

FUTURARC

The Voice of Green Architecture in Asia-Pacific

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Ecological Landscapes

Inside: Reviving Ancient Wisdom; the landscapes of Dr Yu Kongjian | Mohan Rao; environmental designer and landscape architect | Works of Turenscape, Sasaki Associates, HASSELL and Philippe Rahm architectes | In Conversation with Singapore's *Mother Nature*, Lena Chan

With projects from Australia, China, India, Indonesia and Taiwan

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Letter from the editor

Dear *FuturArc* Readers,

Ecology gets discussed a lot these days. It's worth asking what this means to the world of design.

Ecology is the science of conditions and interactions that makes life on our planet possible. An ecosystem is the overlay of organisms, behaviours and processes, over their physical habitats. Ecological design is the creation of habitats in alignment with the natural order of things. We do this by mimicking nature or by integrating blue-green elements into the fabric of the built environment. This is more than a mere expression of form. Green walls and water features become ecological when they connect to an ecosystem (say, a network of habitats for birds) or perform an ecosystem service (say, cleaning the air or a river). It's all about relationships and flows.

When we set out to put together this issue, the editorial team sent out a broad description of what ecological means. Interestingly, what came back was mostly landscape design. What we learnt is that whereas landscapes were once mostly aesthetic, there is now interest in repairing nature. Designers are looking into natural processes that have been lost or fragmented.

There are three perspectives on this.

Dr Yu Kongjian (page 20), known for his award-winning works in China where, aside from the spectacular parks he designs, has been the force behind the sponge city movement. A sponge development deals with storm water run-off in ways that a natural system might; it increases ground water absorption and evapotranspiration, and restores water quality. For inspiration, Dr Yu turns to the Chinese countryside and agricultural practices that have had, for hundreds of years, methods and strategies for integrating the human and the natural. Many of his projects might be labelled restorative, seeking to heal contaminated earth and rivers.

The work of Mohan Rao in India (page 8) speaks to a more rustic approach in design, in which hydrological patterns seem to dictate what is done where, and the landscape appears to be topographically sculpted to do the job. This is as much about social issues as it is about ecological techniques. This overlay of social and ecological creates stunning landscapes that are both understated and powerful.

Philippe Rahm's approach to the Central Park in Taiwan (page 48) might be called 'eco-modernist'. Technology is programmed to the job of nature. We are familiar with climate control systems indoors; this is the first wide-scale engineering of microclimate outdoors. The park is fitted with nozzles and canopies that cool, clean, dehumidify and accelerate the air. This is constructed nature; ecosystem services at the flick of a switch.

One might ask which works best; the answer will always be that it depends on context. The moral of the story, if one can call it that, is that ecological design is first and foremost a response to the local. It's about where you are and what that place needs. We hope you are as inspired as we are.

Dr Nirmal Kishnani

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Cover image: Chengtoushan Archaeological Park by Turenscape

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Environmentalism and Architect
Partner, Integrated Design (INDÉ)

