BIOPHILIC CITY

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Nanyang Technological University of Singapore – Biophilic Campus in the Making

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Abstract

Formed in the year 1991, Nanyang Technological University of Singapore (NTU) was sitting on the old campus ground of former Nanyang University built in 1956. The 200 Hectares Yunnan Garden Campus is the largest (by land sizes) and oldest university campus in Singapore with rich cultural and heritage value as well as generous natural parkland-like landscape. One of the most memorable and distinctive features of Yunnan Garden Campus is its abundant and varied landscape. 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 informal planting that surrounds Nanyang Lake. This diverse collection of original landscape 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 infrastructures. The ecology of these isolated landscape patches was further degraded by a limited variety of plant species, the prevalence of introduced plant species, and the disruption of the original groundwater and surface water patterns. The proposed master plan in 2010 is driven by the key strategy to address ecological fragmentation by stitching the natural system back together, based on modal of "patches, corridors, and matrices. Blue and green landscape corridors were introduced as part of the essential framework of the campus masterplan connecting the scattered greeneries around the Campus. The idea was first tested in the Pioneer and Crescent Hall Project in year 2012. The project was completed in year 2015 and had brought biophilic living to reality.

Keywords: Ecological fragmentation; Natural System; Patches Corridor Matrix; Biophilic

1. NTU Yunnan Campus Masterplan 2010

The 2010 Campus Masterplan values the significance of the natural environment of the Yunnan Garden campus. One of the key objectives of the masterplan is to enhance and reinforce the university's identity as an eco-friendly and biophilic campus. Based on an ecological theory of 'patches, corridors, and matrix' developed by Richard Forman, the master plan outlines a long-term strategy to re-connect the fragmented patches of the landscape into a sustainable whole that will enhance the biodiversity of the campus. This approach includes the creation of an integrated network of green and blue corridors thru parks and green infrastructures for an environmentally sustainable and integrated landscape.

By adopting the ABC Water programs initiated by the Public Utilities Board of Singapore (PUB). The collection, treatment and conveyance of rainwater run-off and water conservation will complement the development of these integrated blue and green landscape corridors. This will require new and existing 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. The masterplan had recommended for all existing and future proposed stormwater drains and drainage channels to be designed with the ABC Waters guideline in mind whenever feasible, to create naturalised water ways, minimising the quantity of impermeable concrete drains on campus.

Fig. 1. NTU Yunnan Garden Campus Masterplan 2010

1.1 Patches, Corridors, Matrix

Patches, Corridors, Matrix is a landscape and ecology theory developed by Richard Forman in Land Mosaics: the Ecology of Landscape and Regions (1995). It classified the natural environment in term of three basic spatial element, referred to as patches, corridors, and matrix.

There are several isolated landscape patches within the campus and surrounding environment. To connect these typically isolated patches, several landscaped corridors are proposed. For example, one of the proposed landscape corridor will link Clean Tech at the east of the NTU Yunnan Garden Campus 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. The proposed corridor will also add extensive natural linkages at the campus periphery, expanding the size of the original ecosystem.

The reconnection of isolated patches will improve the health and fitness of both the patches and the landscape corridors. 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 an 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.

