

A SHORT HISTORY

GROWING GARDENS IN THE SKIES

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Images as credited



Singapore has one of the highest population densities in Asia. The rather built-up physical environment is a challenge for the sustainability and livability of the city. A new trend is to bring some of the greenery onto the buildings and up the skies. With advancements in research and technologies, as well as the resolve of the industry and authorities, this option has become a reality.

FROM SOD ROOFS TO ROOF GARDENS

Green roofs have a long history, dating back to centuries ago in Northern Scandinavia, where sod or turf was traditionally used for roofing the houses, offering efficient regulation in extreme temperatures. The modern "trend" started in Germany, with the works of Reinhard Bornkamm, a researcher at Berlin's Free University, published in 1961. The studies gradually evolved in Germany into the modern-day green roof technology. In 1975, the green roof movement was further institutionalised when the German Landscape Research, Development and Construction Society (FLL) green roof working-group was founded to look into green roof guidelines and standards.

In the 1980s, neighbour European cities, especially in Austria and Switzerland, started implementing green roofs on their buildings. The green roof movement spread over the continents, gaining momentum in Tokyo, Fukuoka, Chicago, Washington D.C. and Toronto. Today, it is estimated that 12% of all flat roofs in Germany are green, boosting a 15% annual growth in the industry, disseminating German know-how over the world.

Vertical greenery, on the other hand, became popular only in the 1980s, when Dr. Patrick Blanc, a French botanist and researcher, popularised the concept and technique to cultivate vertical gardens, allowing endless varieties of living compositions to colonise the inner and outer facades of walls within cities.

Skyrise greenery has since diversified into green roofs, vertical greenery and gardens in the sky, owing its success to its aesthetic, economic and proven environmental paybacks.

The Roof Gardens, one of London's most stylish venues, is an example of a successful project with beneficial achievement. Situated 30 metres above Kensington High Street, the club is part of Sir Richard Branson's portfolio of unique retreats for private events. Originally built in 1932, the gardens have been recently upgraded to propose an oasis of luxury on top of London, with tropical plants, flamingos, olive trees, fountains and archways.



ACROS1 FUKUOKA

ACROS Fukuoka in Japan offers another example of an acclaimed skyscraper greenery development with high aesthetic and ecological value. Wrapping a conical structure with lush greenery, the enchanting green stepped garden exterior stands like a lush green mountain against the urban jungle. When first constructed in 1995, there were 76 varieties of plants, totaling 37,000. Since then, birds and winds have sown seeds that grow freely. Some 120 varieties of plants, totaling 50,000, are now covering the place, enhancing its natural aspect and biodiversity.



OPPOSITE Sod Roof on Farm building in Heidal, Gudbrandsdal, Norway. (Image copyright © Roede)

RIGHT ACROS Fukuoka. (Image copyright © 2010 Fukuoka City)

TOP LEFT The Roof Gardens, Wedding event at the Tudor Garden. (Image copyright © Virgin Limited Edition)

MIDDLE LEFT The Roof Gardens, Flamingos in the English Woodland Garden. (Image copyright © Virgin Limited Edition)

BOTTOM LEFT The Roof Gardens, Spanish Garden. (Image copyright © Virgin Limited Edition)

GROWING HIGH IN SINGAPORE

Singapore earned the name "Garden City" through decades of planning and nurture. The 1968 "Garden City" approach was the vision of integrating nature into developments. Efforts to green up construction started 40 years ago, when the relevant agencies covered walls, flyovers and pedestrian bridges with creepers and ornamental plants, with a view to increase aesthetic value as well as cool the environment.

Subsequently, strategies were developed and the "Skyscraper Gardens Exhibitions" were also launched to encourage high-rise dwellers to create gardens in their balconies.

While these early promotional efforts were well-received, official study trips were conducted in Tokyo and Toronto. The mission revealed that both cities had adopted skyscraper greenery as a strategy to mitigate the adverse effects of urbanisation. Temperatures in Tokyo city had risen by three degree-Celsius over the past 100 years and would continue to go upward by another two degree-Celsius due to the Urban Heat Island effect. This increase was attributed 60% to the loss of greenery and 40% to energy usage from buildings. Simulations predicted that the ambient temperature in Tokyo could be reduced by up to nearly one degree-Celsius if 50% of all available rooftop space were planted. The resultant energy savings would be of 100 million yen per day in electricity bills. On the other hand, Toronto estimated that green roofs could reduce heating and cooling costs by 25%, thanks to their insulating properties.

At the same time, several public agencies in Singapore geared up to spearhead programmes on skyscraper greening.



A NEW FRONTIER FOR TROPICAL RESEARCH

Research in the field of skyscraper greenery has been historically established in the realm of temperate countries. As conditions in tropical climates differ significantly, studies of potential applications and adaptations of overseas greening systems, including plant selection, became urgent and necessary.

Since 2000, the National Parks Board (NParks) has initiated several research projects to validate the benefits of skyscraper greenery in Singapore and overcome implementation barriers through narrowing technical information gaps. In 2007, the Centre for Urban Greenery and Ecology (CUGE), formed under NParks, was tasked to continue and structure the research, with the aim of long-term sustainability. Studies are carried out to establish surface and ambient temperature reductions, air quality improvement and perceived aesthetic value associated with skyscraper greenery in the local context. Projects are performed in collaboration with other institutions and agencies, like the Housing Development Board and the National University of Singapore.



The overall findings have validated the multiple benefits of skyscraper greenery in Singapore. CUGE has also conducted a number of workshops and seminars to share these findings with industry players.

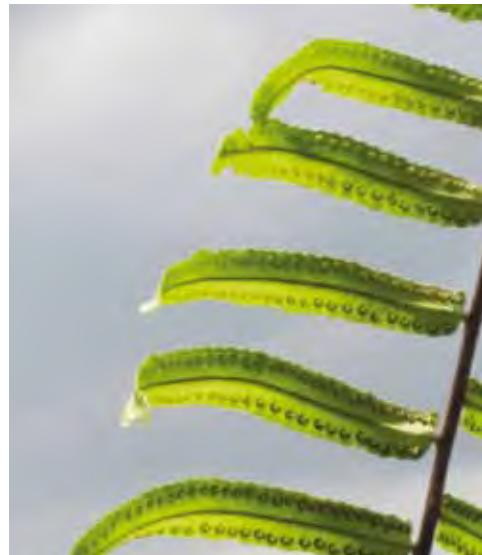
The results of CUGE's research are presented in publications. The collection includes "A Selection of Plants in Green Roofs in Singapore" and "Vertical Greenery for the Tropics". A more recent series, "CUGE Standards for Rooftop Greenery", outlines the design requirements for loading and safety. Several new standards are being developed and will be released over the next few years.

Skyscraper greenery in Singapore is taking many different forms today. Step by step, it has grown from the original creeper climbing the parapet, to the traditional garden pushed up on the roof; going higher, using new ideas and materials, it is colonising the skyscrapers of the city. The industry has also progressed from importing systems to developing its own locally adapted systems. Skyscraper greenery is a means to ensure that nature is injected into the built environment as we develop skywards.

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OPPOSITE LEFT Roof garden at multistorey carpark in Holland Drive. (Image copyright © Elmich Pte Ltd)
OPPOSITE RIGHT, THIS PAGE Plants found on local roof gardens. (Image copyright © NParks; Photo: Rachelle Low)



¹ The name ACROS is an acronym for Asian Cross Road Over the Sea, information adapted from <<http://www.acros.or.jp/english/>>. Last retrieved on 19 July 2010.