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The FuturArc Interview

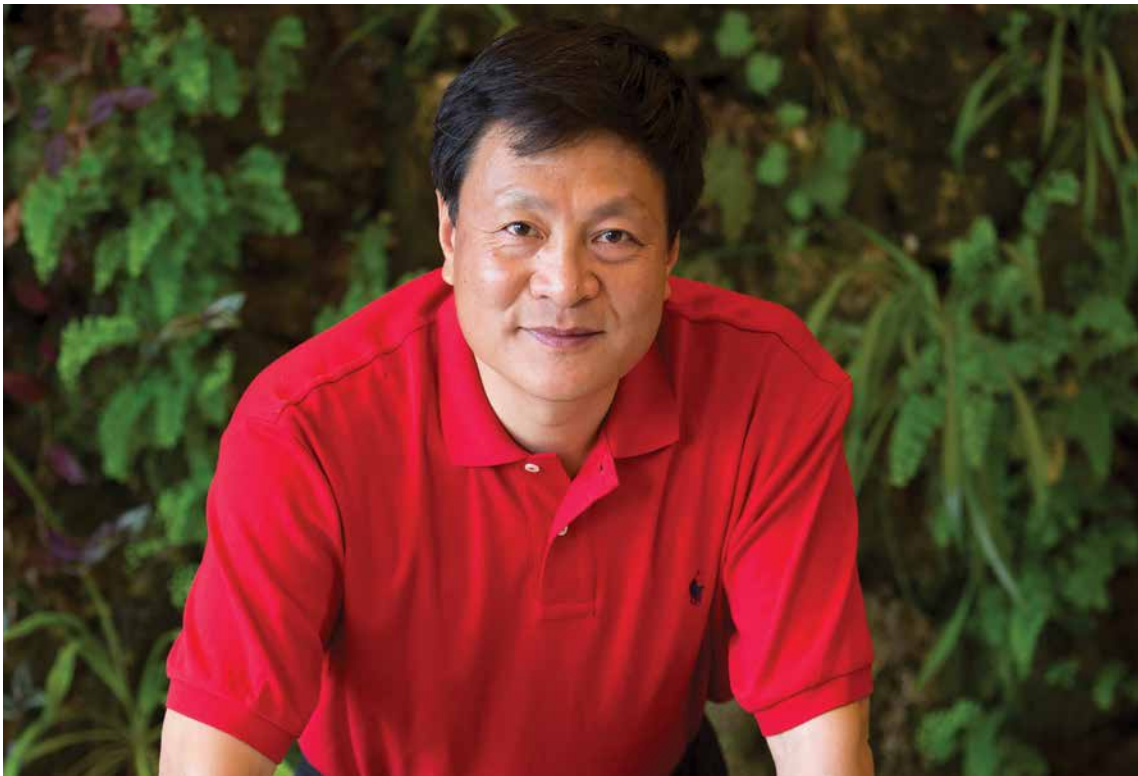
Mohan Rao

**Environmentalist and Architect
Partner, Integrated Design (INDÉ)**

By **Bhawna Jaimini**

Green Infrastructure through the Revival of Ancient Wisdom

by **Dr Kongjian Yu, Peking University** and **Turenscape**





PERFORMATIVE & PRODUCTIVE: CHENGTOUSHAN ARCHAEOLOGICAL PARK

Hidden in a remote and poor rural region for decades, the Chengtoushan Archaeological site was rediscovered through landscape design using performance- and production-based approaches. These not only protect the integrity and authenticity of the site's heritage, but also seek to develop it as a valuable tourist attraction. It showcases how landscape architecture can transform an obscure archaeological site into an educational, playful and productive asset, which will greatly benefit the local community.

CHALLENGES AND OBJECTIVES

In 1979, Chengtoushan was a mound on the intensively cultivated flood plain of Dongting Lake in Hunan Province of China. At that time, Chengtoushan was accidentally discovered as the site of the earliest city in China—and the place where rice was first found cultivated—and soon after, it was designated as a national heritage site. For the local community, this great discovery was more of a burden on their shoulders than a blessing. Given poverty and remoteness in a rural region, the productive land was taken from their hands and designated as protected land, and they were also given the responsibility to protect this place from being destroyed. After being kept untouched for about three decades, the local government made the decision to turn the burden into a blessing, with the aim to transform this area into a tourism attraction to improve the local economy.

