



*The Principal Ideas*

YUNNAN GARDEN CAMPUS  
MASTER PLAN

August, 2010

## Contents

This document provides a summary of the principle ideas expressed in the Yunnan Garden Campus Master Plan. It encapsulates Nanyang Technological University's key aspirations for the campus, through discussion and illustration of a number of goals, principles and design proposals. These provide the University with a planning framework for assessing and managing future development, which over time will transform the University's numerous buildings, public spaces, lighting systems and infrastructure, and provide guidance in the management and growth of the campus' extensive parkland which contributes so powerfully to its character.

The Yunnan Garden Campus Master Plan is the culmination of extensive consultation, discussion and detail design planning. It represents, through written descriptions, diagrams, plans, site controls, illustrations and photographs, how the University envisages the campus will evolve over the course of the next fifteen years. As discussions with University committees, key stakeholders and consultants progressed, it was decided the plan would require several facets to best serve the future needs of the University. These have evolved into four separate, yet interrelated, documents.

The first is this book, which summarises the principle ideas and recommendations contained in the larger Yunnan Garden Campus Master Plan Report. The report itself provides more expansive discussion in regards to detail planning recommendations. Accompanying the report are papers of a more technical focus, relating to a number of specific aspects concerning phasing, costing, landscape planting and maintenance, as well as additional details on future traffic and infrastructure requirements. Finally, another series of documents will evolve as an appendix to the Master Plan Report and Background Papers over the course of the Master Plan's implementation. These will convey extensive technical analysis of particular aspects of the plan. The Appendix currently contains a detail Traffic Impact Assessment and Tree Management Plan. The Appendix will continue to expand as future studies of the campus are prepared and their recommendations implemented.

The principle ideas contained in this booklet begin with a discussion of the overall planning approach. This approach derives from a reflection on the historical, social and environmental context in which Nanyang Technological University has evolved, and has directly lead to the formulation of ten planning goals. In order to achieve these goals, key planning principles were determined, an overriding vision expressed and detail planning recommendations developed. Of central importance to the Master Plan's proposals are new, extensive landscape works and the evolution of a new campus centre, which will become a critical link between the north and south of Yunnan Garden Campus. Finally, the need for careful management during the implementation of the Master Plan's recommendations is emphasised. By establishing ongoing campus planning and management processes, the University's long term aspirations, as expressed in the various Master Planning documents, will become a reality.

## Foreword

Change is the only constant in life. In recent times, with advances in communications, the pace of change has accelerated. Ideas that took years to filter from one part of the world to another now cross the globe in an instant. The world has shrunk and as a result almost every field of human endeavour has become more global. These changes have also affected academic institutions, including Nanyang Technological University (NTU). Increasingly our University must compete on a global scale, and already more than half of our faculty and twenty percent of our undergraduates hail from outside Singapore.



Mr Koh Boon Hwee  
CHAIRMAN, NTU BOARD OF TRUSTEES

that is both practical and physically attractive. The plan is a description of a journey rather than a destination. However, the integrity of the plan must be carefully considered in the course of its implementation.

Balancing the requirements of new facilities with respect for the broader heritage and environmental context of the campus has been a tremendous challenge for those working on the Master Plan. The master planning consultants have considered holistically the views of various stakeholders. They have focused on developing existing natural systems, terrains and water bodies in order to promote and enhance

biodiversity within the campus, as well as to provide an environment conducive to the University community's work and study requirements. This approach will raise awareness of the University's substantial natural landscapes, which have never failed to draw praise from visitors and representatives of overseas Universities.

The future physical development of the University should reflect the fact that NTU has applied its own engineering and scientific skills towards nurturing a sustainable eco-campus. It should be a showcase for the contribution that engineering can make, not only to the University, but to the wider Singapore community and beyond.

As we embarked on the Master Plan review, we were very fortunate to have our fellow Board of Trustees member, Edmund Cheng, as chair of the Campus Planning Committee. He and his committee have played a critical role in the development of the Master Plan. Other Board members and the senior management of the University have also contributed a significant amount of time to reviewing and providing input to the consultants as the Master Plan has evolved. We are grateful for their commitment to NTU, and their substantial involvement in the formation of a blueprint that will guide the development of the University into the future.

Mr Koh Boon Hwee  
Chairman, NTU Board of Trustees



EXPERIENCES, IDENTITY, OPEN  
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VISITORS, INTERACTION, **HERITAGE**,  
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A VIBRANT TWENTY-FIRST  
CENTURY UNIVERSITY IN A PARK

## Foreword

Since our founding in 1955, many generations of students have spent the formative years of their lives learning and living here on our beautiful Yunnan Garden campus, renowned for its lush greenery and open spaces.

Over the decades, as the University has evolved from Nanyang University (Nantah) to Nanyang Technological Institute to present day Nanyang Technological University (NTU), our campus has experienced a number of significant milestones in its physical development. The first was the landmark groundbreaking on 26 July 1953 that saw champion of the Nantah cause, Tan Lark Sye, sink the first hoe into the soil

at Yunnan Garden to lay the ground for Nantah. Since then, two other major campus development phases have occurred. The first, from 1981-1985, culminated in the development of the North and South academic complexes, and the demarcation of academic, residential and recreational zones within the campus. The second, from 1992-1995, focused on accommodating the National Institute of Education within an expanded Yunnan Garden campus.

The culmination of two intensive years of work by our Campus Planning Committee that commenced in 2008, this Yunnan Garden Campus Master Plan lays out our most ambitious physical development initiatives to date. The



Dr Su Guanng  
PRESIDENT, NTU

Master Plan not only addresses the physical needs of NTU in terms of its natural and built environment, but also acknowledges our need to adapt to changing pedagogical requirements, and to develop facilities that can sustain new forms of teaching and research into the future. Significantly, the Master Plan also includes guidelines for the development of a Campus Centre that will form the heart of NTU – a place for congregating, interacting, living and learning.

With Sustainable Earth as one of the five Peaks of Excellence in our NTU 2015 Strategic Plan, the Yunnan Garden Campus Master Plan emphasizes the preservation and enhancement of our

campus' renowned natural environment. Initiatives will imbed sustainability practices into the future operation of the University and create a new physical environment, serving its social, cultural and academic needs.

An extensive road map to guide the future management and development of our Yunnan Garden Campus, the implementation of this Master Plan will ensure that many more future generations of students will continue to enjoy the privilege of a truly memorable experience here at NTU.

Dr Su Guanng  
President, NTU



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## Preface

In early 2008 Nanyang Technological University established a Campus Planning Committee to begin reviewing ideas for the future development of the Yunnan Garden Campus, and the many activities and programmes it supports. The aim was to develop a planning framework able to direct the growth of the kind of physical, natural and social infrastructure that might support a leading high quality academic and research institution.

Following discussions in the United States, where campus planning expertise was generously shared by a number of renowned institutions and the appointment of the consultant team in mid-2009, work commenced on preparing

a new Master Plan for the University. Numerous stakeholders were subsequently consulted, both within and beyond the University community, establishing the parameters of the Master Plan and identifying a number of issues that were to become central to its ongoing development. Foremost among these was the need to foster an enduring identity for the University's Campus, one able to distinguish its many positive elements from those of other institutions while also creating a close association in the minds of faculty, students and visitors alike with the University's physical environment, and in particular with the natural environment that so clearly enriches Yunnan Garden Campus.

A productive collaboration evolved between the planning team and a variety of student, faculty, alumni and administrative representatives. Through discussion and the development of numerous conceptual designs, a planning strategy emerged in which the significance of the campus' natural environment was to be emphasised. It is pleasing this focus has been retained throughout the Master Plan, and in large measure has determined a number of its final recommendations. Two proposals are particularly worthy of note. Firstly, the systematic restoration of the campus' endemic vegetation, with great potential for broader environmental benefit achieved through the reinvigoration of local biodiversity. Secondly, landscaped corridors enabling the free flow of surface water throughout the campus' natural topography will profoundly alter the visual impact of drainage infrastructure on campus, creating a system of natural water management able to closely link the campus'



Mr Edmund Cheng  
CHAIRMAN OF THE  
CAMPUS PLANNING COMMITTEE  
NTU BOARD OF TRUSTEES

ecosystem with that of the surrounding environment. Both the water corridors and the increased planting are tangible examples of the Master Plan's broader intention to imbed sustainability practices into the future operation of the University. Furthermore, these measures will create a new physical environment on campus for a variety of social, cultural and academic uses, for example, providing new locations on campus for the display of public art, set amid reinvigorated pedestrian and cyclist networks.

As the Master Plan developed, opportunities to link the physical plan with the University's changing pedagogical emphasis emerged, as

demonstrated in the concept of a new Campus Centre. Here is an example of how the campus might be re-imagined as a vibrant, living social space, with new forms of accommodation creating flexible relationships between students, teaching spaces, and the campus' surrounding landscape. The conceptual link between the Master Plan and the future goals of the University are also importantly expressed in the relationship established between Yunnan Garden Campus and the adjacent Clean Tech Park, where business research initiatives with a focus on clean technology will be well matched to the academic knowledge nurtured in the University. Physically and philosophically, the Master Plan makes a seamless connection between these two institutions, to a large degree integrating the campuses so as to create a single hub for Singapore's clean technology future.

The Master Plan that has evolved from the long process of discussion, reflection and planning should not be seen as an end in itself, but rather as the essential element in future assessment of how the campus is to be managed, developed and improved. It is through the implementation of the Master Plan that disparate development projects on campus can be integrated with the broader objectives of the University, and collectively create something new – a vibrant twenty-first century University situated in a park.

Mr Edmund Cheng  
Chairman of the Campus Planning Committee  
NTU Board of Trustees



Chinese Heritage Centre with South Spine beyond; a harmonious relationship of contemporary and historical architecture.



This Master Plan provides guidance for the University's planning and growth. Its recommendations envisage a measured expansion of facilities within Yunnan Garden Campus over the next 15 years, with a planning legacy extending long beyond 2025. As well as addressing the needs of the campus' natural and built environment, the Master Plan is in accordance with the University's broader educational mission of encouraging a diversity of social and cultural experiences and fostering intellectual endeavour.

