



GREEN:HOUSE GREEN:ENGINEERING

Environmental Design at Gardens by the Bay

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A UNIQUE CHALLENGE DESIGNING A SOLUTION

The Gardens by the Bay is part of a major citywide initiative by the National Parks Board of Singapore (NParks) in their plan to move from being a Garden City to a City in a Garden. The total project is made up of three significant new urban gardens around the Marina Bay area, the first of which, Marina Bay South, is the largest. Bay South comprises a landscaped garden and water system covering an area of 54 hectares (134 acres) built on partially reclaimed ground in the estuary mouth of the Singapore River on a site that includes two significant rainwater runoff channels that link the land to the south with the Bay.

The project was the subject of an invited international design competition organised by NParks in 2006. Their aim was to find an innovative and implementable masterplan design for the Gardens. The Bay South competition was won by a team led by Andrew Grant of Grant Associates, involving Wilkinson Eyre Architects and Atelier One, structural engineers, with Atelier Ten as environmental designers and building services engineers.

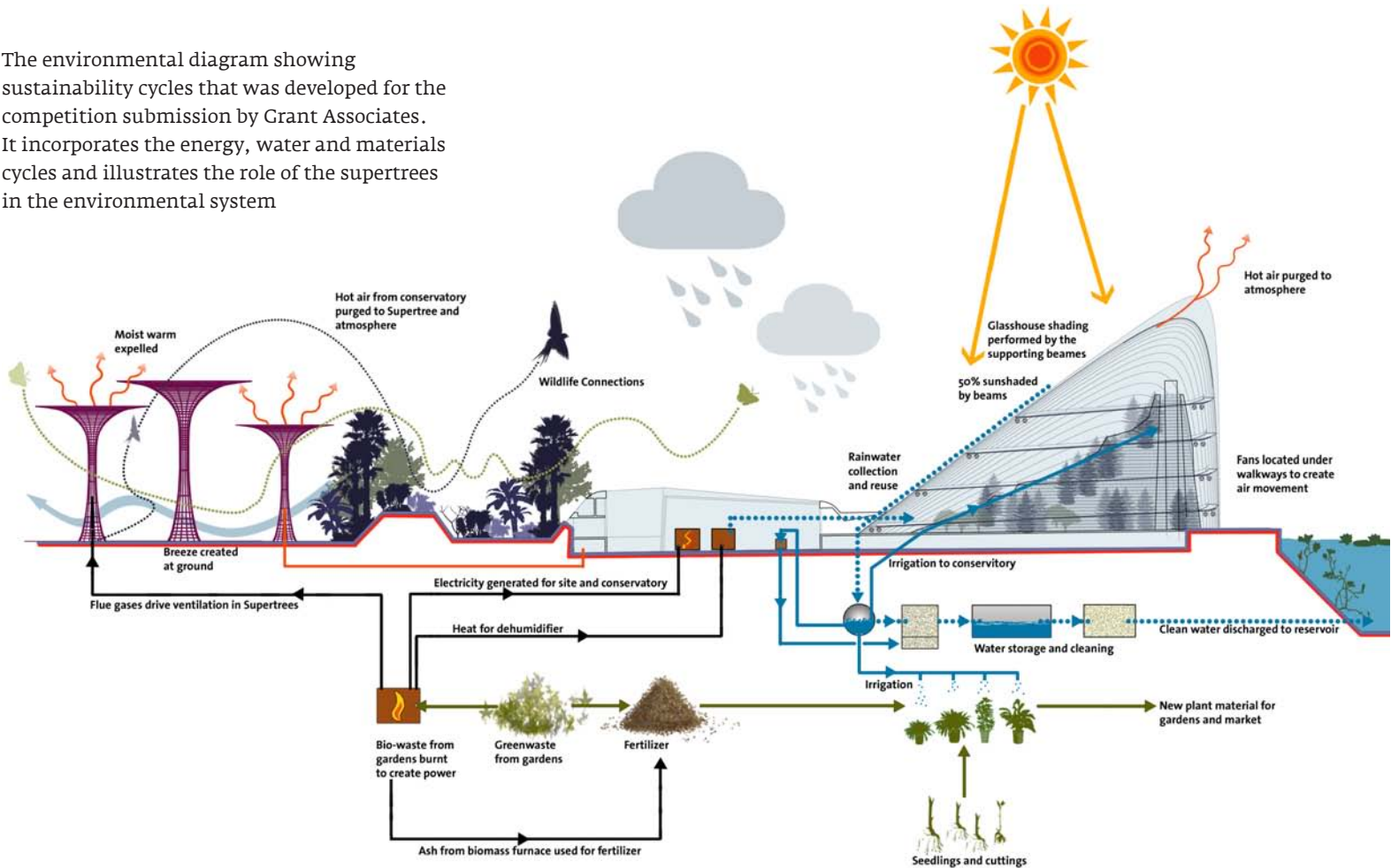
The design was commissioned in 2006 and the Flower Dome and a portion of the gardens opened as a preview to the public in November 2011. The Gardens opened formally to the public in June 2012. The project includes two large cooled conservatories or 'biomes' with a footprint of 20,000m² at the north-eastern end of the gardens and eighteen large 'Supertree' structures, ranging from 25m to 50m in height, arranged in three clusters around the conservatory complex. The two conservatories were known throughout the design stage as the Cool Dry Biome and the Cool Moist Biome. They were renamed the Flower Dome and the Cloud Forest as the project moved towards opening day.

The Flower Dome re-creates the conditions in Mediterranean spring time with mild, dry days and cool nights. It is 170m long, 86m wide and 38m high, contained within a clear spanning double glazed gridshell structure.

The Cloud Forest Dome emulates the conditions of mountainous tropical regions: areas where the air temperature is relatively mild during the day and slightly cooler at night but with humidity levels that are approaching saturation throughout both the day and night period. The Cloud Forest Dome is 118m long, 77m wide and 58m high and has a large mountain in the centre with aerial walkways to take



The environmental diagram showing sustainability cycles that was developed for the competition submission by Grant Associates. It incorporates the energy, water and materials cycles and illustrates the role of the supertrees in the environmental system



The project illustrates how design optimisation and cross discipline integration can result in high-performance, responsive buildings even in very demanding climatic conditions and with a highly technical and challenging environmental design brief.

visitors through the tree-tops. The Supertrees support many of the environmental systems associated with energy production and ventilation of the glasshouses as well as supporting vertical gardens, providing a focal point to the gardens and shade for visitors.

Each biome has a number of unconventional design requirements in order to create artificial environments and allow plants from Mediterranean and Tropical Montane regions to flourish in the tropical climate of Singapore. The project illustrates how design optimisation and cross discipline integration can result in high-performance, responsive buildings even in very demanding climatic conditions and with a highly technical and challenging environmental design brief.

The project is concerned with recreating nature; the elements for the development have been interleaved in such a way as to generate an enhanced ecosystem for the site, with the conservatories and the gardens being designed to be symbiotic through the interaction of energy, water, nutrient and water cycles and processes.

This is an excerpt from our book on Gardens by the Bay, World Building of the Year (WAF Award 2012).

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