
Leadership in Sustainable Design and Performance - Commercial





A TREE OF LIFE IN THE HEART OF THE BUSINESS DISTRICT



Located in the heart of Singapore's Central Business District (CBD), CapitaGreen – one of the newest completed office buildings – stands out with its striking green façade. As a modern office tower comprising 40 storeys of premium Grade A space, CapitaGreen breaks away from conventional office building design, incorporating multiple sustainable features in its design and operation.

Designed by Pritzker Architecture Prize Laureate Toyo Ito, like a plant growing towards the sky, the 242-metre high CapitaGreen is crowned by a distinctive sky forest of tropical trees on its rooftop and a sculptural 'petal-like' funnel made of aluminium sheet with steel frames. These 'petals' draw in clean fresh air from the top of the tower into a cool void that penetrates 34 storeys of the building to deliver fresh air through its air-conditioning

system, to cool the office floors. At the same time, the building's generous floor-to-ceiling height allows natural lighting to permeate the interior, creating a sense of space without the extensive use of energy-consuming artificial lighting.

The building's innovative façade design has a 55 percent green ratio, with over half the perimeter of its façade covered by living green plants. This energy-efficient double-skin façade consists of an outer layer of frameless glass and an inner envelope of double-glazed full-height glass. In between these two layers of glass are planter-boxes filled with shrubs and ground-covers. This façade helps to reduce solar heat gain by up to 26 percent. Premium, ultra-modern office space is further complemented by lush greenery in the sky terraces at selected floors and in the expansive roof-top sky garden, as well as unique sculptures by internationally renowned artists which are tastefully integrated with the building design.

With a net lettable area of approximately 704,000 square feet (sq ft), CapitaGreen has one of the largest and most efficient, truly column-free typical

floor plates ranging from 22,000 sq ft to 26,000 sq ft. CapitaGreen also has the highest raised floor-to-ceiling height of 3.2 metres of any CBD office building. All carpets, paint and ceiling boards used for office interiors are certified by the Singapore Green Building Council's (SGBC) Singapore Green Building Product labelling scheme.

For its environmentally-sustainable and inclusive design, CapitaGreen was awarded two pinnacle awards – the Green Mark Platinum Award in 2012 and Universal Design Mark Platinum in 2016 respectively by the Building and Construction Authority of Singapore (BCA).

A SUSTAINABLE DESIGN

Conservation efforts were made at various stages of the life cycle of CapitaGreen, which occupies the site of the former Market Street Car Park. The project life cycle of CapitaGreen (from design conceptualisation, development, construction to operation) is strictly governed by CapitaLand's Sustainable Building Guidelines to maximise the economic and social value of the building and reduce its environmental impact.

Several innovative passive designs, such as the cool void and double skin façade, were incorporated to reduce energy consumption. New and efficient construction methods were adopted to improve productivity, reduce material wastage and cut unnecessary costs. Building Information Modeling (BIM) was used to study the construction sequence to minimise material wastage and enable sustainable demolition of the old building. CapitaGreen was recognised by BCA with a BIM Platinum Award in 2015. Reused and recycled materials were also widely used in the construction. A rainwater harvesting system and water efficient fittings rated "excellent" by PUB's Water Efficient Labelling Scheme in all common toilets, pantries and shower facilities help lower water consumption. Biodiversity was encouraged by consulting local authorities and specialists and native plant species were used for the greenery. Social factors were considered resulting in the creation of sky gardens, a rooftop forest, an open plaza at the northern end and dining amenities. Art pieces and sculptures by internationally renowned artists were also incorporated to inject a new vibrancy to the area. All vendors engaged at various phases of the development (construction, operation etc.) abided by CapitaLand's Environmental, Health and Safety (EHS) Guidelines.