## Introduction

In 2008 Nanyang Technological University (NTU) embarked on an ambitious process of planning for its future development. Through analysis of its assets and assessment of its potential, NTU, with its expertise in science and technology, aims to establish itself among the world's premier academic institutions. This Master Plan provides guidance for the University's planning and growth. Its recommendations envisage a measured expansion of facilities within Yunnan Garden Campus over the next 15 years, with a planning legacy extending long beyond 2025. As well as addressing the needs of the campus' natural and built environment, the Master Plan is in accordance with the University's broader educational mission of encouraging a diversity of social and cultural experiences and fostering intellectual endeavour.

The Master Plan approaches the University's needs on several levels. Firstly, it assesses NTU's relationship with the wider international and regional community. It acknowledges the University's need to adapt to changing pedagogical requirements, and to develop facilities that can sustain future teaching and research. Secondly, the Master Plan focuses on the campus itself. It analyses its physical links to adjacent properties, its social links to the Singapore community and its environmental connections to the local ecosystem. Finally, planning proposals specific to discrete areas within the campus itself will ensure the University sustains a number of highly localised, intimate places able to collectively enrich the academic, as well as the broader community's, experience of Yunnan Garden Campus.

Nanyang Technological University is fortunate to occupy a campus with a generous provision of natural and designed landscapes. With its distinctive parkland setting, Yunnan Garden Campus is itself among the University's premier assets, and is a memorable environment for work and study. The Master Plan's recommendations understand and appreciate the significance of the natural environment to the University as a whole. At the heart of the Master Plan is the aim of enhancing the already substantial interactions occurring between buildings, people and gardens on campus. This includes consideration of the natural systems underpinning the local ecology and an assessment of how these processes contribute to the campus' biodiversity, plant species and surface water movement. The natural systems will help structure the physical environment of the campus in terms of prevalent ecological conditions. For example, they will become the foundation for a number of outdoor landscape and water corridors accessible by pedestrian walkways and cycle paths. These spaces will be enhanced by vistas taking advantage of the campus's distinct and diverse topography.

To complement the open parkland characteristic of Yunnan Garden Campus, a new campus centre will help establish the University's identity through a physical structure emblematic of its goals and aspirations. The campus centre will become the heart of Nanyang Technological University; a place for congregating, interacting, learning and living. The new campus centre will also generate a sense of arrival for visitors, faculty and students, and serve as a node for transport connections between academic, residential and recreational facilities. With its sinuous form governed by local topography, the campus centre will support a variety of uses such as classrooms, accommodation, dining and social spaces, both in and out of academic hours. This vibrant gathering place will be complemented by the integration of mixed use spaces amid the residential halls on campus, encouraging student social interaction. These initiatives are priority recommendations in the University's *NTU 2015 Strategic Plan*.





New vegetated drainage swales, landscape corridors and water bodies will transform the natural environment in North Terrace precinct, opposite new undergraduate residential accommodation along Nanyang Crescent.





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While the campus centre will generate a new focus for the University as a whole, the identity of other areas on campus, established by the existing configurations of buildings and spaces, will also be enhanced. The Master Plan identifies a network of twelve *precincts* in order to give structure to the distinct identities of specific places within the greater campus. The precincts are primarily defined by existing topographic elements, and the proposed water and landscape corridors. Although precincts have been previously characterized by a predominant building type, the Master Plan varies this approach by introducing a diversity of building types into each precinct in order to help the University develop a more flexible spatial definition for its various activities. Precincts will include places for ceremony, such as a new forecourt to the Chinese Heritage Centre, the most significant building on campus. And they will include places for informality, such as the many landscaped spaces woven throughout the campus' disparate buildings.

This Master Plan was preceded by two milestones in the evolution of Yunnan Garden Campus. A 1981-1985 plan by Kenzo Tange & Associates culminated in the building of the North and South Academic Complexes, each of approximately 95,000sqm. At this time, academic, residential and recreational zones were also demarcated. A 1992-95 plan by Kallmann McKinnell & Wood Architects focused on expanding Yunnan Garden Campus to accommodate the National Institute of Education. Development proposed under the 2010 Yunnan Garden Campus Master Plan has required careful integration with both of the previous major planning phases. For example, the geometry of dominant academic buildings such as the North and South Spines has determined a number of new detail planning recommendations. Similarly, the configuration and organisation of established housing clusters has influenced a number of new design proposals.

Innovative responses to the campus' built environment can be catalysts for the University's broader educational agenda. For example, by renovating the upper floor of the North Spine complex in order to provide accommodation for post-doctorate students, the University's academic facilities and new forms of residential living attractive to outstanding young researchers, can be brought together. This meets a key aspiration of the *NTU 2015 Strategic Plan*.

The Master Plan recognises the need for the University to strengthen its connection with the Singapore community. CleanTech Park, a multi-disciplinary institution promoting the development of clean technology, will be developed on a property adjacent to the University by JTC Corporation. The proximity of this eco-business park to Yunnan Garden Campus offers great potential for sharing research and development initiatives, technical expertise and physical infrastructure. At a more symbolic level, the broader Singapore community will find their welcome to Campus enriched by the establishment of two new, clearly demarcated University entry points.

The Master Plan recommends covered walkways, separated from the road system and vehicular traffic, be enhanced to provide a campus wide network of pedestrian and cyclist infrastructure. A program to encourage the use of bicycles on campus will complement the University's other public transportation systems, such as the shuttle busses operating within and beyond the campus. At a number of key locations, existing roadways will be resurfaced so as to privilege pedestrian movement.

Nanyang Technological University has become a large, international, multi-disciplinary research intensive institution. The Master Plan supports this research capacity through new inter-disciplinary buildings and proposals for increasing flexible use spaces. By emphasizing collaboration between different spheres of



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academic endeavour, close relationships between the centres of industry at CleanTech Park and the University's research institutes, such as the *Nanyang Environment & Water Research Institute* and the *Energy Research Institute*, can be facilitated.

The Master Plan further responds to the University's desire for increased inter-disciplinary collaboration by reviewing the design of existing lecture theatres and proposing new teaching spaces more adaptable to flexible educational uses. These spaces will increase the integration of new media and technologies with teaching environments on campus. They will transform the delivery of higher education, as proposed by the pedagogical directions of the University's Blue Ribbon Commission.

New technology can further the interconnectivity between students and faculty, and help achieve a campus defined less by an adherence to single use buildings, and more by a sequence of spaces adaptable to the varied needs of multiple academic functions. The Master Plan establishes a number of key architectural and planning controls, inclusive of landscaping, lighting and infrastructure requirements. Predominant among these are the foregrounding of sustainability initiatives in all proposed development. While the Master Plan aims to achieve a degree of uniformity in the architectural expressions that will establish the qualities of each identified precinct, it nevertheless encourages creative design responses to the diverse character of discrete development parcels. Underground buildings, especially sporting facilities able to support green roofs, will be given particular consideration. This Master Plan aims for immediate relevance and application. Its recommendations address the University's pressing need for a guiding framework able to give structure to the on-going development of the campus's physical and natural elements. This is a task central to the realisation of Nanyang Technological University's educational goals, and to ensuring the institution flourishes as a leading global University, not only for the fifteen year duration of the Master Plan, but well into the future beyond.



Nanyang University, established 1955

## Context

Nanyang Technological University occupies a 200 hectare site in the south-west region of Singapore Island, approximately 25 kilometres from the city centre. The campus is renowned for a generous provision of landscaped open space. The quantity and quality of this landscape is an especially valued asset in Singapore's typically high-density built environment. In addition to the campus' ecological links to the regional environment, and the ambience created by a garden campus, the Yunnan Garden Campus landscapes retain important links with the University's heritage. For example, Nantah Lake and Yunnan Chinese Garden are among the few important physical artefacts still traceable to the inception of Nanyang University in 1955.

A variety of land uses, including both civic and military facilities, adjoin Yunnan Garden Campus. To the west and north-west are forested land reserves used by the Singapore Armed Forces as a restricted live firing area. A Public Utility Board waterworks occupies property to the south-west of the University, while the primarily residential area of Jurong West Extension lies beyond the Pan Island Expressway (PIE) to the south-east. CleanTech Park will occupy a site of approximately 50 hectares to the immediate north-east of the University. Transportation links to Yunnan Garden Campus from the Singapore city centre are via the PIE and Kranji Expressway. Public transport serves the University from the nearby Pioneer bus interchange and the Pioneer Mass Rapid Transit (MRT) station, with the Singapore Bus Service operating between this station and the campus. The University currently has two entrances: at Jalan Bahar to the north-west and Pioneer Road North to the east. The University's boundaries are largely defined by Nanyang Crescent and Nanyang Drive, which form a ring road around the campus perimeter.

Yunnan Garden Campus has developed in three significant phases. In 1955 Nanyang University became the first Chinese language university outside China. Land for the future University was originally donated by the Singapore Hokkien Clan Association. In 1981 Nanyang University became the Nanyang Technological Institute (NTI), and a Master Plan for the growth of the new institution was developed over the ensuing four years, concentrating on two large academic complexes for research and teaching, known as the North and South Spines. In 1991 NTI became Nanyang Technological University and a major review of campus planning was undertaken. As part of this process, in 1992 the National Institute of Education became a significant new physical and educational presence on campus.

Earlier phases of planning have played a significant role in determining the characteristics of today's campus. Predominant among these are the substantial trees and greenery, with the topography, including steep local hillsides and modest sized water bodies on the east side of the campus largely retained. Zones defined by building use can be broadly identified, with academic buildings to the south-west, residential accommodation to the north, and sporting and recreation facilities towards the east.

Significant buildings on campus include the Chinese Heritage Centre and the dominant North and South Spines, which include important academic facilities such as the University Library. The National Institute of Education forms a complex in the north west of campus, occupying a site on the fringe of the broader campus. More recent additions to the University's urban environment reflect the growth of an increasingly diverse academic expertise. They include the Art, Design and Media Building, the School of Physical and Mathematical Sciences and



## Nanyang Technological University: Satellite Campuses

Two satellite campuses will complement Yunnan Garden Campus during the implementation of the Master Plan.

