



Technical Visit to Singapore

6-9 May 2026

Overview of Marina Bay Development (6 May 2026)



Integrative Design Solution

Originally, Singapore's main business district was centered around Raffles Place, which became increasingly dense and constrained by limited land availability.

The government therefore planned a "new Downtown" through land reclamation around Marina Bay in order to:

- support future economic growth,
- expand office space, hotels, and mixed-use developments, and
- create a new national skyline.

As a result, Marina Bay became a city-scale master plan, incorporating the concept of district cooling to improve energy efficiency and reduce the Urban Heat Island effect caused by heat rejected from cooling towers.

Bugis Junction (6 May 2026)



Adaptive Reuse

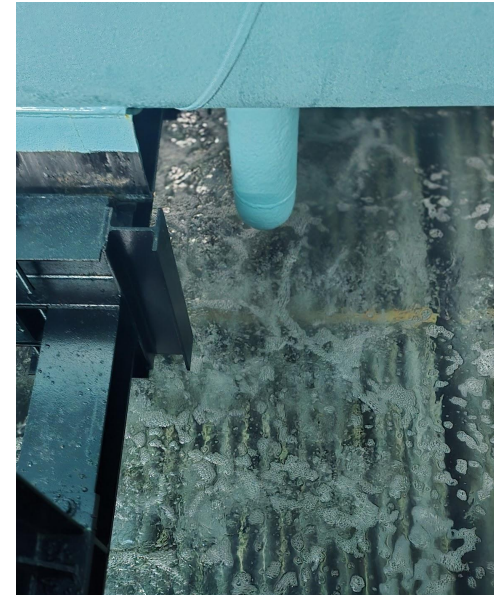
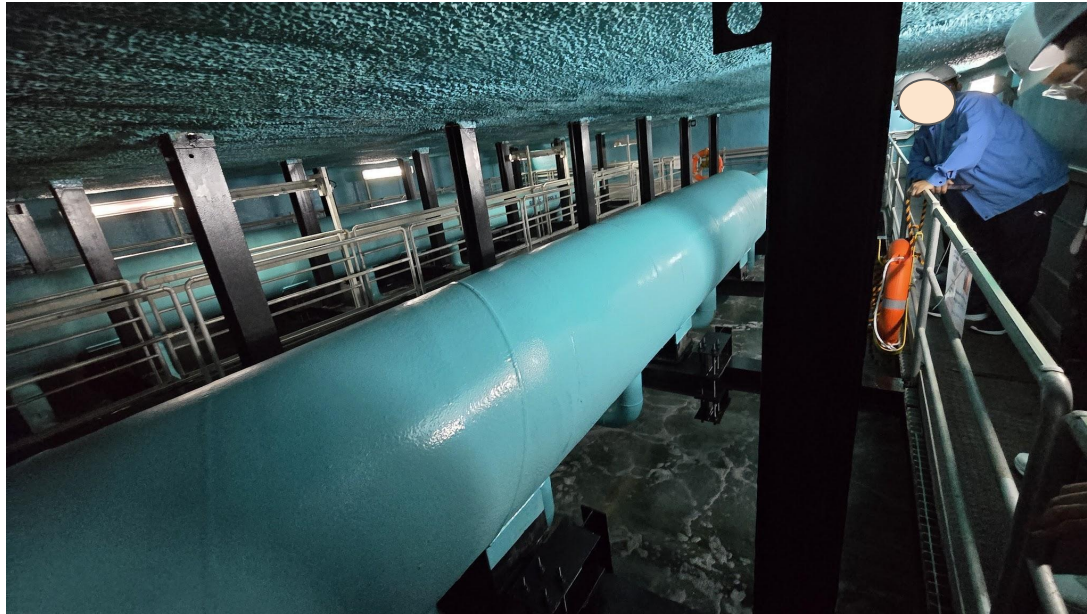
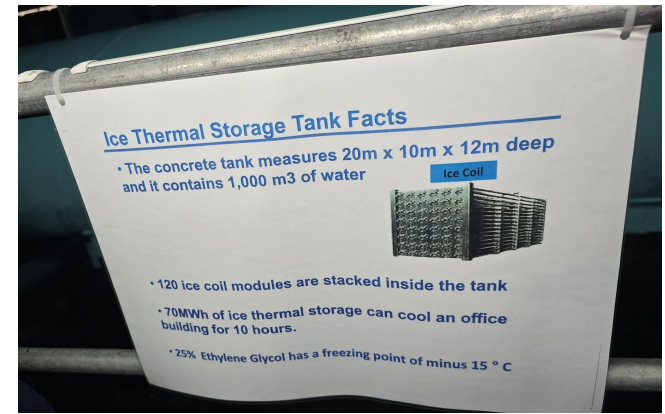
- The area was originally a deteriorated nightlife district.
- It is considered one of Singapore's early examples of adaptive reuse.
- The project preserved the historic streetscape while improving comfort through a climate-controlled environment by covering and air-conditioning the original street.
- The glass roof allows natural daylight into the space while still protecting visitors from rain.
- This concept later influenced many mixed-use retail developments across Singapore.