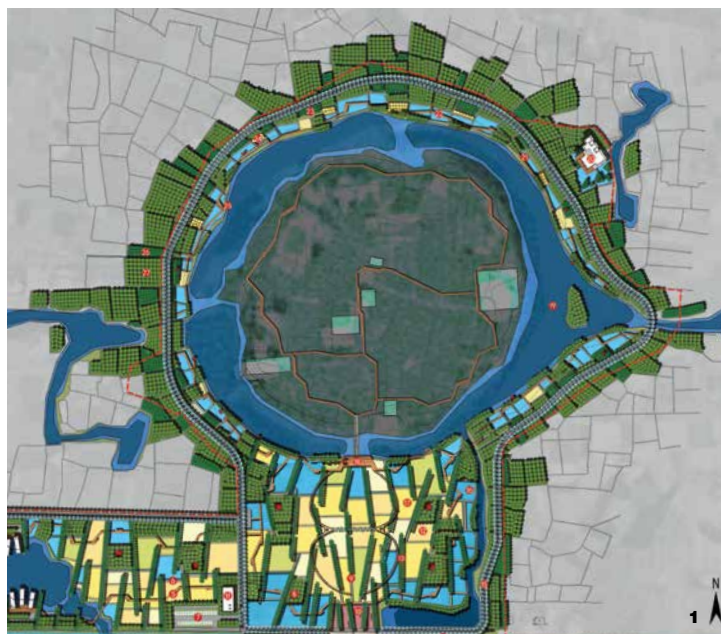
An expensive mistake was made at the beginning of this endeavour. Prior to a landscape architect being called in, the landscape around the archaeological site had already been transformed dramatically from agricultural fields into ornamental gardens. A wide avenue composed of several museums and monumental structures, lined with ornamental trees and decorated with flower beds and rockeries, had been built, as if it were in the urban landscapes seen ubiquitously in China. A paved square was to be built at the south entrance outside the archaeological site. The site began to lose its authenticity, and interest waned from visitors and urban residents from the cities in this region. It is fortunate that such a vast scale decorative landscape project was put on hold when a knowledgeable senior government official visited the site and made a negative comment. The landscape architect was invited to redesign the project, although for the most part it was too late, except to rescue the situation by a rediscovery of the surrounding landscape. The challenge, however, remained as to how the authenticity and integrity of an archaeological site should be protected, while concurrently transforming the landscape in such a way that the agricultural

landscape can become an attraction for tourism to fulfil the objectives of the local community and government.

DESIGN STRATEGY

Three strategies had been taken to protect and transform the landscape of Chengtoushan. Firstly, the archaeological site was maintained with minimal changes, except for a route designed to enable visitors to interpret the environment. The circular city surrounded by a moat becomes an empty and silent theatre, which creates ample opportunities for visitors to imagine what life may have been like in the ancient city.

A second strategy of ecological recovery through the use of diverse wetland plants and patches of trees was implemented for the land beyond the moat surrounding the circular urban core. The main part of the park outside of the



1 Site plan of Chengtoushan 2 Aerial view



CENTRAL PARK

by **Ann Deslandes**

Scheduled for completion by September this year, Philippe Rahm's Central Park (previously named Jade Eco Park) has been erected on the site of the former airport of Taichung, Taiwan. The park will serve a new residential and commercial district that backs onto the Tunghai University. Spanning 70 hectares, it includes space for leisure, sport, family and tourist activities. There is a 3,000-square-metre visitor centre and a maintenance centre; regulatory approval for a new library and tower in the future is underway, and more than 30 other facilities buildings, including pavilions, cafés, classrooms and toilets.

Central Park is a realisation of Rahm's creative climate-driven approach to design. The architect's experiments with 'thermodynamic urban design' are well known in the field of Green architecture, and have been rendered in this case through the development of microclimates adapted to human activities requiring cool (Coolia), dry (Drylia) or clean/clear (Clearia) environments. The design is based on computational fluid dynamics (CFD) simulation, with each microclimate formed through augmentation of its natural assets.

As such, the park offers what are known as ecosystem servicesⁱ. Typically, nature provides services like moderating ambient temperature or cleaning the air. Here, it is being engineered with the help of technology. As Rahm has said elsewhere, "Architecture should no longer build spaces, but rather create temperatures and atmospheresⁱⁱ." In the case of Central Park, he has used his technology-mediated understanding of meteorological and physiological phenomena to shape the space. His attention to existing organic, elemental processes in landscapes, in the practice of architecture, is reminiscent of the Japanese experiments in the 1960s and 1970s with metabolic and autodigestive designⁱⁱⁱ.

Along with Mosbach Paysagistes and Ricky Liu & Associates, Rahm won the international competition for the design of the park in 2011, which continued his well-established interests and practices around thermodynamics and landscape. In 2008, Rahm's Digestible Gulf Stream was selected and exhibited at that year's Venice Biennale. In an accompanying text, he wrote, "The lower plane is heated to 28 degrees Celsius, the upper one is cooled to 12 degrees Celsius. Like a miniature