NTU@one-north campus, approximately seven kilometres east of Yunnan Garden Campus, currently comprises a facility with two wings accommodating academic teaching spaces and student amenities. Educational facilities include an auditorium, lecture theatres, seminar rooms, computer laboratories and a cafeteria. Student amenities, currently used by alumni, include a pool, restaurant, games arcade, wine bar, lounge, karaoke rooms, games rooms, gymnasium, childcare centre and spa.

Novena Campus, north of the city centre is approximately twenty kilometres east of Yunnan Garden Campus and will accommodate part of the University's new medical school. The facility will be in the immediate vicinity of Tan Tock Seng Hospital, the medical school's primary clinical partner. Drawing on the University's expertise in biological and biomedical sciences, as well as in management and technology, the medical school will apply cross disciplinary research to the future development of health-care education, one of the key elements of the NTU 2015 Strategic Plan. Another facility for the NTU medical school will be constructed on Yunnan Garden Campus, in close physical and operational proximity to the School of Biological Sciences.

It is envisaged that both NTU@one-north campus and Novena Campus will develop in accordance with the broader planning agenda of the Yunnan Garden Campus Master Plan.

the School of Humanities and Social Sciences. The campus is noted for its substantial provision of residential accommodation, including sixteen halls of residence for undergraduates and additional housing for the graduate and post-doctorate population. A significant proportion of the faculty also lives on campus.

Accommodation blocks vary from two or three storey dwellings built in the mid 1950s to larger, more recent tower blocks of more than ten storeys. Complementing the University community are buildings for staff and student facilities, administrative functions and sporting and recreational activities. At a smaller scale, a network of covered walkways connects substantial areas of the campus, offering protection from the sun and rain. A number of buildings are utilized for the campus's infrastructure needs. Three service reservoirs owned by the Public Utilities Board serve the University and the Jurong West community, occupying an approximately 8 hectare site in the middle of the north-western area of campus.

Master Plan Goals EXPERIENCES,  
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## Master Plan Goals

### Goal 1

Create an enduring identity for the campus that incorporates the concept of a campus in a park. Campus identity should be established through a network of landscaped spaces, each with their own characteristics.

### Goal 2

Support sustainability when designing and developing infrastructure, buildings, and landscaped spaces. This should involve the promotion of biodiversity throughout all areas of the campus, and include proposals for environmentally sensitive architectural designs, including underground or partly underground buildings.

### Goal 3

Locate and define a new multifunction campus centre that enables the University community, including alumni and visitors, to identify the heart of the campus. The new campus centre should create a sense of place and address the need for closely interrelating internal and external public spaces.

### Goal 4

Extend the University's engagement with the community by improving accessibility, establishing facilities for visitors, and creating a recognisable place of arrival.

### Goal 5

Create an extended campus through seamless physical engagement with CleanTech Park. This should enable ease of movement between the two campuses, provide for the shared use of facilities and establish places conducive to informal social interaction. Plans should accommodate LTA proposals for a new road and a possible future LRT system.

### Goal 6

Form a heritage precinct of buildings, gardens, water bodies and landscapes. The social and historical importance of this area should be communicated in an interpretative centre able to inform both the University community and visitors alike.

### Goal 7

Develop academic teaching facilities that support the pedagogy embraced by the Blue Ribbon Commission. More generally, develop a variety of places around campus that encourage individual and group study as well as informal interaction within the University community.

### Goal 8

Distribute sporting and cultural facilities throughout the campus, highlighting these activities as integral to University life.

### Goal 9

Improve pedestrian safety by upgrading the covered walkway system. Enhanced pedestrian facilities should provide linkages between newly formed landscaped spaces and be expanded to encourage the use of bicycles on campus.

### Goal 10

Diversify the residential character of the University through introducing new types of accommodation including undergraduate housing clusters, graduate, post-doctorate and faculty residential buildings that are attractive, variable, and competitive with facilities offered by other Universities internationally.





The Master Plan will integrate the landscaped spaces of Yunnan Garden Campus into a seamless network. The natural environment will become central to University life; accessible, unimpeded by obtrusive development and encouraging informal social interaction.





The Master Plan acknowledges place making to be inseparable from environmental, urban and architectural design criteria, history, infrastructure needs, public transportation and the ephemeral social encounters and cultural expressions that enrich and enliven daily life on campus.

The natural environment establishes the predominant identity of Yunnan Garden Campus. The Master Plan recognises the significance of natural open space to the campus as a whole, which gives to the University an enviable physical asset: a campus in a 21st century park.

## Master Plan – The Vision

### Establishing a Sense of Place: Introduction

The Yunnan Garden Campus Master Plan recognises that a network of natural, urban and social relationships link the University community to its campus. By developing five key principles to support this inter-dependent network, the Master Plan offers a conceptual response to the goals that emerged from the consultation process. The principles are expressed in terms relevant to the whole of campus. They serve to guide the subsequent formulation of more detailed planning proposals, and are united through their common intent of establishing a distinct sense of place for the University's physical environment.

The Master Plan acknowledges place making to be inseparable from environmental, urban and architectural design criteria, history, infrastructure needs, public transportation and the ephemeral social encounters and cultural expressions that enrich campus life. A sense of place will be fostered through planning principles reinforcing the existing urban context, infilling the built environment already established on campus, and connecting the campus through both physical and natural corridors that encourage casual social interaction and ease of movement. Planning principles will further involve preserving the generous quantity of open space characteristic of Yunnan Garden Campus and sustaining the local ecology for the well being of future generations.

Diagrams in the Master Plan Background Papers detail the development proposed for each precinct and phase.

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The most fundamental recommendations of the Master Plan are founded on the local ecology. An ambitious program of landscaping and the establishment of substantial new water bodies will form a physical network underpinning much of the proposed new built form. In careful support of the built form and the re-established landscape parkland and natural environment are proposals for campus illumination and infrastructure. These are accompanied by suggestions to harmonise the physical components of the campus with the University's social, environmental and cultural programs.

Planning proposals invariably will be realised in contextually sensitive localities established within the broader campus environment. The careful demarcation of twelve precincts, largely defined by topography, landscape and water corridors, and in some cases by the existing built environment, reduces the scale of the campus to a series of loosely defined, though readily identifiable, places. These become key elements enabling the campus plan to integrate a sometimes large and diverse series of open spaces into a detailed, yet coherent and legible urban design.

The Master Plan will be implemented over fifteen years. Three five year phases are identified: 2010 – 2015, 2016 – 2020 and 2021 – 2025.





Landscaping on Nanyang Crescent,  
North Hill precinct

## Guiding the Plan: Key Principles

### Sustaining the Natural Environment

Environmental sustainability refers to strategies to reduce energy and water use, carbon emissions and waste generation. More broadly, sustaining the natural environment should enhance local biodiversity through planting, surface water management and landscape design. Sustainable transport initiatives, including 'green fuel' public transportation and enhanced facilities for pedestrians and cyclists, will also be key elements in fostering environmental awareness. Environmental programs, such as recycling initiatives can also improve sustainability practices. All of the Master Plan guidelines, drawing on the University's expertise in environmental technologies and the NTU 2015 Strategic Master Plan, which identifies environmental research as a core academic focus, are intended to weave sustainability practices into the fabric of University life.

### Connecting the Campus

The campus' open spaces, while numerous, are often disparate and unconnected. The Master Plan aims to integrate them wherever possible to ensure a seamless landscaped network is achieved. The natural environment should be a part of University life. It should be accessible, unimpeded by obtrusive development and should enable informal social interaction. Other linkages connecting distant parts of the campus should include upgraded infrastructure for pedestrians and cyclists, covered walkways to the adjacent CleanTech Park development, and new, expanded modes of public transportation. As well, there should be renewed emphasis on the experience of entering the campus itself. A new curvilinear 'spine' at the heart of the campus will become the most significant element of the campus' urban environment, incorporating an extensive covered walkway uniting and activating the areas between the predominantly residential north and the mainly academic south. Other connections will include biodiversity corridors of water and vegetation, integrated with naturalised stormwater channels adaptive to local topographic and ecological conditions.

### Preserving the Open Space

The natural environment establishes the predominant identity of Yunnan Garden Campus. The Master Plan recognises the significance of natural open space to the campus as a whole, which gives to the University an enviable physical asset: a campus in a 21st century park. The Master Plan's recommendations will achieve an overall site coverage of less than 30 percent of the University's approximately 200ha campus. Suggested infill developments balance the need for additional floor space with appropriate building heights, setbacks, densities and configurations able to meet the need for future expansion and the desire to retain, preserve and enhance the natural environment.

### Infilling the Built Environment

In several areas on campus, the prevailing urban landscape suggests opportunities to complete the general grouping of established architectural forms. Infilling, while respectful of the existing architectural language, should not preclude new building typologies, especially new residential halls where a diversity of social and extra-academic activities should be integrated with housing clusters. Building forms, colours and materials should offer variety amid a broader visual and experiential harmony of human scaled structures and places. Newly proposed building clusters should be of sufficient density to relieve pressure for developing other areas of the campus currently occupied by landscape or open space. By concentrating new development at key locations a greater proportion of the surrounding natural environment can be preserved as dedicated parkland, and can accordingly be defined, named and maintained for the amenity of the





1 YUNNAN GARDEN

2 SOUTH SPINE

3 NORTH SPINE

4 CAMPUS CENTRE

5 SOUTH HILL

6 SPORTS AND RECREATION

7 CLEAN TECH PARK

8 NORTH HILL

9 RIDGEVIEW

10 NORTH TERRACE

11 N.I.E.

12 RESERVOIR





University community. Infilling the built environment should also refer to the placement of artworks within and around the campus architecture. As a principle it is also relevant to landscape designs that re-establish the presence of endemic plant species.