Marina Bay Sands (7 May 2026)



The largest district cooling in the world
It is the the district cooling system, with a capacity of approximately 70,000 refrigeration tons. The system is located about five stories underground near Marina Bay Sands and distributes chilled water through a district cooling network serving approximately 30 buildings.

Underground Ice Storage tunnel



Cooling tower facade with metallic mobile



The underground chillers reject heat through cooling towers located at ground level along the road near Marina Bay Sands. However, the cooling towers were designed to blend harmoniously with the surrounding urban environment.

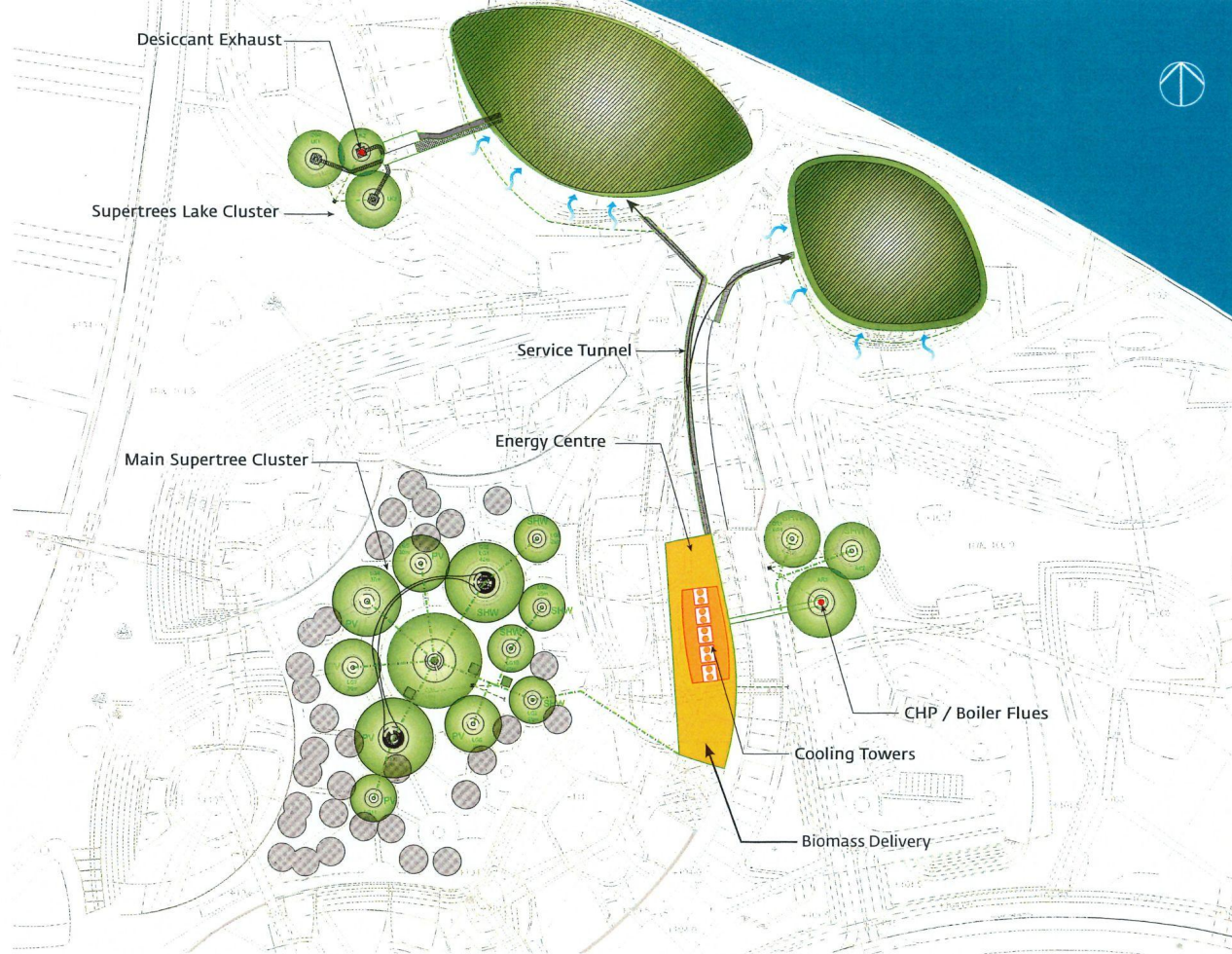
Garden by The Bay (7 May 2026)