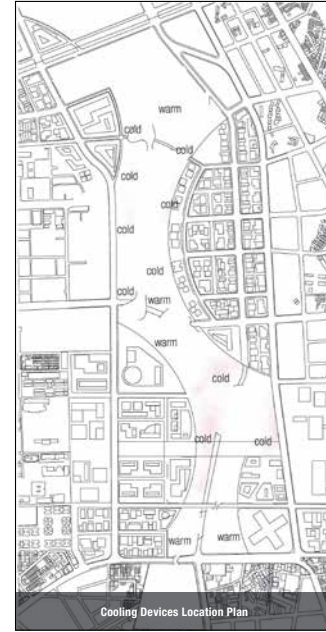
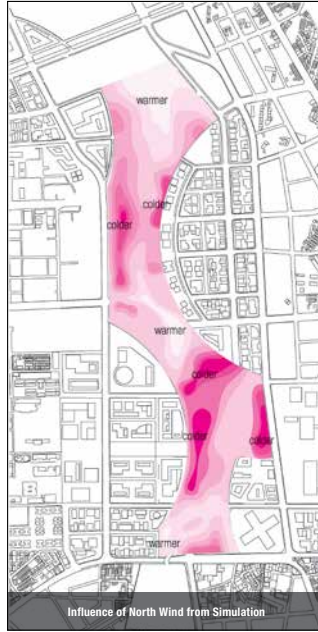
Gulf Stream, their positions create a movement of air using the natural phenomenon of convection, in which rising hot air cools on contact with the upper cool sheet and, [upon] falling, is then reheated on contact with the hot sheet, thus creating a constant thermal flow, akin to an invisible landscape. What interests us here is not the creation of homogeneous, established spaces, but of a plastic, climatic dynamic, the activation of forces and polarities that generate a landscape of heat. In this case, the architecture is literally structured on a current of air, opening up a fluid, airy, atmospheric space. This architecture is based on the construction of meteorology. The inhabitant may move around in this invisible landscape between 12 degrees Celsius and 28 degrees Celsius, temperatures at the two extremities of the concept of comfort, and freely choose a climate according to his or her activity, clothing, dietary, sporting or social wishes^{iv}."

In an interview with *FuturArc*, Rahm explained his philosophy further. "Rather than having form follow function," he said, "we say function follows form, and form follows climate." That is, "We first map the climate, the climate behaviour, then we find the form, then we find the function."

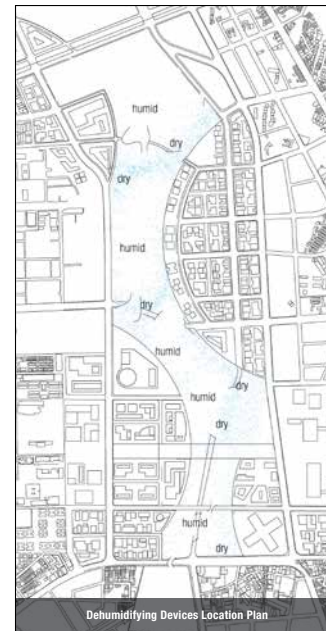
1 Central Park is a realisation of Philippe Rahm's climate-driven approach to design
2 Climatic simulations on the master plan



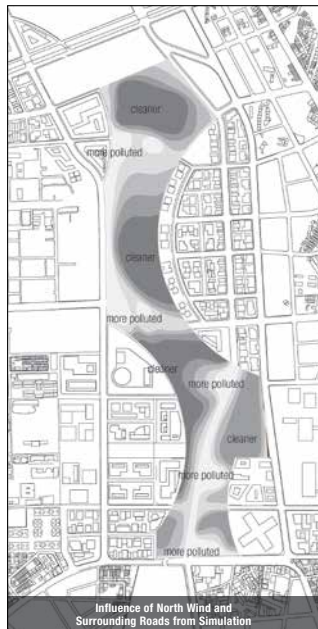
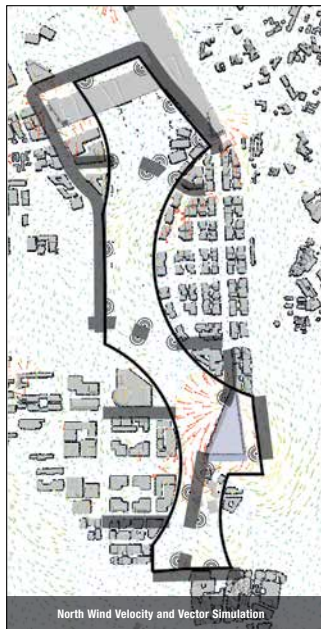
Heat map on site