### Reinforcing the Urban Context

Previous University planning initiatives have achieved a high quality urban environment for Yunnan Garden Campus. Wherever they are in accordance with the broad intent of the Master Plan, established streets, pathways, structures and buildings of considerable design merit and heritage significance should be reinforced. The Master Plan acknowledges that campus buildings are generally organised in clusters with a distinct, harmonious and identifiable character. Architectural forms frequently generate urban patterns that create a governing geometry for the arrangement of surrounding structures. Different clusters of buildings exhibit a diversity of architectural qualities and offer a diversity of urban experiences. The future growth of the University should be compatible with these prevailing patterns of urban development, rather than involve the imposition of new structuring devices unlikely to bare a close relationship with the habits people have developed over time in their interactions with the University's built environment. Increasing local urban densities will also help prevent the spread of development across the campus landscape, which should be retained and preserved wherever possible.



Natural systems and landscape at new campus entrance

## Founding the Plan: Natural Systems and Landscape

### Introduction

One of the most memorable and distinctive features of Yunnan Garden Campus is its abundant and varied landscape. A network of natural elements, including the land itself, the soil and topography, and the substantial local flora prevalent both on campus and adjacent properties underlies this landscape, taking various forms. These include avenues of shade trees beside streets, large open spaces, primary forest along the northern and western edges of the campus, the meticulously designed environment of the iconic Yunnan Garden, and the informal planting that surrounds Nantah Lake.

This diverse collection of individual landscapes is neither substantially integrated nor well connected. Over time the original continuous landscape has been fragmented by the construction of roadways, buildings, pathways, and other hardscape areas. The ecology of these isolated landscape patches has been further degraded by a limited variety of plant species, the prevalence of introduced plant species, and disruption of the original ground water and surface water patterns. Complex challenges include a need for sustaining, and where necessary reestablishing, the degraded ecology so the various landscape elements may better contribute to the quality of living, studying and working on campus.

The Master Plan's overall landscape strategy is to address ecological fragmentation by 'stitching' the natural systems back together, based on a model of patches, corridors, and matrices. The principle is that a well-connected and integrated landscape should exhibit a variety of native flora and fauna, and be self-sustaining and ecologically diverse. The enhanced preservation of native trees in the surrounding area will also offer a potential habitat for animals and bird life, providing the campus with a distinct identity and further reinforcing the idea of a 'campus-in-a-park'.

Addressing the needs of the site's natural systems provides a foundation for the Master Plan's proposals regarding built form, lighting and campus infrastructure: the ecological constraints of the campus help determine the future development possibilities.



Landscaping at North Hill precinct

## Landscape Objectives

A number of objectives will provide guidance in ‘stitching together’ the natural elements within the Yunnan Garden Campus landscapes. These begin with the establishment of landscape corridors to interconnect existing landscape patches. Both the corridors and the patches will be planted with native plant species to increase bio-diversity. Wherever feasible, landscape corridors will extend across, above or below existing roadways, pathways and other barriers allow animals uninterrupted movement. Boardwalks and pathways along the landscape corridors will create opportunities for interpretive nature walks. Pavilions and decks accessed from the boardwalks and pathways will provide further informal social gathering spaces, outdoor classrooms, and lookouts.

Adopting the principles of the Public Utilities Board ABC Design Guidelines for the collection and treatment of rainwater run-off and water conservation will complement the development of the landscape corridors. This will require detention ponds, retention ponds, and other water bodies to collect surface water runoff for recycling and re-use. The ponds and water bodies will also enhance ground water recharge, and provide a habitat for birds and other wildlife. Where feasible, existing and proposed storm water drains and drainage channels should be in accordance with the ABC Design Guidelines to create naturalized water ways, minimizing the quantity of impermeable concrete drains on campus.

Minimizing hard surfaces should also involve transformation of exposed concrete roof surfaces and terraces using green roof systems. The impact of hard surfaces can also be reduced at ground level where new road paving, parking lots, pathways and plazas should be constructed, wherever possible, with porous paving materials.

Planting along existing roadways will be enhanced by adding native plants. Informal landscape designs will reduce the formality of existing shade tree avenues. Planting along new roadways will be similarly informal, with native plants creating a well forested natural environment.

Distinct landscape designs at key locations will enhance the campus’ sense of place. Significant locations will include the two major campus entrances, which will demonstrate to visitors the predominance of the natural environment. Specific native plant palettes for the precincts will help establish their identities. Focal points will also be identified or created to act as markers at intersections, gateways, and the termination of streets and foot paths.





A new formal landscaped forecourt linking the Chinese Heritage Centre to Yunnan Garden

### Patches, Corridors, Matrix

*Patches, Corridors, Matrix* is a landscape and ecology theory developed by Richard Forman in *Land Mosaics: the Ecology of Landscapes and Regions* (1995). It classifies the natural environment in terms of three basic spatial elements, referred to as *patches*, *corridors*, and *matrix*. A *patch* is defined as a non linear mass of land, vegetation, or water that has a homogenous character, different from its surrounding environment. Patches are the basic units of the landscape that fluctuate and change. They have a definite shape and spatial configuration. A *corridor* is defined as a linear strip of a particular type of landscape, differing in character from the adjacent land either side. Corridors can be isolated strips, but are usually attached to one or more patches. Importantly, corridors allow unimpeded flora and fauna movement between patches. This in turn improves the patches' overall ecological fitness and bio-diversity. The matrix is anything that occurs outside of a patch or corridor, and is typically the most extensive landscape unit.

The Master Plan uses the *patches, corridors, matrix* model as a tool to understand and evaluate the existing landscape structures on Yunnan Garden Campus. There are several isolated landscape patches within the campus and surrounding environment. These include the Thow Kwang Dragon Kiln Park, the north entrance at Jalan Bahar and the east entrance from Pioneer Road, the entrance to the National Institute of Education, the reservoir hill in the north, the ridge along Nanyang Avenue at the centre of the campus and Yunnan Garden to the south-east.

To connect these typically isolated patches, several landscaped corridors are proposed. These will link CleanTech Park and the Thow Kwang Dragon Kilns to the parkland in the North Hill precinct, create a natural corridor adjacent to Nanyang Avenue and provide a continuous landscape connection leading from the new east west entry road southwards to Yunnan Garden. They will also add extensive natural linkages at the campus periphery – refer diagram 2.3.1.

Reconnection of isolated patches will improve the health and fitness of both the patches and the landscaped corridors. Their close linkage will provide opportunities for landscape objectives such as the enhancement of ecological systems through extensive planting of native species and the creation of appropriate habitat corridors. There will be further opportunities for the revitalization of water bodies in accordance with the *ABC Design Guidelines* through the creation of wetlands conducive to wildlife habitats, the modification of existing concrete storm water drains and the connection of isolated ponds into a continuous water network.

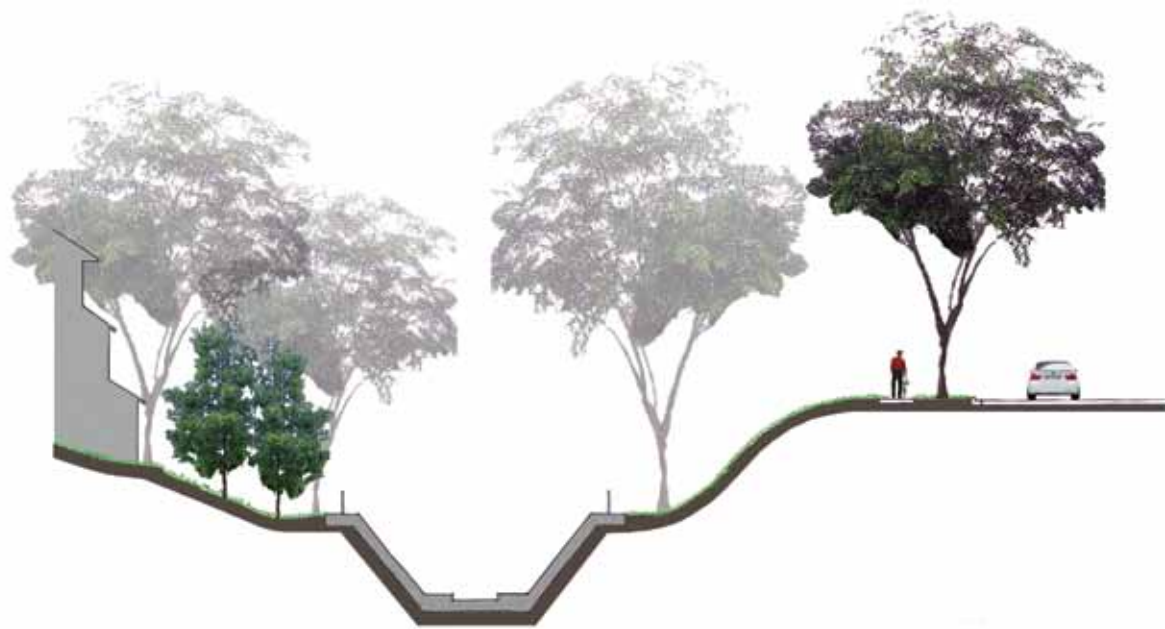




- 1 YUNNAN GARDEN
- 2 NANTAH LAKE
- 3 SOUTH HILL
- 4 THOW KWANG  
DRAGON KILNS
- 5 NORTH HILL
- 6 RESERVOIR
- 7 NEW ENTRANCES
- 8 NEW WATER  
BODIES







Typical existing storm water drain



Proposed naturalised storm water system

### Naturalised Waterways, Retention Ponds & Detention Ponds

The original surface water and ground water routes of Yunnan Garden Campus have been altered by several hardscape areas. These drain into a number of impermeable reinforced concrete storm water, roadside and building drains. Water collected in these drains is very efficiently routed off site. A limited amount of run-off water on campus is also collected in Nantah Lake.

While this drainage system is generally very efficient, it has a number of negative environmental effects. For example, the groundwater is not re-charged resulting in lower water tables. This in turn reduces groundwater for plant root systems. Sterile engineered drainage channels inhibit the flourishing of flora or fauna and fail to promote any type of landscape amenity for social and recreational purposes.

Existing and proposed new drainage systems should be designed in terms of the ABC Design Guidelines, to create a more sustainable drainage strategy. This will involve, where feasible, the creation of naturalized water ways and vegetated drainage swales.