The Singapore government dedicated part of the reclaimed land to create a large public garden, transforming the city's vision from a **"Garden in the City"** to a **"City in a Garden."**

This project is an excellent example of sustainability-focused design, where **multiple systems are seamlessly integrated together**, including:

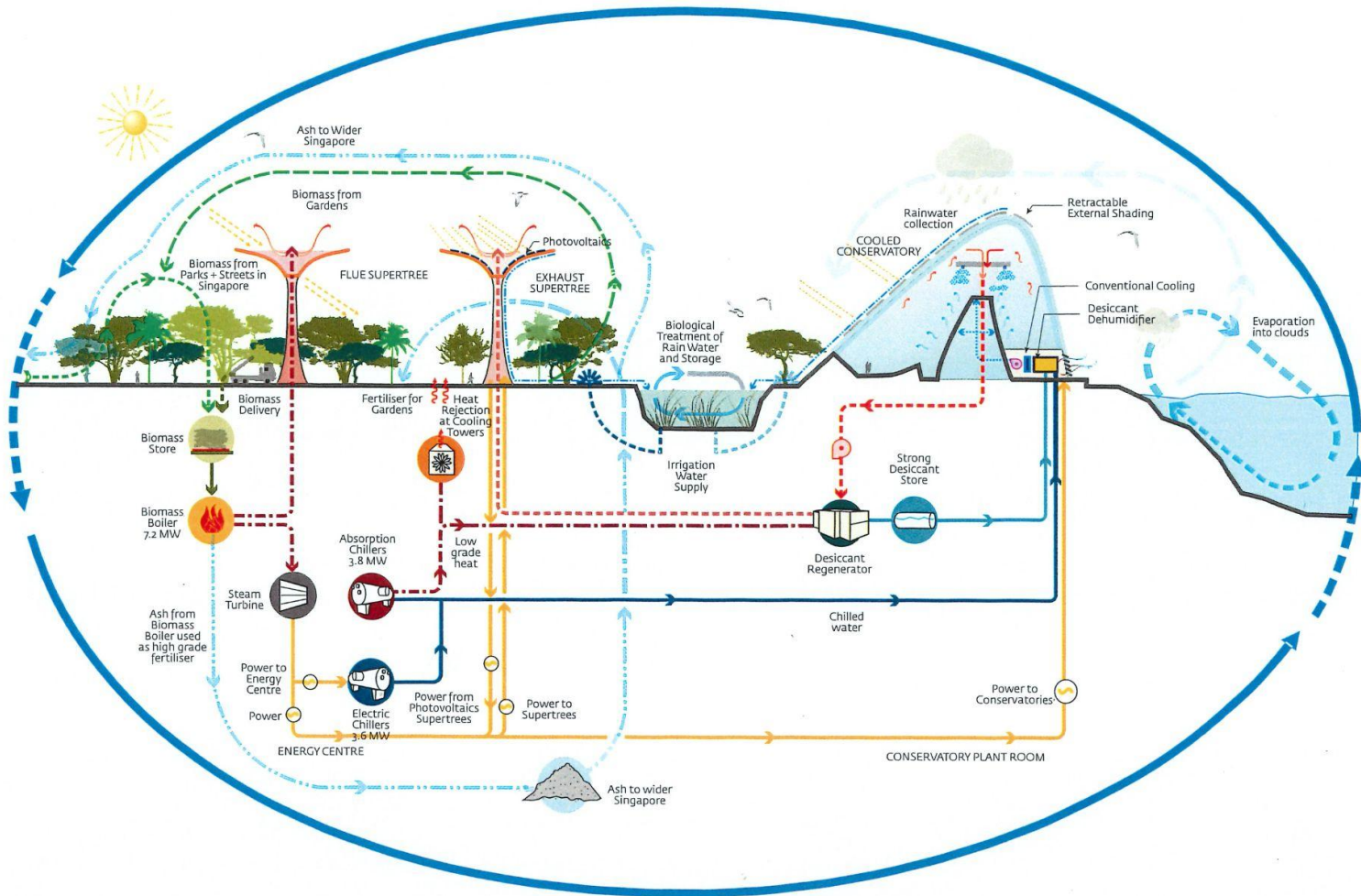
- Ecological systems
- Energy systems
- Architecture
- Landscape design