Humidity map on site



Pollution map on site



AUSTRALIA



GREENWAY MASTER PLAN

GreenWay is a 5.8-kilometre multi-use linear link between Iron Cove and Cooks River. It is envisaged as an urban green corridor, a continuous and connected shared landscape for cultural engagement and recreation. Following the route of the Inner West light rail, this platform features bike paths and foreshore walks; bushcare sites; cultural and historical sites; public art and community events; cafés; and a range of parks, playgrounds and sporting facilities.

Based on the objectives, site and precinct analysis, stakeholder consultation, as well as the review of benchmark examples, many ideas have emerged about what GreenWay should be, what it should include and how it should be delivered. It seeks to become a multifunctional and ecological community infrastructure by weaving together its physical, natural and cultural elements into a coherent and integrated whole, thus enhancing its amenity value, design quality, identity and a sense of place.

The draft plan, which was created using community and grassroots input, proposes a combination of capital works and other improvements, including more than 4 hectares of revegetation and bank naturalisation; improvements to existing and newly accessible public open spaces; public art installations along the length of the corridor; and the completion of the remaining 3.2 kilometres of walking and cycling paths on Greenway (from Parramatta Road south through Lewisham West and Dulwich Hill to the Cooks River cycleway at Earlwood).

MASTER PLAN OBJECTIVES, STRATEGIES, KEY DESIGN AND PROGRAMME ELEMENTS

The Inner West community and local councils have been campaigning for over a decade for its completion. With the release of the draft master plan, it is a step closer to reality for GreenWay to proceed with a distinctive, integrated, place-based approach by combining its four main functions—ecology, active transport, recreation and culture—in each of its six precincts along the corridor.

ECOLOGY

Biodiversity is found throughout urban areas; research into urban ecology reveals thriving species while providing insights into how to create effective habitats for a diverse range of native species in the urban landscape. It is crucial to protect and enhance the role of Greenway as an urban biodiversity spine, where urban ecosystems can play important roles in environmental services such as the mitigation of urban heat island effect; reduction in storm water runoff; and increased resilience

to extreme conditions. Where built infrastructure is located in areas with habitat value, the plan proposes employing ecologically sensitive design strategies. Two proposed strategies in the plan are the protection of existing ecological restoration sites and other areas with habitat value as well as improving habitat connectivity (canopy, understorey layer and waterways with riparian zones). Plantings can be incorporated in the rail corridor, parks, streetscapes and private gardens. A new development along GreenWay has been encouraged to provide a ten-metre vegetated buffer between the buildings and the rail corridor.

GreenWay's two waterways once supported rich ecosystems. Post-colonial development decimated the local bushland, of which only fragments remain. On the other hand, long-term access restrictions in the rail corridor have allowed a valuable vegetated link to be re-established, and community bushcare has restored pockets of native vegetation. The waterway can be reconnected with its riparian zone by naturalising drainage systems to create wetland habitat and better fauna linkages between water and land, as well as creating offline wetlands and ponds for both habitat (sheltered water sources) and water treatment (clean water sources).

Today, GreenWay supports regionally significant ecosystems in an otherwise heavily urbanised landscape. Native ecological communities and species that have been lost throughout much of the Inner West are still present along this corridor. The GreenWay Biodiversity Strategy (2012) found that these include the modified remnant and/or recolonised fragments of the Sydney Turpentine-Ironbark Forest endangered ecological community, as well as endangered populations of the eastern long-nosed bandicoots (*Perameles nasuta*), grey-headed flying foxes (*Pteropus poliocephalus*) and eastern bent-wing bats (*Miniopterus schreibersii oceanensis*).