A number of new detention and retention ponds for the recycling and reuse of rain water runoff will be created. Existing water bodies such as Nantah Lake will require rehabilitation to become functioning wetland habitats. All campus water bodies, including naturalized waterways, retention ponds, detention ponds and lakes will form a continuous integrated network of water elements.

Naturalized drainage systems have several benefits. These include habitat for native flora and fauna and the creation of social, recreational, and interpretive learning opportunities. The natural cleansing and filtering by water growing plants will capture sediments and reduce the passage of pollutants. Water flows through naturalized drainage systems at a slower pace, increasing the opportunity for percolation and ground water recharge and reducing the potential for erosion.



Typical existing storm water drain



Proposed naturalised storm water system





An overpass habitat corridor connects Nanyang Technological University & Clean Tech Park

### Habitat Corridors

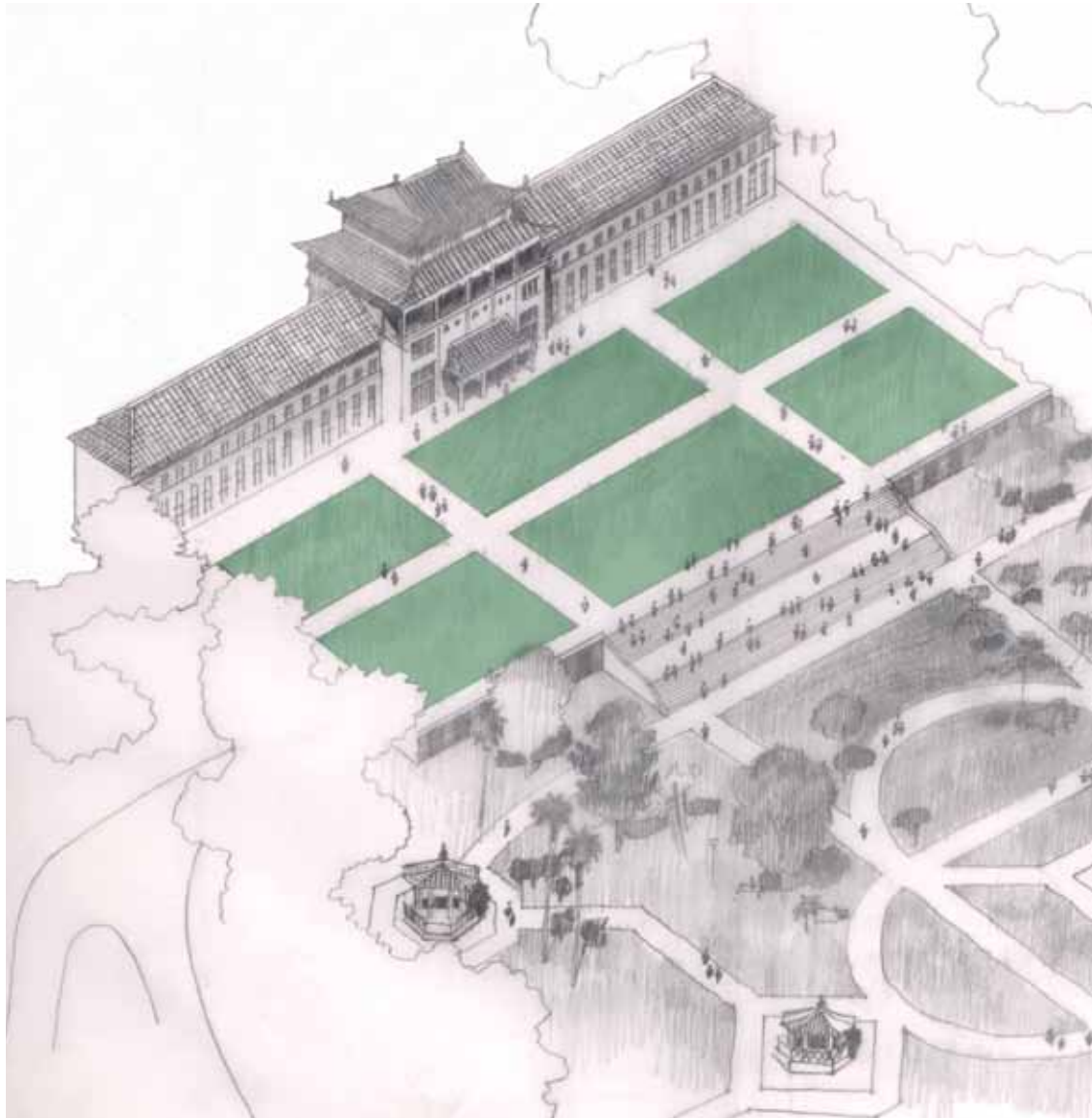
Habitat corridors are land or water connections that permit uninterrupted safe movement of animals or fish across roads, walkways or other barriers.

On campus, habitat corridors will be a significant element in encouraging biodiversity by maintaining the health and fitness of plant and animal species. Movement within the broader natural systems will also lead to a more diverse and vibrant natural environment, better able to sustain itself. Buildings and infrastructure planning should ensure that animal movement patterns are not disrupted.

Habitat corridors can be either overpasses or underpasses. Successful corridors are typically not less than five to eight metres wide. They should be designed with a layer of buffer planting and natural protection along their edges to prevent encroachment.



Underpass habitat corridor



A new formal landscaped forecourt linking the Chinese Heritage Centre to Yunnan Garden

### Formal Spaces

Formal spaces are characterized by designed landscapes. Their distinct formal character distinguishes them from the surrounding landscape. Each of the formal landscaped spaces has an appearance that complements its particular function. The major formal landscapes on campus include the new northern and eastern entrances, the new University campus centre, the proposed landscaping in the new building courtyards in the South Spine and the landscaped forecourt fronting the Chinese Heritage Centre.

The new campus entrances will incorporate water and planting arranged to create strong, identifiable landscapes announcing the point of arrival. One dominant tree should be planted to anchor the planting design, with campus signage appropriately incorporated. The water bodies should contain a variety of plants, and have aerated water jets for greater visibility.

The new University campus centre landscaping will be an extension to the strong architectural forms of the proposed buildings and covered pedestrian plaza. Terraces will cascade down the eastern slope towards Nantah Lake following the sinuous outline of the covered pedestrian walkway. These terraces should be planted with grasses, herbs, or other ground covers to emphasize their flat green character. The campus centre's northern entrance will be punctuated with a large open water body and large natural garden with water falls, offering vistas along the Nanyang Avenue landscape corridor.

The South Spine landscaping will be a series of outdoor courtyards that provide informal social interaction between students and faculty. The courtyard's scale and character should match the surrounding buildings, and include pavilions with shade and seating for around twelve people. Planter edges should be raised to provide informal seating, while water features should be strategically placed to create ambient noise. Landscape designs should have a plant hierarchy with one dominant shade or flowering tree as an anchor.

The formal landscaped forecourt to the Chinese Heritage Centre is an open grass plane uniting the Chinese Heritage Centre with Yunnan Garden. It will become the primary formal landscaped space on the campus for functions such as graduation ceremonies. To realize this area's potential, the existing roadway separating the two landscapes will be relocated to the south side of Yunnan Garden, adjacent to the Pan Island Expressway. To forge stronger physical and visual connections between new and existing work, landscape pathways from Yunnan Garden should be extended across the proposed lawn towards the Chinese Heritage Centre. The lawn edges should be planted with a dense layer of trees and palms to frame the vista towards the building. A series of landscaped steps leading from the new lawn down to the existing Yunnan Garden will negotiate the difference in grade.





Pedestrian walkway set amid landscaped corridor

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Informal social space set amid landscaped corridor

## Informal Spaces

Informal landscaped spaces are loosely defined areas along walkways and pathways where random social interaction might occur. They also refer to places where time can be simply, yet comfortably, passed outdoors.

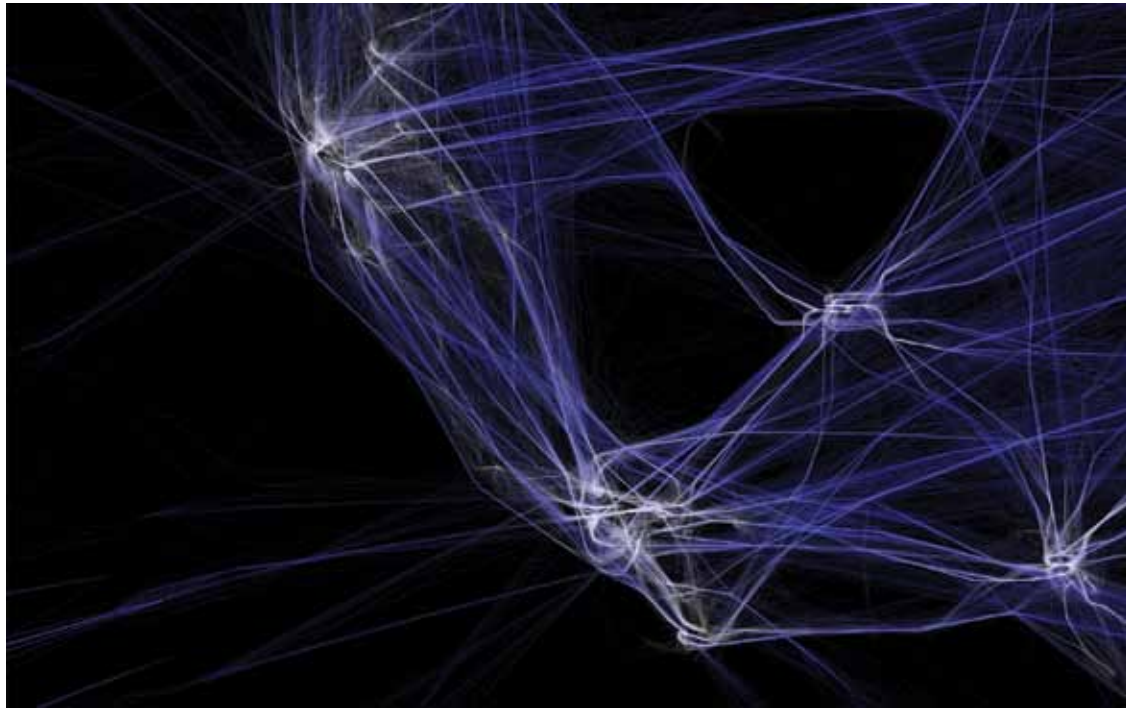
These spaces should be sensitively inserted within the broader landscaped corridors and patches. Designs could include lay-bys along the pedestrian walkways and bicycle paths, look out points, open timber terraces, or discrete sheltered pavilions. Where possible, spaces should be suspended above the landscape on posts so they do not interfere with the natural terrain below. In such cases, safety railings should be designed into the structure. Interpretive signage about the local native flora and fauna should also be incorporated in designs, made from durable materials that blend with the natural environment.



