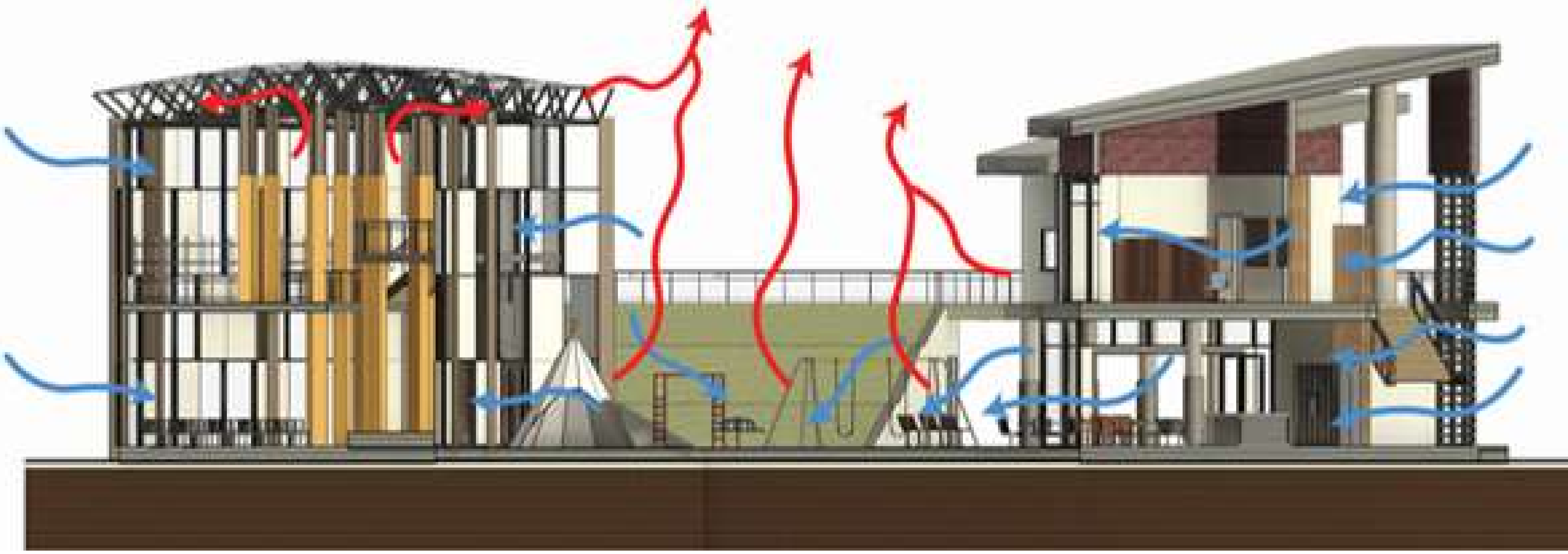
Stack ventilation occurs through the courtyard. Hot air inside rises and escapes through thermal displacement, while cooler air from outside enters through the lower openings, thus called *thermal buoyancy*.