ACTIVE TRANSPORT

Active transport, which includes walking, cycling and other non-motorised transport, is gradually becoming more popular in higher density inner suburbs of Australian cities (Zander et al 2014). GreenWay will form a vital north-south connector in a network of regional active transport routes by transforming several existing and proposed routes traversing the region's east-west, including important routes to the city and the airport, into a safe and accessible network. A continuous shared path

1 Rendering of Hawthorne Canal

CHINA



SILK ROAD CORRIDOR



For its winning competition scheme, HASSELL has been appointed as design partner for the development of a critical urban area within the new Qianhai business district of Shenzhen, one of China's important 'gateway' cities. As Mawan is a new area in Shenzhen, the plan focused more on strategic concepts; detailed landscape and sustainability input was not required at the initial stage. The mixed-use master plan concept consists of four layers that form an integrated and defined new public place: above and below ground neighbourhood zones; a continuous park; a series of pavilion buildings; and a 1.6-kilometre sky deck that weaves its way above and links the whole development. The idea of the deck in the winning concept serves as a 'boulevard in the sky', connecting buildings in the precinct and the park, as well as the wider city street network. It could provide an uninterrupted cycling and jogging path that promotes exercise and well-being, a central goal of the project.

DESIGN INTENT

HASSELL's competition concept was to create a major green corridor that acts as the ecological and public activity spine for Mawan. Its urban intervention integrates landscaped spaces with programmes, as well as small-scale cultural and educational facilities to create a green civic precinct for the neighbourhood.

At the macro-scale, the proposal creates a major north-south green spine and an extended network of pedestrian routes that connect with the surrounding area and their open spaces. Furthermore, this network connects with the major

1 Aerial view of the 1.6-kilometre sky deck that links the whole development

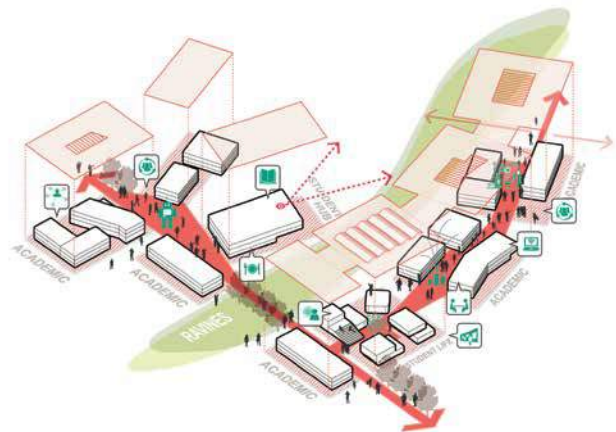
WEST JAVA NEW UNIVERSITY

The West Java campus is conceived as a compact living-learning ‘village’ that sits harmoniously within its natural setting. The master plan took advantage of the morphology of the site by concentrating the development of academic and student housing around the central valley and the ravines. This will enable the preservation of key watersheds on-site and create a series of diverse open spaces. The valley will thus be transformed into a primary campus amenity that integrates water management systems and houses a diversity of natural habitats, agricultural terraces as well as recreational spaces for outdoor learning.

LANDSCAPE STRATEGIES

The master plan promotes the restoration and ecological inclusion of the agricultural landscape. It responds to its site context through a variety of conservation and development strategies, such as the continuation and restoration of existing natural ecosystems; the restoration of the tropical rainforest within the site; and the conservation of wetlands and open streams as part of the larger regional watershed. Key landscape strategies include reinforcing existing natural systems by promoting native vegetation; consolidating development and impervious areas; complementing existing ecosystems with the regulation of the site’s watershed; and developing terraces and planting areas to stabilise the ravines.

Extensive in-depth research into the characteristics of the site, its morphology, climatic conditions and connections—along with a series of site visits, interactive work sessions and charrettes that were conducted at regular intervals with the various stakeholders—guided the planning process. This was supplemented by a research exercise that explored global trends in contemporary pedagogy. The result of the analysis was harnessed to create a detailed site-specific space and public realm programme as well as a phasing strategy that focuses on the university’s operation, programme and teaching modalities.