Informal social spaces amid campus landscaping & water bodies, intersection of Nanyang Walk & Nanyang Crescent

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Lighting concept: 'nodes and connectors' – areas of lighting density connected by a network of illuminated paths



Lighting the landscape

## Lighting the Campus: Illumination

### Introduction

A comprehensive review of how Yunnan Garden Campus is illuminated supports the Master Plan proposals regarding built form and landscaping. Improved lighting will help transform the frequently inhospitable out of hour's campus environment into a space capable of supporting the University's social, recreational and academic functions after dark. A carefully considered program of campus lighting is essential to campus safety, and can help to define and activate the public realm.

The illumination program develops a strategy of consolidating lighting at key nodes linked by a web of safe, clearly identifiable and amenable pedestrian corridors. Lighting serves a diversity of scales, from establishing a sense of distance and vista via the illumination of large buildings and open landscapes to more particular tasks, such as way finding and campus signage.

Illuminated nodes situated in conjunction with the proposed natural systems will help delineate and foster a sense of place in each campus precinct, achieved through differentiating light quantity, quality, scale, colour and illumination intensity.

### Lighting the Landscape

Lighting the campus' landscape elements is pivotal to an amenable night time campus environment. Lighting approaches vary between precincts, including at the primary campus entrances, along the landscape and water corridors, within the residential enclaves and in and around the various campus buildings.

Fixture typologies include ground-mounted tree canopy up lights, trunk-mounted tree canopy up lights, ground and stem-mounted down lights for low lying greenery, pedestrian poles or street poles, feature lighting nested within tree canopies and linear LED landscape 'rail-lite' fixtures.

Each typology has a different general use, as well as a different associated experiential scale. They will collectively create a horizontal layering of light throughout the campus.





New lighting proposals will illuminate vegetation along the landscape corridors



Typical existing daytime and after hours condition; lighting displays excessive glare and fails to adequately illuminate elements within the landscape

### Lighting the Landscape Corridors

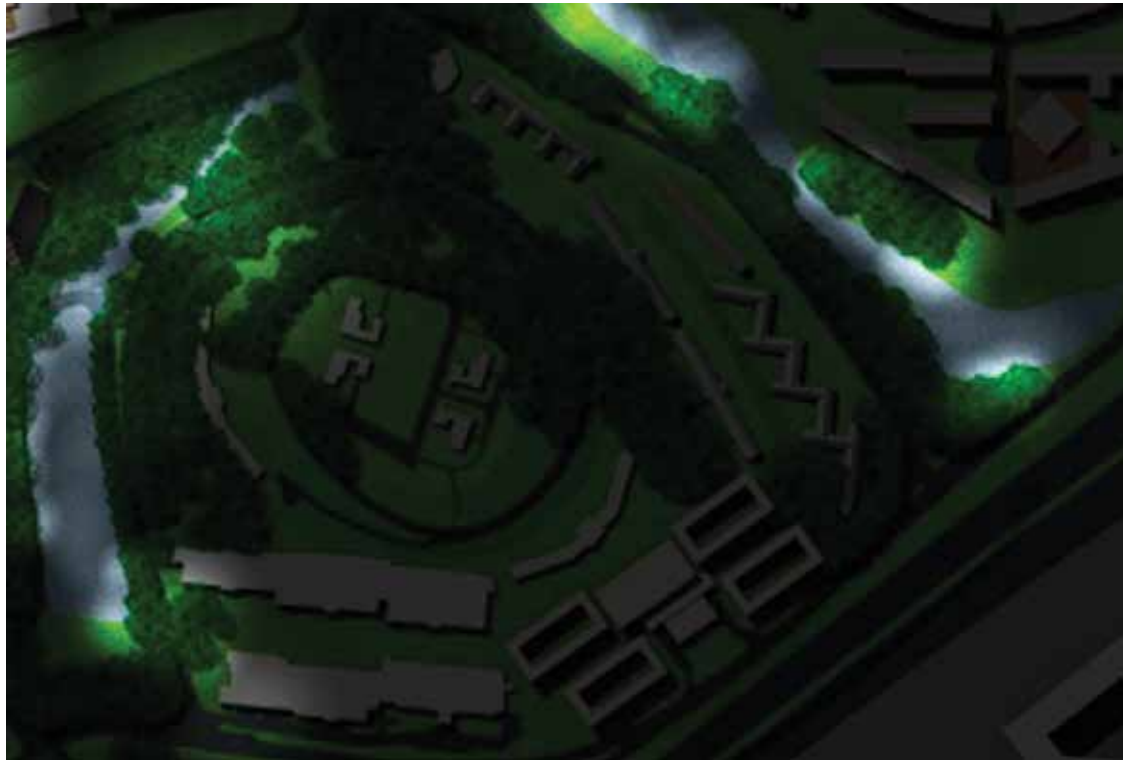
Landscapes adjacent primary roadways and pedestrian footpaths have an intense presence during the day; the artificial lighting of the project seeks to maintain this visual impact during the night. The design intent is to create a layer of light that, while not as bright as the light on the road or walkway surfaces, has a presence that nevertheless defines the campus landscape.

While the entry nodes create a 'postcard view' of the campus, The landscape corridors will permit the 'postcard view' of the campus experienced at the entry nodes to be carried into the depths of the campus. The lighting will render the vegetation flanking the passage of vehicles or pedestrians, creating a subtly illuminated, continuous landscape network.

The landscape acquires a different spatial configuration depending on the roadway type. For roadway zones with a central median, landscape lighting is created with a ground-mounted tree canopy up light. For primary roadway zones without a central median, landscape lighting for the linear tree rows immediately adjacent to the roadway are also created with ground-mounted tree canopy up lights, but arranged along the edges of tree canopies so as to create a sense of depth. Planting and tree canopies behind and beyond the first tree rows must also be subtly illuminated wherever possible. These glowing areas will provide a depth and organic informality to balance the linearity of the tree rows immediately flanking the primary roadway.

Illumination in these areas will focus on tree lined edge conditions, allowing the landscape to be reflected in the surface of adjacent water bodies. Just as the horizontal layering of light in other parts of the campus creates depth and drama, this approach will allow for the water surfaces to become a subtle echo of the landscape itself.

A second layering of light, intended for the ambient illumination of bridges and deck conditions, will use light to visually bind together opposing waterway edges.



Lighting the edge of Nantah Lake

### Lighting the Water Corridors

Waterways are critical elements in the overall experience of the campus at night. Lighting around the waterways will use the landscape as a canvas. As a result, the water will reflect the combination of light and landscape, creating areas of intense light density that differentiate them from other campus areas.

Lighting strategies will differ between water ways located at the entry nodes and those occurring as part of the landscape corridors. In both instances, lighting will work with the landscape and waterways to enhance their particular experiential differences.

Linear light will be either directed outwards and downwards from the water's edge or oriented more obliquely to indirectly illuminate the junction of the water and land. Either way, the physical presence of the light fixture should be completely concealed, with only the light itself illuminating the volume of water.





Public art on Yunnan Garden Campus



Social, cultural &amp; environmental programs on campus

## Enacting the Plan: Programs

The Master Plan acknowledges the University's commitment to undertaking a range of social, cultural and environmental programs in support of the Master Plan's goals. Programs will necessarily evolve from the changing needs of the University community over time, and acquire a variety of expressions. Programs engaging both the student population and the faculty on campus will ensure key planning recommendations find their realisation beyond the evolution of the University's physical structures.

A number of social activities occurring on Yunnan Garden Campus will require dedicated places in order to properly flourish. New development proposals should reflect this need in their site planning and encourage the provision of flexible use facilities, multi purpose spaces and studios able to adapt to a variety of University functions such as student association meetings, performances, lectures, creative art workshops, seminars or informal collaborative study.

Yunnan Garden Campus will become a significant patron of regional art through initiating a program for the display of public art on campus. A variety of media and forms such as sculpture, sound and lighting installations, landscape art and performance, can dignify and enrich the University's physical environment with both a temporary and a permanent display of artworks on campus. The art program will be inaugurated in 2010 with a legacy piece commemorating the University's role as Olympic Village for the Singapore 2010 Youth Olympic Games.

A number of sustainability initiatives, discussed at greater length in the background papers, will involve the actions of the faculty and students who live, work and study on campus. Programs should complement the environmental benefits created through the development of the landscaping and natural systems on campus, focussing on a reduction of water, waste, energy and carbon emissions through the encouragement of activities such as recycling, sustainable purchasing policies, on campus composting and car pooling.



## Sustainability Opportunities

Yunnan Garden Campus is entering its next phase of development, and as the site evolves there is growing recognition its unique park-like character deserves enhancement. Given the strong interest the University and its community has in matters environmental, the latter need not be passive participants but can contribute, not only in terms of feedback during the formulation of the Master Plan, but also through active participation by way of using the campus for research. Research programs can be constructed to investigate issues concerning water, energy and carbon emissions, waste, and biodiversity. Research outcomes can complement the development of the natural systems and built form on campus. Fortuitously, JTC Corporation's CleanTech Park will be adjoining the University – a location allowing for unprecedented levels of collaboration between the two institutions. Collaborative site planning with CleanTech Park will help establish a larger and more sustainable ecosystem – especially in terms of wild fauna and flora diversity. The University, CleanTech Park and industry groups will have further opportunity to both collaborate and apply their shared research and development in the wider community. In effect Nanyang Technological University and CleanTech Park can and will become “test beds” at scales which are already practically real.