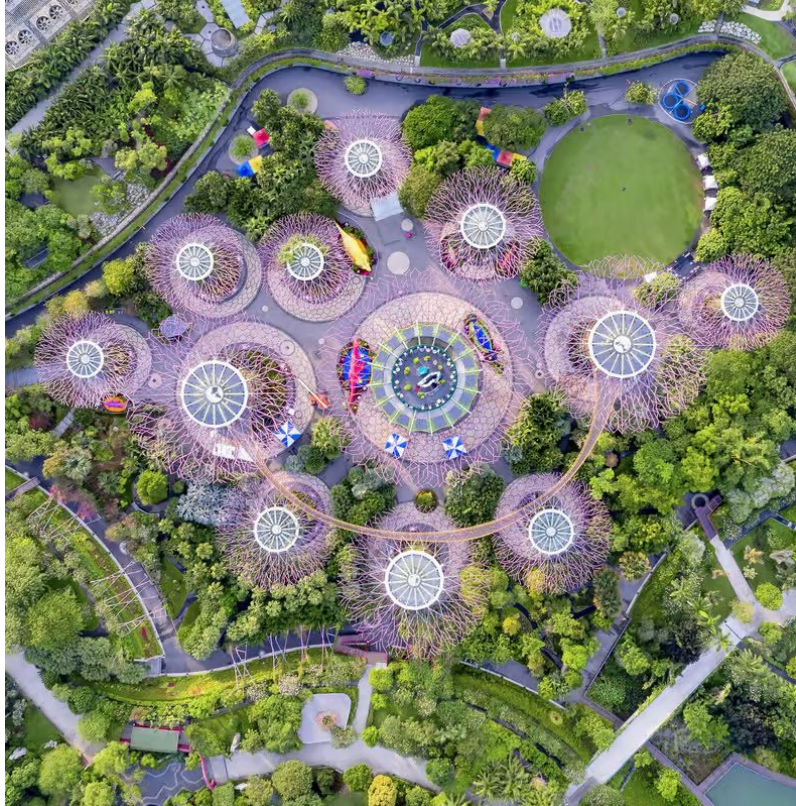
Integrative Design towards Sustainability

- Horticultural waste is converted into biomass fuel for electricity generation.
- The waste heat is utilized by absorption chillers to provide cooling for **Flower Dome** and **Cloud Forest**.
- The **Supertree** Grove serves multiple functions, including:

conservatories' exhaust air system, generating renewable energy through PV panels, accommodating cafés, providing elevated viewpoints for visitors.



Garden by The Bay



Labrador Tower (8 May 2026)



The 34-story premium-grade office building of SP Group has achieved Green Mark Platinum, **Super Low Energy**, and **LEED Platinum** certifications.