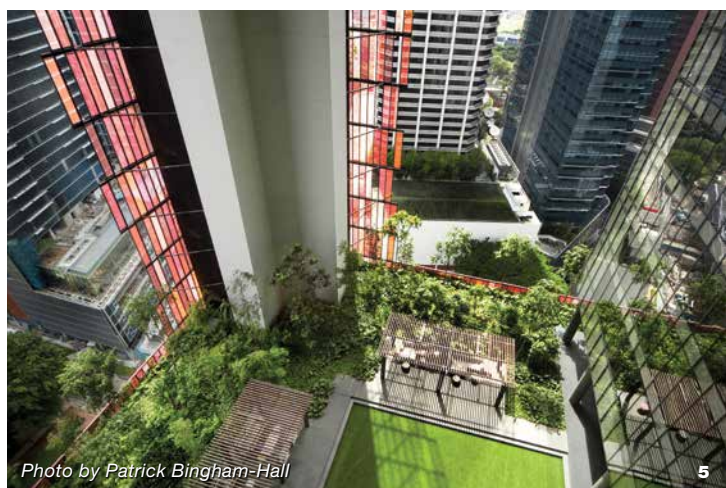
1



2

- 1** Academic clusters to create a structure for collaboration and exchange of ideas
- 2** Student housing is structured around a series of active courtyards
- 3** Aerial rendering of the campus master plan





URBAN GREENING AND ARCHITECTURAL FORM: A BIRD'S EYE VIEW

Architects in a post-graduate programme were asked to reimagine familiar building typologies by considering species movement and habitats. The studio, led by **Dr Nirmal Kishnani**, a sustainability expert, and supported by **Dr Anuj Jain**, a biologist, yielded six form strategies. **Heather Banerd**, a graduate of the programme, summarises the studio's explorations.

by **Heather Banerd**

The loss of green cover in cities is often discussed as an issue of human well-being. We speak of increased urban heat island effect, worsening air quality and the psychological discomfort arising from our separation from nature. These are important points, and critical to developing more liveable cities, but they overlook a crucial consideration: that green elements are also part of complex natural systems that support life in general, including species other than our own.

Of late, building-integrated greenery has become a widely accepted design strategy. Green roofs are popular as they offer added social space; green walls are liked for their visual appeal, creating a 'wow factor'.

These strategies can be applied to any typology at any stage in the design process. In other words, they have little impact on early consideration of form. Architects like Ken Yeang and WOHA, however, have been exploring the potential of building-integrated greenery in reshaping conceptual form.

In *Constructed Ecosystems* (2016), Yeang lays out several strategies for incorporating greenery within recesses, voids and incisions. To link these with ground-level planting, Yeang proposes the concept of a 'linear park-in-the-sky', in which a vegetated strip can be mounted vertically onto the façade (DiGi Technology Operation Centre, Malaysia) or placed flat as a horizontal ribbon winding upwards around the building (Solaris, Singapore) to create continuity and connectivity.

WOHA's use of greenery varies with each project; in many projects their design strives for green coverage that is more than the site area. In Oasia Downtown, Singapore, greenery is vertical planting on a second skin façade with patches on mid-level decks. In the PARKROYAL on Pickering, a high-end hotel development, the architecture is organised

around cascading terraces acting as patches, supplemented by façade and podium planting.

Both WOHA and Yeang are explicitly interested in using building-integrated greenery to create habitats (patches) and pathways (corridors) for species movement. What is not yet understood is whether biodiversity, such as birds and butterflies, recognises and responds to this design intent, and whether one form strategy is better suited than another.

In response to this question, students of the Masters of Science, Integrated Sustainable Design (MSc. ISD) programme at the National University of Singapore were asked to explore how architectural form creates space for biodiversity habitats and pathways. This was done over the course of several 12-week studios, in which they were asked to redesign existing buildings in Singapore. The new design had to adhere to the programme and density of the existing development; in addition, it was to create new spaces and surfaces for flora and fauna. The challenge was to reconfigure space and envelope in ways that make a building function effectively as say, an office building, while at the same time making it part of the urban network of green patches and corridors. For this, they relied on rules-of-thumb from Dr Jain on how species move and what they need (see sidebar).

Shown here is a summary of six form strategies, extracted from some 30 proposals from these studios. These strategies were used by students to manage the needs of the building programme and create space for greenery. Notes accompanying each strategy are by Dr Kishnani, who explains form-logic as it pertains to programme and Dr Jain, who discusses what is likely to work on the basis of literature from the field of biology.

1, 3 & 5 Oasia Hotel Downtown **2** DiGi Technology Operation Centre, Malaysia **4** PARKROYAL on Pickering **6** Solaris

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Maison T by NGHIA-ARCHITECT
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