Given the nature of Nanyang Technological University and CleanTech Park, green building designs shall be the norm. The need for greater energy efficiency and reduction of carbon footprints will also give rise to research and development opportunities in power generation, alternative energy sources, cooling, lighting and transportation. The need to conserve water resources may lead to investigations in rainwater harvesting, wastewater separation and treatment coupled with resource recovery and wetlands for polishing water quality. The latter is interesting as it may allow extension into studies on biodiversity. Biological degradation to generate energy and composting of horticultural residues may be investigated, potentially combined with the food wastes arising from dining facilities on both the Nanyang Technological University and CleanTech Park campuses to enhance energy generation. Perhaps less obvious, there may also be the possibility for projects such as those which will utilize the substantial grounds for microbial carbon capture and so extend applications into rural areas and the hinterland of cities.

These are indeed exciting times as the NTU Master Plan is translated and implemented. Yunnan Garden Campus can itself become a vast laboratory allowing research on a scale which will be difficult to replicate elsewhere. There is every possibility these investigations will not only address the University's and Singapore's environmental issues but can also be applicable elsewhere in a world with rapidly growing urban centres and stressed rural areas. Given the rare confluence of sustained effort in matters environmental, capability, capacity in research and development, manpower and infrastructure (both within laboratories and considering the campus itself as a laboratory), there is every likelihood Nanyang Technological University will develop as a leader in sustainability education and research.

For Singapore, sustainable development means achieving both a more dynamic economy and a better quality living environment, for Singaporeans now and in the future IMCSD, “Sustainable Singapore Blue Print”, April 2009

Contextually, the growth of urban centres across the world places increasing demands on resources, and the shift to alternative and renewable resources is inevitable. This shift is all the more important when viewed together with the need to mitigate climate change – the latter being a consequence of modes of resource utilization which strain Earth's ecosystems. There is clearly a need to develop in a sustainable manner and reverse as much of the “damage” which has already been caused.

Notwithstanding the obvious direction towards addressing national needs, conscious sustainable development at a particular locale contributes to the global effort. Furthermore, Singapore is a high-density urban centre and its efforts and solutions are likely to find relevance in other urban centres around the world.

Alternative approaches leading to sustainable development require efforts in research and development, and an enlightened approach towards the assessment and adoption of new technologies. Singapore and Nanyang Technological University in particular, has been party to many of these initiatives. The University's commitment to environmental science and engineering has been sustained for over two decades. The culmination of this sustained effort is the campus-wide ‘Sustainable Earth Peak of Excellence’ in the NTU 2015 Strategic Plan. This includes within its overarching framework major interactive research entities such as the Research Centres of Excellence, the Earth Observatory of Singapore and the Singapore Centre for Environmental Life Sciences and Engineering. In addition to these are the Nanyang Environment and Water Research Institute and the Energy Research Institute at NTU. Together, they form a large number of ‘centres of competence’, recognized for their excellence in particular scientific and engineering niches.

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As a leader of the Sustainability Task Force, Nanyang Technological University will be one of the ‘Guardians of Green’, committed to achieving the ‘Four Zero's’:

Zero Water, Zero Waste, Zero Energy, Zero Carbon

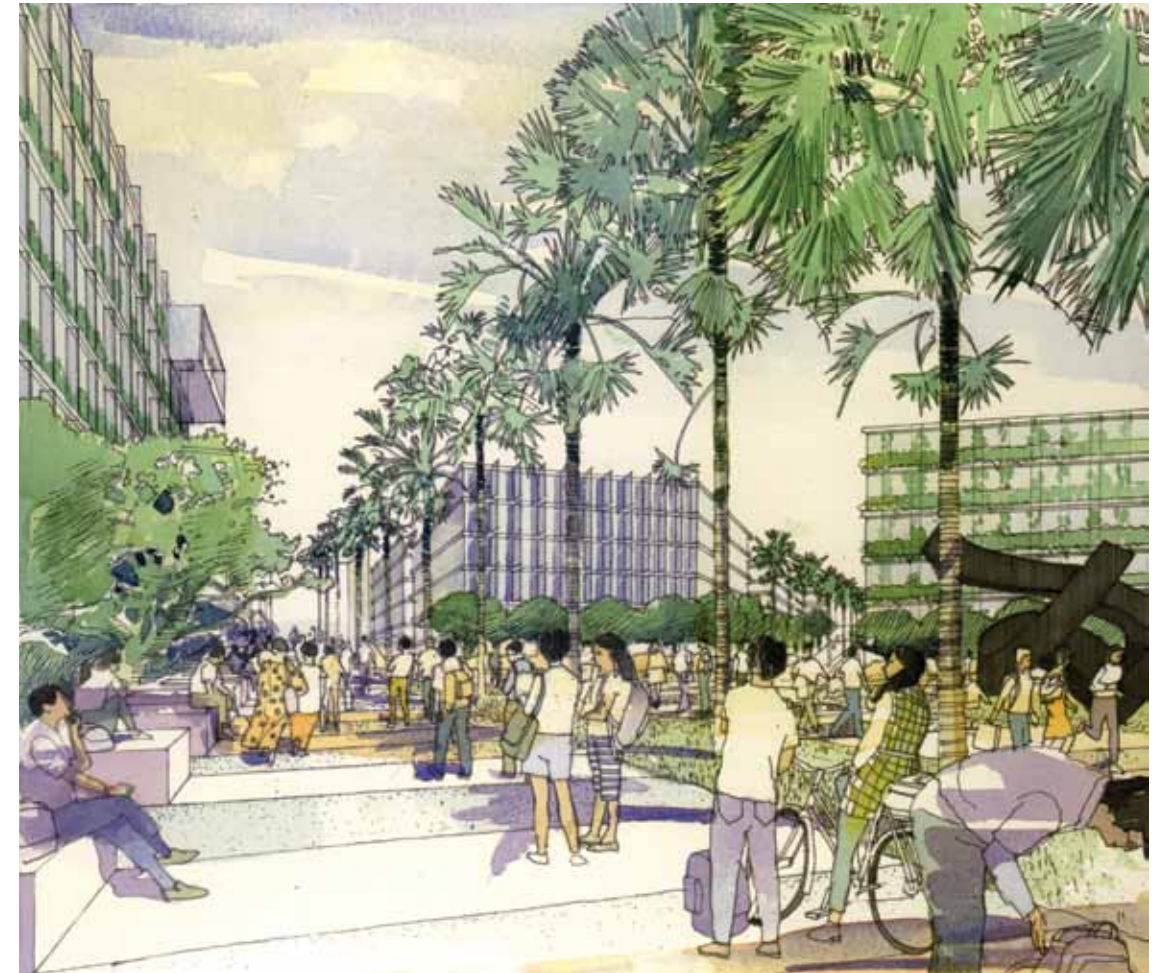
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Professor Ng Wun Jern  
Division of Environmental and Water Resources Engineering  
School of Civil and Environmental Engineering  
Nanyang Technological University





Retrofitting the North Spine internal courtyard will involve the relocation of on-grade car parking to the new campus centre and allowing new landscape designs, lighting, group study teaching modules, artworks and shade screens to revitalise this significant open space.



Linear arrangements of academic and residential buildings will create new landscaped, pedestrian avenues in South Spine precinct.



The Master Plan recommends a new urban structure be established along the existing topographic ridge, bisecting the axes established by the North and South Spines. This will create a ribbon of diverse, interconnected places mixing academic, social and residential functions, natural spaces, pedestrian facilities and public squares.

## Linking the Campus: a new Campus Centre

The Campus Centre precinct occupies an area of land stretching in a north-south direction between the intersection of Nanyang View and Nanyang Avenue in the north, and the Chinese Heritage Centre and the School of Humanities and Social Sciences in the south. It is bounded to the west by the North Spine complex and to the east by the Student Walk and Nantah Lake.

The precinct topography rises sharply from the north-west. The School of Art, Design and Media and the adjacent intersection of Nanyang Drive and Nanyang Avenue are some 30 metres lower than the ground level in the vicinity of the Student Services Centre. From here, the topography falls gradually towards the south and south-west, and very sharply towards the east beyond Nanyang Avenue, forming a long ridge running across the centre of campus, midway between the primarily academic buildings in the south-west and the primarily residential areas in the north-east. There are good views across the south-east of campus from along the top of the ridge.

The boundary of the Campus Centre precinct extends north beyond Nanyang Drive to encompass landscaped space south-east of Hall 8.

Height restrictions limit development potential where the precinct is elevated to the south and west; however there is considerable potential for redevelopment using the change in topography towards the east.

The Master Plan recommends a new urban structure be established along the existing topographic ridge, bisecting the axes established by the North and South Spines. This will create a ribbon of diverse, interconnected places mixing academic, social and residential functions, natural spaces, pedestrian facilities and public squares. The urban form will be provided unity by a continuous series of broad roofs offering protection from the sun and rain. The Campus Centre will serve as an important link between the academic areas in the south of the campus and the residential areas further north.