LEGEND

Cross Ventilation

Stack Ventilation



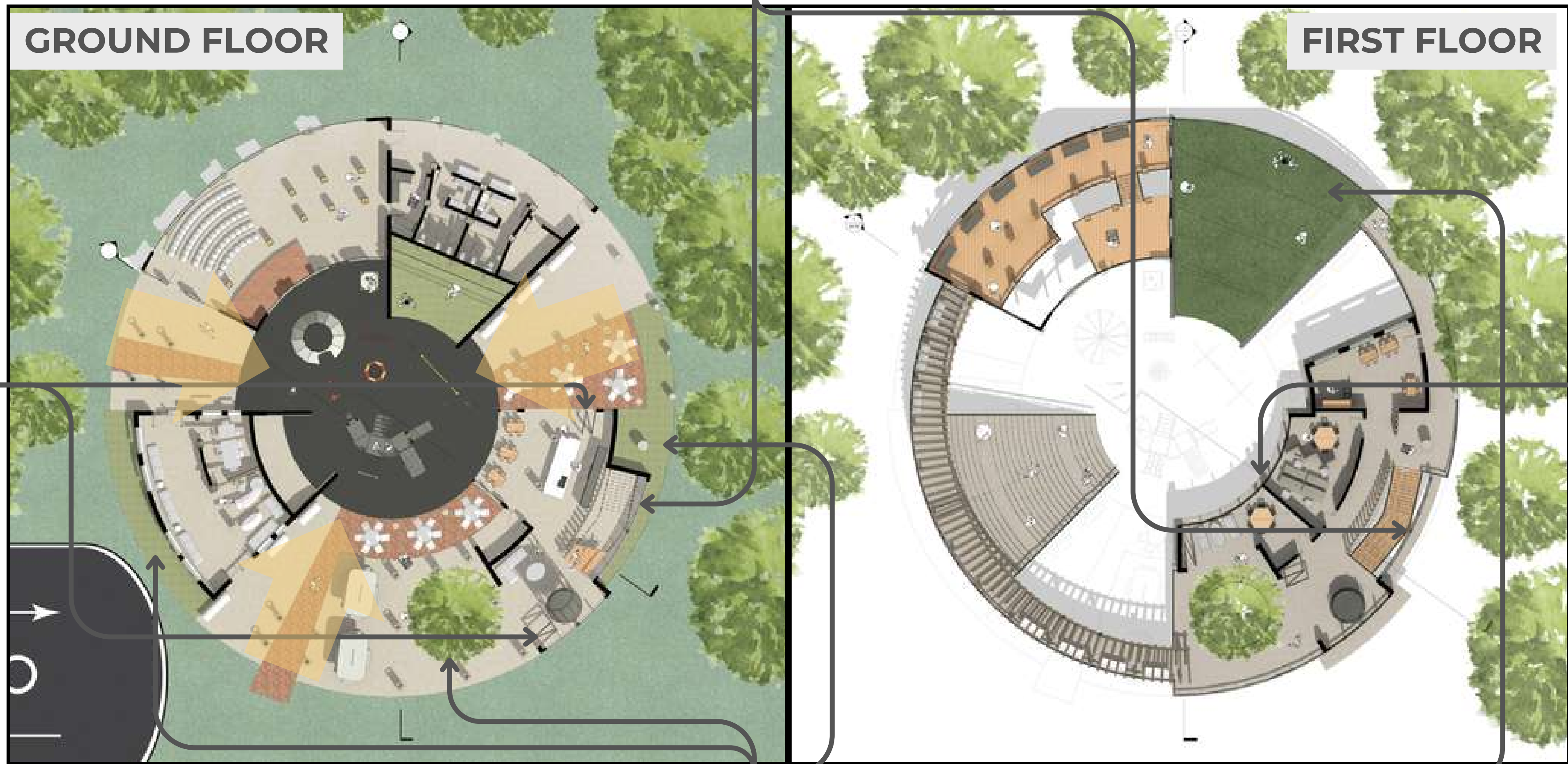
5.2 VENTILATION STRATEGIES & DEVICES

STEEL LOUVRES

Utilizing natural ventilation through louvres facilitates the exchange of indoor and outdoor air, reducing the buildup of pollutants and enhancing overall indoor air quality. This is especially beneficial for health and well-being.

FOLDABLE DOORS

Foldable sliding doors can be partially or fully opened, providing variable control over the amount of ventilation. This adaptability allows occupants to adjust the indoor environment based on weather conditions, preferences, and the desired level of natural airflow.



LARGE WINDOWS

Large windows placed strategically on opposite sides of a building allow for effective cross-ventilation. When windows are opened, they enable the flow of air from one side to the other.

OPEN PASSAGEWAYS

Open spaces and well-designed louvres create a seamless transition between indoor and outdoor areas. This connection not only enhances the visual appeal of the architecture but also encourages the free flow of air, contributing to a more pleasant and refreshing indoor environment.

"Large open passages are indicated using arrows"

SOFTSCAPES

Well-planned softscapes with strategically placed trees, shrubs, and plants can contribute to the creation of microclimates around the building. This can influence wind patterns and create areas of cooler air, enhancing natural ventilation.

