

THE RAINSCAPE

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CONCEPT

“Sometimes to go green, we have to think blue”

As aspiring architects, we are often told to design green buildings; to think of ways we can add vertical greens into our creations or construct superstructures that utilise passive cooling.

5 litres of water is used each time a toilet is flushed. 100 litres of water is used to wash a load of clothes. 8 litres of water is used per minute when we shower. In order to create a sustainable “green” building, we first have to find a way to quench the copious amounts of water used per person.

The Rainscape is our proposal for the development of a Green Tropical Living Residential Compound. Singapore sits 1.5 degrees North of the equator, enjoying a tropical climate with high uniform temperatures (27-31 degrees Celsius) throughout the year and abundant rainfall (2430mm annually). Inspired by the heavy rainfall that Singapore receives, erratic weather patterns and rising sea and rainfall patterns, this project is designed with a focus on the harvesting and utilisation of rainwater to create cool, comfortable spaces for living and communal gatherings on the waterfront.

Catering to the needs of 300 households, The Rainscape is a superstructure that transports greenery from the ground upwards and water from above to the landscape, resulting in an oasis where the elements are always in tandem.

SITE

The proposed site for The Rainscape is an empty plot of land along Geylang Park Connector. It is bounded by the Geylang River, Kampong Arang Road and Tanjong Rhu Road. Situated in the heart of Singapore's sporting district, the National Stadium, OCBC Aquatic Centre, Singapore Sports Hub, Singapore Swimming Club and Kallang Leisure Park are within 15 minutes walk from the site.

DESIGN

1: CELEBRATING NATURE – Ecology

When a building is built, the construction site has to be cleared of existing vegetation.

We decided to preserve the existing Banyan Trees on site due to their age and incorporate our proposed design around them. The Banyan Tree is characterized by its aerial roots that eventually form into trunks. The trees on site currently have a trunk circumference of 30-45 metres. We felt compelled to conserve them due to how long they have been there.

We have also designed vertical green walls to frame several of the trees. By retaining the trees, ample shade is provided to the ground floor of our residential development.

2: COMMUNAL ACCESSIBILITY – Community

Flowing, organic-shaped ramps bring the community from the ground floor upwards. There are 2 main ramps, one for cyclists and the other for joggers. By bringing these intensive activities onto the ramps, families with young children can enjoy the ground floor without having to worry about collisions with speeding cyclists.

Several study and resting spaces are located along the ramps to allow adolescents with refreshing shaded areas for revising their schoolwork. The study and resting spaces are spacious and airy, encouraging people to use them and promoting interactions within the community. The ramps are also handicap friendly with gradients of 1:12 to 1:25.

The Rainscape is situated 1.3 kilometres from the National Stadium. People are welcome to gather on the ramps for a glimpse of fireworks when they are set off during National Day Parades and New Year's Celebrations.

3: RAINWATER MANAGEMENT – Water

There are 2 different phases of rainwater management, both of which are integrated into the design: Rainwater Collection & Rainwater Cleansing.

STUDY SPACES – Collection & Cleansing

Cleansing biotopes are constructed into the roofs of the study and resting spaces to collect precipitation. The rainwater is then cleaned naturally as it is filtered through the plants in the cleansing biotopes. The water then irrigates the slanting greens connected to the biotopes and excess water flows into the bio-retention pond.

CORES – Collection

The proposed residential development has 11 cores, each with a surface area of 78.5 m². These cores house fire escape stairs, lifts as well as services and are used to collect rainwater. The rainwater is channeled down, through the pipes that twine around the core, to the Water Collection Tank. Based on the surface area, each core has the potential to collect up to 7850mm² rainwater.

GROUND FLOOR - Collection

Swales in the ground floor collect surface run-off during rain and transport it to the bio-retention ponds.

APARTMENTS & RAINWATER PLAYGROUND – Cleansing & Usage

Water collected in the bio-retention ponds and from the cores is then sent to the Water Collection Tank and Water Treatment Tank before being pumped to the Rainwater Playground on the ground floor and the apartments in the upper floors.