While the proposed building forms that create the Campus Centre's different elements will vary according to programmatic requirements, collectively the

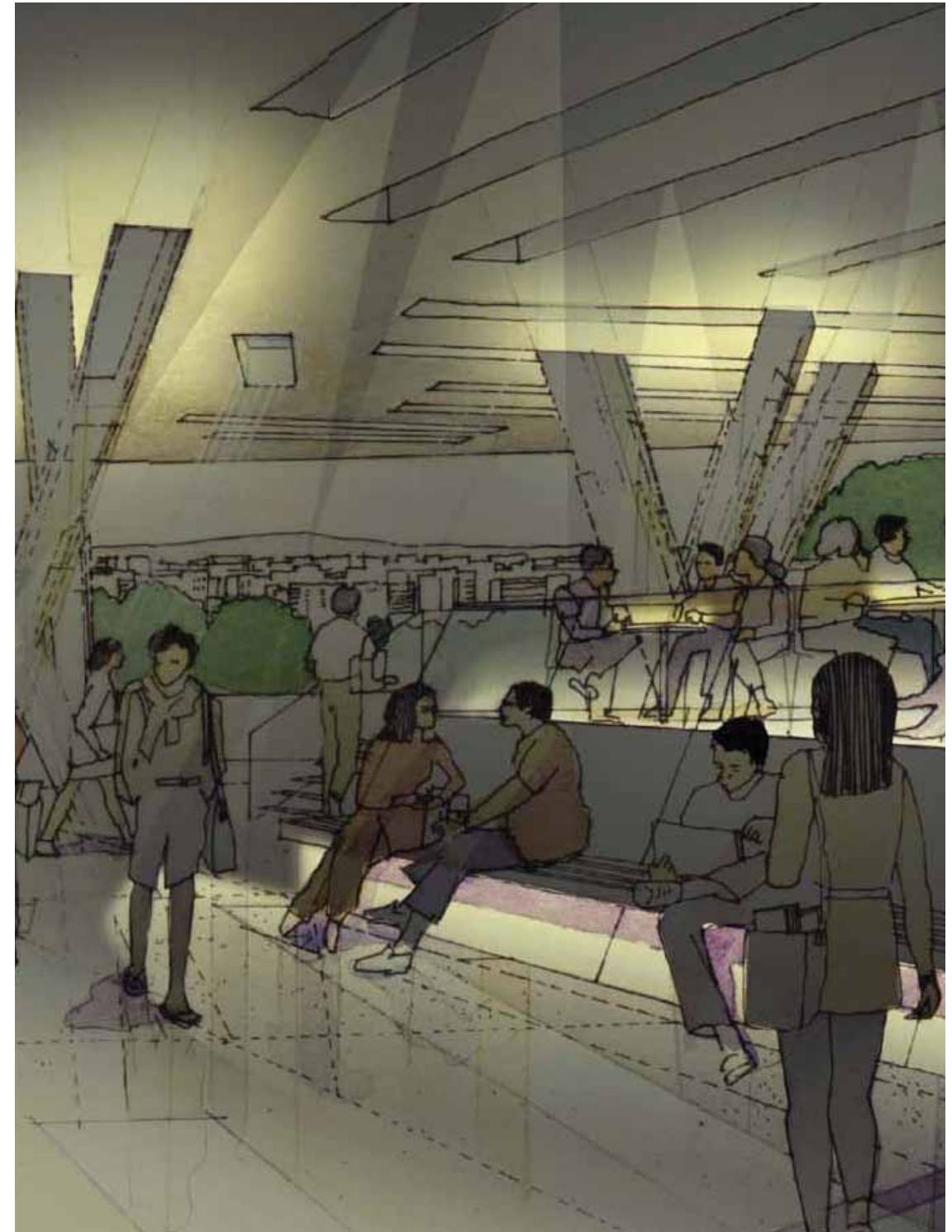


Campus Centre precinct





The new campus centre will arrange a series of terraces along the topographic spine running between the primarily residential areas in the north of campus to the primarily academic areas in the south. Generous allowance will be made in the campus centre for public space, with open walls enabling cross ventilation and expansive views across Nanyang Valley to the east. Overhead, the campus centre roof will provide shelter from the elements.



Campus Centre interior at night





Campus Centre ground floor &amp; terrace levels below roof

Campus Centre will adopt a similar scale and architectural typology to that employed in the North and South Spines: a major linear element supporting a series of subsidiary structures accommodating diverse uses organised perpendicularly to a predominant urban axis.

The floor level of the new Campus Centre will form a broad pedestrian ramp, rising continuously from north to south following the natural topography. The floor is interspersed with a series of terraces, providing spaces for seating and entry to the adjacent buildings, which extend perpendicularly from the main Campus Centre axis to the east. All pedestrian areas will be wheelchair accessible, with elevators required to effect the transition between floor levels where the landfall is steepest towards the north. The Campus Centre will remain unenclosed to both the east and west, enabling good cross ventilation and achieving a continuous view to the landscaped areas of Nanyang Valley below. The pedestrian spaces in the Campus Centre will be served by a number of retail facilities and food outlets, generating a vibrant hub for social activities and informal student congregations. The retail outlets will be located in kiosks or small tenancies forming part of the adjoining buildings to either side of the main concourse and will also serve the adjacent open spaces between the new Campus Centre and North Spine. The intervening roadway, Nanyang Avenue, will be converted to a primarily pedestrian environment by landscaped resurfacing and limiting vehicular access to utility and emergency vehicles.

The topography of the Campus Centre precinct falls level near the intersection of Nanyang Drive and Nanyang Avenue. Here, the Campus Centre roof will form an expansive cantilever, providing cover for a generous public square, establishing a new focus of arrival for the campus as a whole. Extensive landscaping north of Nanyang Avenue will unite the Campus Centre square with the University's natural environment. In addition to its role as a symbolic and social public space, the Campus Centre square will also serve as a transport interchange, connecting the heart of the campus to the University's main entrance via the new east-west entry road. The square will also serve as a terminus for the various modes of vehicular public transportation on campus, as well as forming a hub from where networks of bicycle and pedestrian pathways will extend into the broader University environment.



A generous sequence of external stairs, accompanied by escalators and lifts, will complement the Campus Centre's pedestrian ramp in its southwards progression from the new Campus Centre square. These elements of vertical circulation will enable wheelchair and disability access throughout the length of the new development. The north-south pedestrian pathway, sheltered by the sequence of Campus Centre roofs, will connect to adjacent buildings via east-west circulation paths. These will include a tunnel through to the central court of the School of Art, Design and Media, and covered walkway structures linking the Campus Centre to the roof of the School of Mechanical and Aerospace Engineering and the School of Computer Engineering.

A number of building 'wings' will extend east of the new Campus Centre spine into Nanyang Valley, utilising the steep fall of land to achieve substantial amounts of floor space without requiring buildings in excess of the height planes established by the Campus Centre roofs. A range of University facilities will be accommodated in the wings, including a visitor's centre to the north, a student services centre, administrative facilities, and academic teaching spaces such as auditoriums and tutorial spaces, a relocated international house, and a substantial quantity of largely undergraduate housing. Between the east-west building wings, landscaped terraces will create a series of gardens, each of distinct character, linking the elevated floor of the Campus Centre to the ground below. The fall of land further suggests opportunity for underground buildings, accessible via the Campus Centre's changing floor levels. Additional landscaping will be brought over the roofs of a number of the building wings themselves.

New facilities in the Campus Centre will attract a large population, both permanent and transient, requiring a substantial area for parking in support of the new building proposals. Parking will be accommodated in the lower levels of the new Campus Centre, concealed by the overhead landscaping and development. Vehicular access to the parking areas, utilising the existing street network as far as is possible, will be via a partly underground entry road built into Nanyang Terrace. Access to the new east-west entry road via the Student Walk can thereby be readily achieved. The Master Plan proposes an additional independent



Campus Centre interior with views over terrace to the east

development in the south-east of the Campus Centre precinct. This proposed building will accommodate substantial areas for academic teaching spaces. The radial form will be set into the curving slope of the land, while associated works will involve renovating the existing Student Services Centre, where it is envisaged a new publicly accessible 'observation deck' will be developed at roof or upper floor level.

### Campus Centre Applicable Goals

Create an enduring identity for a campus in a park

Support sustainable design and development principles & promote bio-diversity

Develop a new curvilinear 'spine' located at the heart of the campus in order to connect the predominantly residential zones in the north of campus to the predominately academic areas in the south

Extend the University's engagement with the community

Develop academic teaching facilities that support the pedagogy embraced by the Blue Ribbon Commission

Diversify the residential character of the University through introducing new types of accommodation

Integrate the campus' disparate open spaces into a seamless landscaped network



Campus Centre perspective





Pedestrian spaces in the campus centre will be served by a number of retail facilities and food outlets, generating a vibrant hub for social activities and informal congregations of students, faculty and visitors to the University.





## Evolution of the Master Plan: the Future

The adoption of Nanyang Technological University's Yunnan Garden Campus Master Plan is the culmination of a long and thoughtful study of the campus, and what it might become in the years between now and 2025.

Don't mistake this beginning for an end.

The adoption of a Master Plan is also the beginning of a process that will guide these plans and dreams to fulfilment. That important work is just beginning.

A Master Plan and its ideas, guidelines, evocative text and images will not in itself create good buildings and places. It is not a design for specific development projects, nor does it commit the University to carrying out specific improvements. Instead, the Master Plan suggests a planning framework within which the University may preserve what is good in the present environment, enhance what could be better while guiding what is new to be compatible with the best of the existing environment. Furthermore, it recommends improvements where the campus lacks those qualities to which the University aspires.

So we have a kind of 'roadmap' for the journey – a carefully crafted study of Yunnan Garden Campus encompassing its history and traditions, its site and parkland, its buildings and programs, as well as its location in Jurong, Singapore and the broader global academic community.

The question now is how to proceed; how to breathe life into these ideas and dreams.

Implementation requires an ongoing process in which the University uses this Master Plan with its own processes and traditions of collegiality, research and innovation to learn as the academic community and campus environment evolve over time.

The Master Plan will be used as an advisory document for allocating resources, guiding growth and accommodating change. It will provide a framework for those proposing and evaluating specific design projects. It is a dynamic process - the University is a living thing. Blood pulses through its veins. Yunnan Garden Campus is more than a thing of buildings, landscapes, rules and academic programmes. The spiritual lives of the men and women who have gone before rest within it. It is a precious life to be nourished and passed on.

Well done – this process will become the most important product of the plan.

Richard Bender  
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## Acknowledgements

### Campus Planning Committee

#### Members

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Sitetectonix Pte Ltd *Landscape Architecture*

L 'Observatoire International *Lighting Designers*

AECOM Singapore Pte Ltd *Traffic Planners*

United Project Consultants Pte Ltd *Building Services*

P&T Consultants Pte Ltd *Civil & Structural Engineering*

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Davis Langdon & Seah Singapore Pte Ltd *Cost Engineering*

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#### Watercolours

David Wardman; Sydney, Australia

#### References

Forman, Richard T.T. (1995)

Land Mosaics: the Ecology of Landscapes and Regions

Cambridge University Press: Cambridge

(Ed.) Kultermann, Udo (1970)

Kenzo Tange: Architecture & Urban Design

Pall Mall Press: London