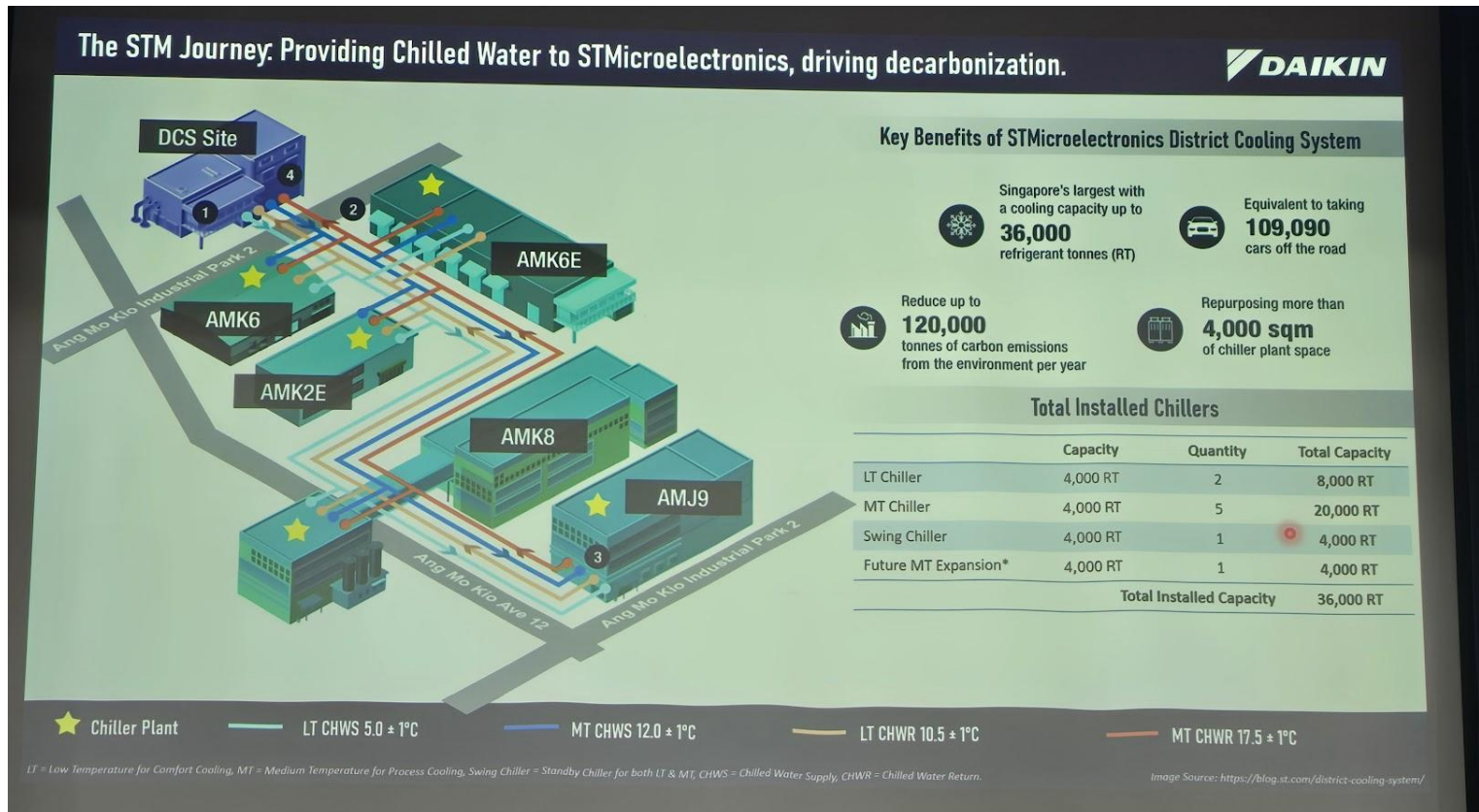
Labrador Tower

- The building features high-performance energy-efficient glass façades to maximize panoramic sea views while minimizing solar heat gain.
- An **active chilled beam** system is installed along the building perimeter to reduce the mean radiant temperature from the glass façade and improve occupant thermal comfort.
- The building utilizes high-efficiency chillers, DOAS and integrated with IoT and AI-based control systems for optimized energy performance and smart operation.
- The parking facilities are designed to be **100% EV-ready**, supporting future electric vehicle charging infrastructure.



STMicroelectronics

It is the largest district cooling system serving an industrial facility in Singapore.



SD4 - National University of Singapore (8 May 2026)

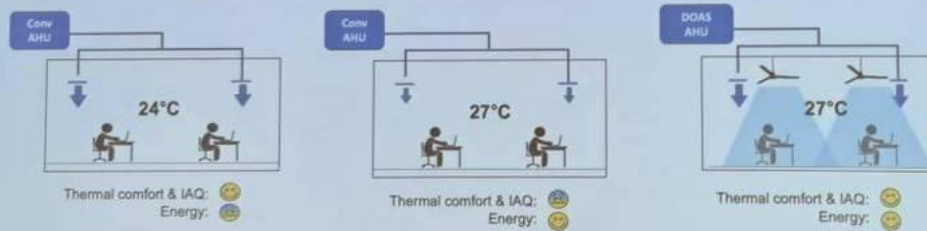
The building is the **first newly constructed Zero Energy Building in Singapore** to be designed as Zero Energy Building. It received **ZEB certification** from the International Living Future Institute (**ILFI**) and later achieved **Green Mark Positive Energy certification** and the *WELL* Building Standard.