4: PASSIVE COOLING – Energy Conservation

The layout of the apartments in this project strays from the conventional. The upper floor is wider while the lower floor is kept as narrow as possible in an effort to create an overhang. As such, occupants are greeted by a well-lit bedroom upon entering their apartment. By locating the bedrooms on the upper floor, the living and dining room on the lower floor are shaded by the overhang. This allows the living and dining spaces that are used during the day to be shielded from the sun by the bedroom which is only used at night. The comfort levels of these spaces are further enhanced through this programmatic arrangement.

Courtyards on the ground floor established around the Banyan Trees actualize a large cooling system. As water evaporates from the ground floor, the surrounding ramps and apartments are cooled.

5: VENTILATION & VIEWS – Energy Conservation

The Rainscape utilises louvers as the façade of the residential apartments. The external façade has no walls. We have decided to do away with traditional walls and windows and have come up with the wall-less window. By having louvers as the external façade, ventilation within the apartment is ensured.

The louvers can be set at 3 different angles: open, slanted and closed.

When completely open, the louvers provide ample circulation of air and furnish the apartments with unhampered views. This setting is appropriate for use on days and nights where the weather is humid.

When slanted, the louvers allow for some ventilation whilst preventing rain from entering the apartment as raindrops slide off the tilted surface. This setting is recommended during wet weather or when the residents want some privacy.

When closed, the louvers provide residents with complete privacy. This setting can be used when inhabitants want to turn the air-conditioner on or intend to leave the apartment uninhabited for periods of time when they travel overseas.

6: NATURAL LIGHTING – Energy Conservation

All apartments within The Rainscape do not exceed 5 metres in width. The narrow apartment design combined with the floor-to-ceiling louver façade ensures maximum diffused daylight is allowed into the living spaces. By utilising natural lighting, The Rainscape cuts down on electricity used to light its apartments without compromising the comfort level of people living within them.

7: SOLAR PANELS – Renewable Energy

Solar panels are installed on the roofs of the residential units. This maximizes the amount of exposure to sunlight, allowing for maximum harvesting of solar energy. By converting solar energy into electrical energy, the amount of electricity used by residents at night is reduced.

8: APARTMENTS – Carbon Footprint

The Rainscape has 3 types of apartments: studio units, one-bedroom units and three-bedroom units. The one- and three-bedroom units are double-storey apartments while the studio unit is single-storey.

We have decided on a mix of these apartments to cater to a range of households. Studio apartments are for people who live alone, one-bedroom units are for young couples and three-bedroom units are for couples with children and are living with their parents.

We have omitted the two-bedroom apartment unit type as the demographic of Singaporean families show that when couples have children, their parents tend to move in with them to act as the primary caregiver of the child. As such, having three bedrooms is more conducive as a long-term housing plan. The grandparents get one room, the parents have their own room and the child will have the third bedroom. This living arrangement promotes familial bonding and interaction across three generations.

9: MATERIAL – Carbon Footprint

The proposed residential development uses brushed steel and concrete as its primary materials. Part of reducing carbon footprint includes sourcing materials that can be found locally and not shipped from abroad. This reduces the amount of carbon produced during the transportation of these materials to the construction site. Steel and concrete are building materials that can be recycled. Should The Rainscape be torn down in the future to make way for another building, its materials can be reused in other architectural projects.

The timber decking of the pedestrian ramp is made from recycled wood of the smaller trees that were cleared to make way for The Rainscape. Using recycled wood reduces the amount of waste material.

CONCLUSION

The Rainscape is our attempt at integrating sustainable features, both passive and active, into the day-to-day life of residents. Through creating the Rainwater Playground, we hope to educate and emphasize the importance of recycling water to children. Our wall-less louver façade invites maximum views in when fully opened, encouraging residents to allow natural ventilation to cool their abodes instead of mechanized air-conditioners.

The RETV of this design is 9.61 W/m² when the louvers are fully opened and 11.89 W/m² when the louvers are completely closed. This project achieves a BCA Greenmark Rating of Platinum.