6.1 STRATEGIC LANDSCAPPING

HARDSCAPES

CONCRETE FLOORING
durable, low maintenance & versatile

TIMBER FLOORING
warm, natural resource & durable

BRICK PAVERS
clean finish & aesthetically pleasing

GRASS FLOORING
blends the surrounding with the building

SOFTSCAPES

1

RAIN TREE

4

BOUGAINVILLEA SHRUB

2

PENTAS LANCEOLATA

5

MURRAYA KOENIGII (CURRY LEAF TREE)

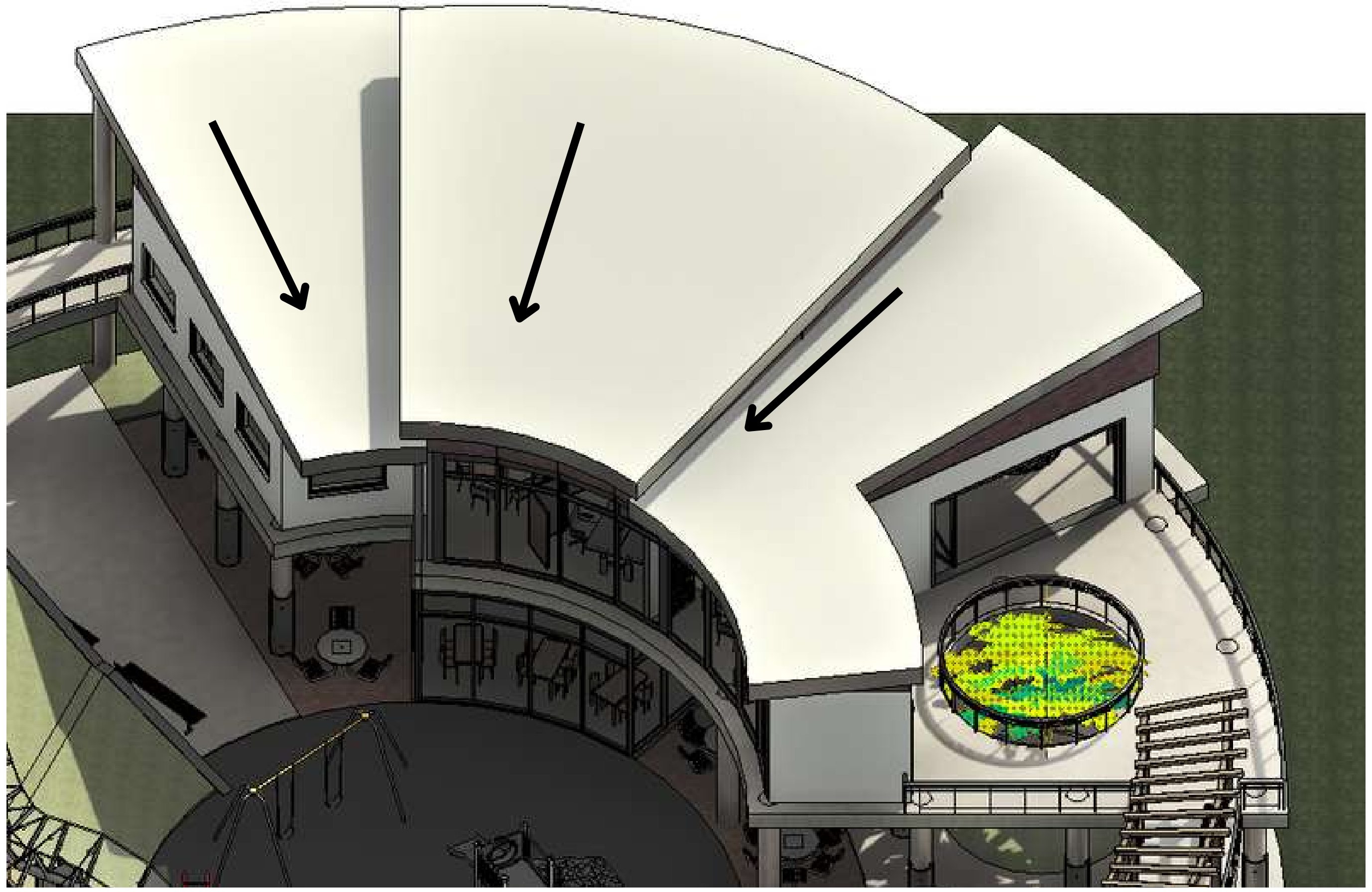
3

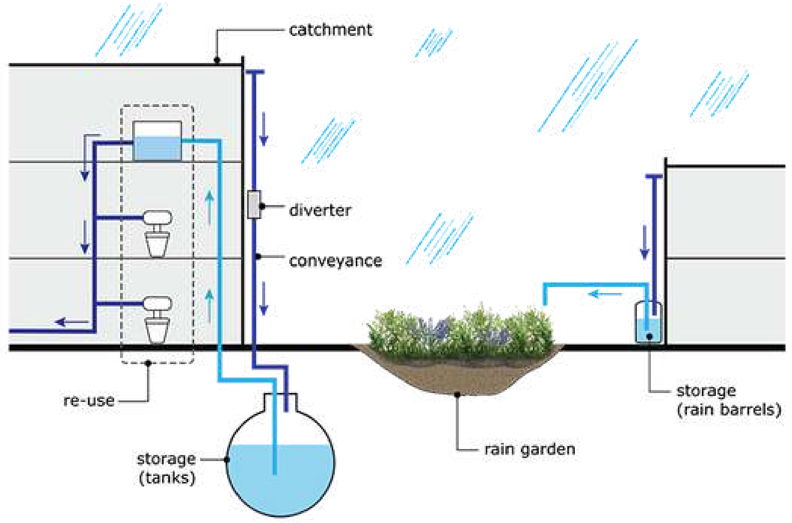
JASMINE TREE

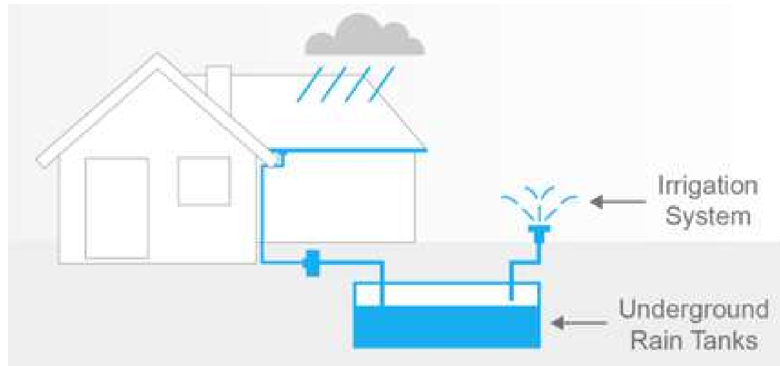
6

HERBS & SPICES

7.1 RAINWATER HARVESTING SYSTEM







A rainwater harvesting system is a sustainable and eco-friendly method of collecting and storing rainwater for various purposes. Typically, this system involves the installation of gutters on rooftops to capture rainfall, which is then directed through downspouts into a storage tank or cistern. The collected rainwater can be filtered and treated for use in non-potable applications, such as watering plants, flushing toilets, and even for certain household tasks.

The ingenious integration of a rainwater harvesting system on the sloped roof of the community building in this site presents a compelling narrative of sustainability and resourcefulness. The sloped roof, designed with a keen awareness of the local climate in Subang Jaya, maximizes the capture of rainfall through a network of gutters strategically placed along its incline. The collected rainwater is then channeled into a dedicated water tank, becoming a precious resource that extends far beyond the confines of the roof. This system not only alleviates the burden on conventional water sources but also underscores a commitment to responsible water management.

The harvested rainwater, now stored in the tank, serves a dual purpose—nurturing the greenery within the greenhouse and sustaining the cultivation of fresh produce. This conscientious approach not only aligns with sustainable practices but also exemplifies a holistic understanding of the interconnectedness between architectural design and environmental stewardship. As rainwater descends from the roof to nourish the soil and crops, it paints a vivid picture of how thoughtful solutions can transform a building into a regenerative force, fostering a harmonious relationship between human activities and the natural world.