SD4 - National University of Singapore

Concept of Hybrid Air-conditioning: DOAS-CF System

Reduce the cooling demand by increasing the room temperature and to improve thermal comfort and IAQ by elevated air movement



- The building uses a **hybrid cooling** approach that combines fans with air conditioning operated at approximately 27°C.
- It was designed as a living laboratory for testing and demonstrating sustainable building technologies and strategies.

City Link Mall (8 May 2026)

CityLink Mall is an underground retail and pedestrian link connecting MRT stations and major developments in Singapore's Marina Centre area. The project transforms underground circulation into an air-conditioned public space with shops and dining. It supports Singapore's "**work-live-play**" urban planning concept by improving walkability and connectivity. The design also enhances pedestrian comfort by providing shelter from heat and rain.



Marina Barrage

(9 May 2026)



Green Mark Platinum Infrastructure

The facility functions as a water control infrastructure that regulates water levels, prevents flooding, and reservoir for freshwater production.

It also serves as a recreational destination for water sports, while providing exhibitions about the operation of the barrage system.

The roof is designed as a green roof, offering a public space for and outdoor activities, 24 hours a day.

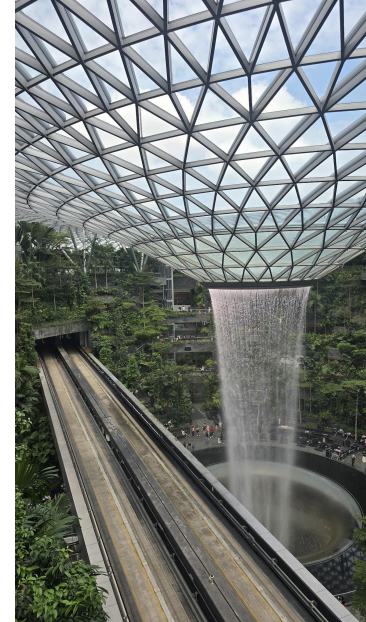
Marina One (9 May 2026)

Biophilic Design - Green Mark Platinum Superlow Energy, LEED Platinum – This high-rise development consists of two office towers and two residential towers surrounding a large central green space. The landscape is designed with multiple terraced levels, resulting in more greenery after development than before construction. The green space is also open to the public as a **public realm**.