The building's design factored in local physical and environmental conditions to optimise the intended results. The creation of sky gardens/forest and the extensive use of greenery serve to reduce the urban heat island effect, considering CapitaGreen is located in the heart of the CBD. The cool void takes advantage of the wind conditions at the maximum height of 242 metres and in an unobstructed part of the building to draw in cooler fresh air for circulation in the air-conditioning system. The Kakiotoshi wall, made from a special method of Japanese plastering, wraps around the core of the main lobby. The earth plastered wall is made by domestic soil and cement which are easily available in the local market. The full height glass windows draw in natural lighting into the office space to reduce reliance on artificial lighting as Singapore enjoys an abundance of sunlight due to its location along the equator.

SUSTAINABLE FEATURES

The aesthetically pleasing and creative design of the cool void and sky forest on the rooftop allows for fresher and cooler air intake for distribution to the office floors below, after going through the air handling units (AHUs). This fresher and better quality air is expected to reduce the load on the air-conditioning system required to cool the fresh air intake. Together with the incorporation of an innovative double-skin (green and urban) façade which cuts down the solar heat gain, the energy consumption is estimated to be lower by over 1.4 million kWh per annum, which is equivalent to over 700 tons of carbon emission or planting around 235 trees.

CapitaGreen has a high window/wall ratio to maximise the visible light transmission (about 61 percent of the influx of natural light) through the inner glass skin and reduce the need for artificial lighting with the inclusion of photocells to control the office interior perimeter lights. The building is also designed with an Envelope Thermal Transfer Value (ETTV) of 37.13 W/m², 26 percent lower than the benchmark of 50 W/m².

The extensive use of vertical greenery comprising a wide variety of living plant species, largely in the east and west facades to diffuse the strong sunlight penetrating the building, provides tenants with a more comfortable indoor environment.

To boost water efficiency, condensate water from the AHUs is recycled and stored in the cooling tower water tank in Basement 2. In addition, an alternative source of water, NEWater (purified wastewater using dual-membrane and ultraviolet technologies), is available for cooling towers and irrigation purposes to reduce consumption of potable water.

A total area of 112,408 sq ft of greenery was brought into the urban landscape of CapitaGreen, which is equivalent to 190 percent of site replacement. About 311 trees of 17 different species can be found within and around the building. Some 65,000 shrubs and ground cover from 80 different species are planted within the site. Having extensive greenery in and around the building, as well as the rainwater harvesting features, significantly reduces the load on the local drainage system by slowing down rainwater runoffs and reducing peak flows.



The water-efficient automatic irrigation systems for most of the greenery includes drip emitters and a gravity feed delivery pipe network to save energy. Rainwater is harvested and reused for irrigation purpose. All the water efficient features translate to water savings of 34,536 cubic metres per year, which is about 60.5 percent of the total water consumption of the building. Sub-meters are installed to monitor the major sources of water consumption.

A FOCUS ON WELL-BEING

The building design goes beyond the conventional office setting by including a wide variety of commercial, recreational and social space and amenities in the spatial planning. This ranges from the restaurants and cafes to social amenities on various levels of the office tower, providing convenience, comfort and breakout spaces to both office workers and the public.

CapitaGreen is well connected to existing public amenities, pedestrian walkways and transportation networks, offering ease of access for workers in the building and the general public. For example, there is a relocated taxi stand on the ground floor of the building along Cecil Street, and CapitaGreen is close to the Raffles Place and Telok Ayer MRT stations as well as multiple bus stops.

Covered walkways provide visitors with shade from the sun and shelter from the rain. The majority of the routes to the amenities of the building are step-less to facilitate movement of visitors on wheelchairs. The design and construction of an Underground Pedestrian Network with accessible lifts provides a seamless route to the nearby developments and beyond.

The building management team hosts frequent visits to CapitaGreen to market the building and educate people on the unique green features and sustainable designs adopted. CapitaLand organises tenant engagement programmes including an annual key event, called the CCT Eco Race, to promote awareness of the sustainability and green initiatives driven by the Group. 🍃

Developer: CapitaLand, CapitaLand Commercial Trust (CCT) and Mitsubishi Estate Asia

Concept Designer: Toyo Ito & Associates, Architects

Project Architect: RSP Architects Planners & Engineers (Pte) Ltd

M&E Engineer: Squire Mech Pte Ltd

Main Contractor: Takenaka Corporation

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