One significant benefit of rainwater harvesting is the conservation of traditional water sources, as it reduces the reliance on municipal water supplies. Additionally, it mitigates stormwater runoff, which can contribute to soil erosion and flooding. The harvested rainwater is often of high quality and free from many contaminants found in ground or surface water. Moreover, rainwater harvesting promotes self-sufficiency, especially in regions with irregular water availability, and it is a sustainable practice that aligns with environmentally conscious living by reducing the carbon footprint associated with water transportation. Overall, the implementation of rainwater harvesting systems contributes to water conservation, reduces strain on existing water infrastructure, and promotes a more sustainable and resilient approach to water resource management.

8.1 CONCLUSION

In conclusion, "The Oasis" stands as a triumph in sustainable architecture, showcasing an innovative fusion of green strategies within the design of a community building dedicated to farming. Through meticulous attention to detail and a holistic approach, the project successfully integrates a range of green elements, transforming the structure into a living testament to ecological responsibility and community well-being.

The utilization of large windows and foldable sliding doors not only bathes the interior in natural daylight but also harnesses the power of cross-ventilation, fostering a harmonious connection between the built environment and nature. The incorporation of steel louvres, strategically placed, enhances this ventilation system, allowing for precise control and optimization of airflow. This not only contributes to occupant comfort but also significantly reduces the reliance on mechanical systems, embodying a commitment to energy efficiency.

The introduction of softscapes, comprising thoughtfully curated greenery, not only lends an aesthetic charm to the surroundings but also serves multifaceted purposes. These natural elements act as windbreaks, providing a shield against prevailing winds, and create microclimates that enhance the overall cooling effect. Moreover, the softscapes contribute to improved air quality and offer a serene backdrop for community engagement and relaxation.
The standing seam galvanized zinc roofing, a durable and reflective choice, not only ensures longevity but actively mitigates heat absorption. This not only contributes to a more comfortable indoor environment but also aligns with principles of sustainability by reducing the urban heat island effect.

In essence, "The Oasis" emerges as a transformative blueprint for sustainable community architecture. By seamlessly integrating natural daylighting, ventilation, and softscapes, the project not only elevates the quality of life for its inhabitants but also exemplifies the potential for green strategies to create environments that are both ecologically responsible and aesthetically captivating. This architectural endeavor serves as a beacon, inspiring a future where the cultivation of communities harmonizes seamlessly with the principles of environmental stewardship.

- Nikhil Isaac Selvanandam

9.1 REFERENCES (APA FORMAT)

1. Michaelaschloegl, S. (2023, December 15). Simulated historical climate & weather data for Subang Jaya. meteoblue. https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/subang-jaya_malaysia_8504423
2. PictureThis, T. (n.d.). Top 20 most common plants in Malaysia, Kuala Lumpur. https://www.picturethisai.com/region/Malaysia-Kuala-Lumpur.html
3. King, V. (2011, December 6). Green Forest Middle School / Modus Studio. ArchDaily. https://www.archdaily.com/188913/green-forest-middle-school-modus-studio
4. Elizabeth Stamp, Z. L. W. (2023, July 19). Green roofs: Everything you need to know about these lush and vibrant canopies. Architectural Digest. https://www.architecturaldigest.com/gallery/green-roof-living-roof-designs
5. Energy, H. (n.d.). Cross and stack ventilation strategies. House Energy Site. https://www.house-energy.com/Cooling/Cool-Convective.html
6. next, cc. (n.d.). Rain water harvesting. NEXT.cc. https://www.next.cc/journey/design/rain-water-harvesting
7. PDP Services, G. (2023, July 4). PDP services - rainwater harvesting: Renewable energy: Sussex. PDP Group. https://pdp.services/renewables/rainwater-harvesting/
8. Belitardo, A. (2023, November 6). Greenwashing in architecture: Identifying false sustainable strategies. ArchDaily. https://www.archdaily.com/1008813/greenwashing-in-architecture-identifying-false-sustainable-strategies?ad_source=search&ad_medium=search_result_all