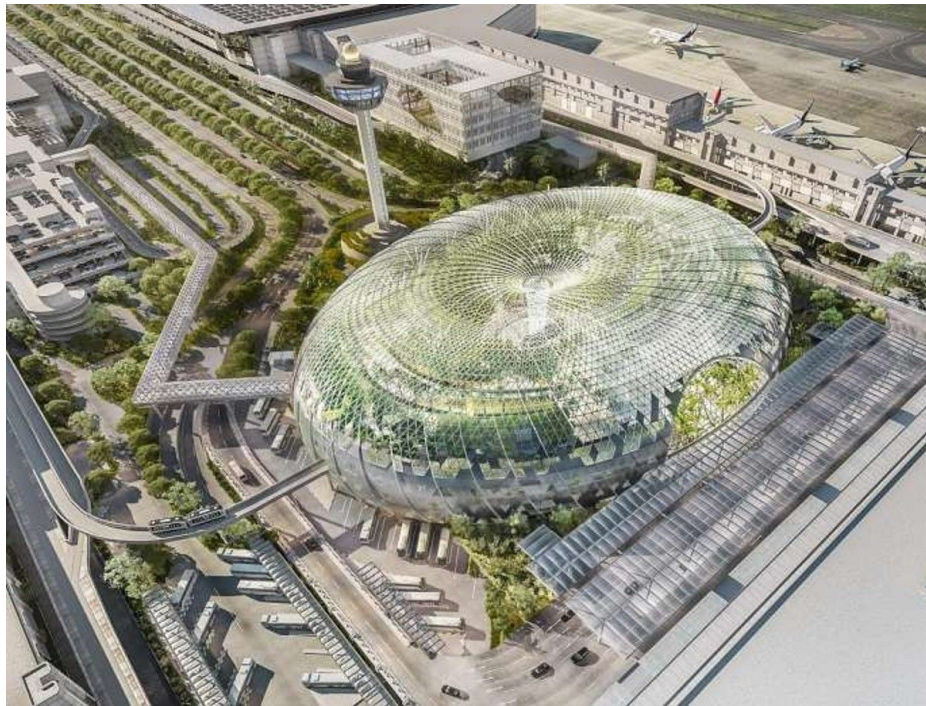


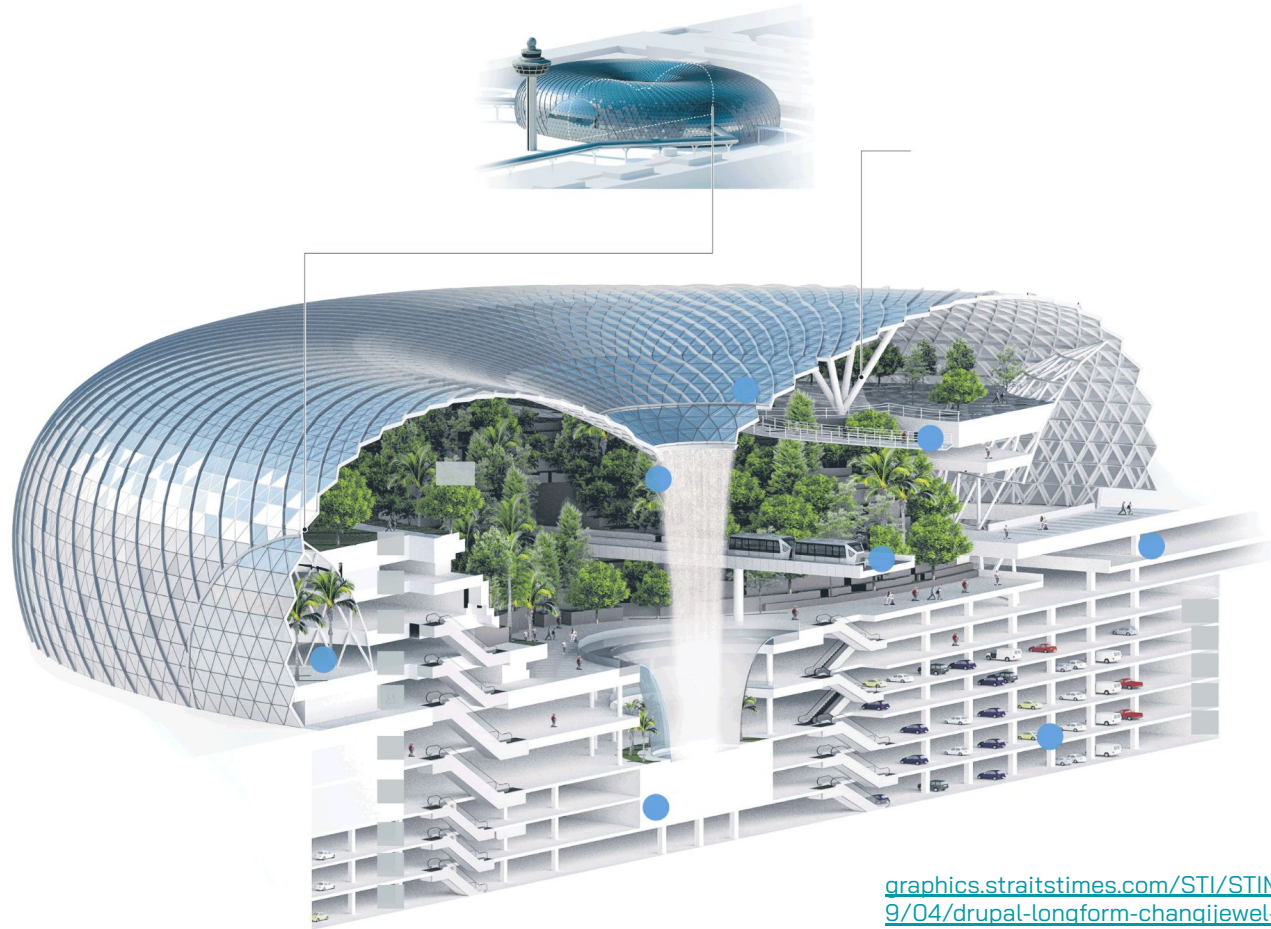
The Jewel -Terminal 4 of Changi Airport (9 May 2026)

- It is an award-winning building that received the Singapore Presidential Design Award. The project was designed under the concept of “Destination before Destination” – creating a public park with an indoor waterfall, where even Singapore residents, not traveling can come and enjoy the space.
- The building uses a displacement ventilation system, supplying conditioned air through benches and planter features to enhance thermal comfort at the occupant level.
- The roof is constructed with spectrally selective insulated glass, which allows high levels of daylight penetration while effectively reducing solar heat gain.



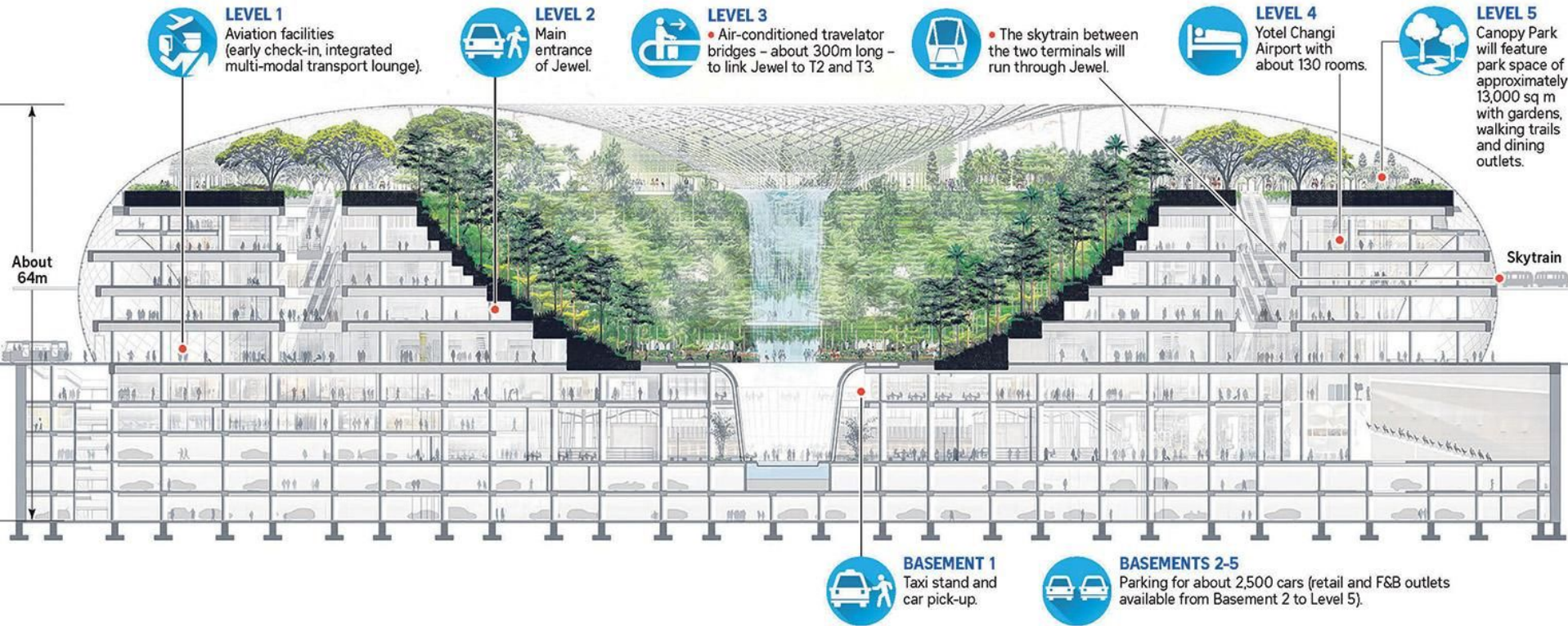
Torus or Donut Form





graphics.straitstimes.com/STI/STIMEDIA/Interactives/2019/04/drupal-longform-changijewel-mainmapedited/mainmapwhole.html

CROSS-SECTIONAL VIEW



Basement of The Jewel





Thank you