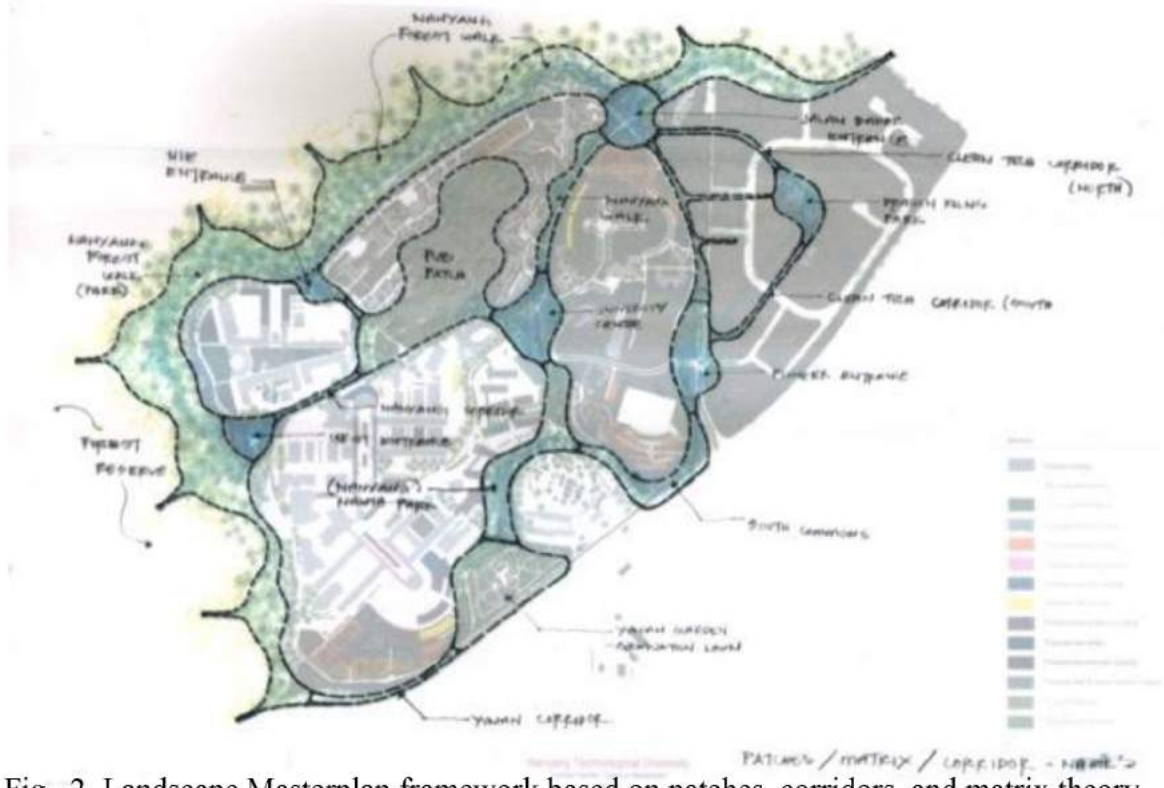


Fig. 2. Landscape Masterplan framework based on patches, corridors, and matrix theory. The corridors allow unimpeded flora and fauna movement between patches.

Fig. 3. Illustrative plan: The site's natural system provides a foundation for the Master plan's proposal. The ecological framework of the campus help determines the future development possibility. The corridors allow unimpeded flora and fauna movement between patches.

1.2 Habitat Corridor

Habitat corridors are land or water connections that permit uninterrupted, safe movement of animal across roads, walkways or other barriers. Habitat corridor 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. Habitat corridor was identified as one of the essential components in enhancing the natural system of the Yunnan Garden campus. Whenever feasible, the existing and new development with the university should bear in mind the importance of creating an uninterrupted ecosystem and shall promote the enhancement of the biodiversity around the campus by taking into consideration the ecological aspect during the planning stage of the development.

Fig. 4. Section of a Habitat Corridor underneath a Roadway. This is an example of how habitat corridor can be part of the infrastructure for the campus while at the same time utilise as a safe passing corridor for small animals to move from one habitat to another.

1.3 Naturalized 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 some impermeable reinforced concrete storm water, roadside and building drain. While this drainage system are generally very efficient, it has a number of adverse environmental effects.

Existing and proposed new drainage system should be designed and adopt the "ABC Waters Design Guidelines", to create a more sustainable drainage strategy. This will involve, where feasible, the creation of naturalised waterways and vegetated drainage swales.

The ABC Water Programme was started in the year 2006 by the Public Utilities Board of Singapore (PUB). It is the Singapore's version of Water Sensitive Urban Design (WSUD) program aiming at transforming all water bodies in Singapore into clean, beautiful and functional landscapes where the water could eventually be retained, harvest and reused for the water scarce country.

A number of new detention and retention ponds for the recycling and reuse of rainwater runoff will be created. All campus water bodies, including naturalised waterways, retention ponds, detention ponds and lakes will form a continuous integrated network of water elements. The naturalised drainage system has several benefits. These include habitat for native flora and fauna and the creation of social, recreation, and interpretive learning opportunities. The natural cleansing and filtering by water plants through biological uptakes will not only capture sediments and reduce the passage of pollutants, it reduces heavy metal and contaminants in the water system and cleaner water will be discharged.

Fig. 5. Informal walkway/ Social space set amid landscape corridor: Design includes pedestrian walkways, bicycle paths, open timber terraces or discrete sheltered pavilions.

1.4 Planting & Hardscape Strategy

The Master Plan's planting strategy is based on the re-creation of a native landscape of lowland rainforest species sustainable within this endemic environment. Fostering native flora and fauna will increase the landscape's biodiversity. A native landscape is also easier to maintain and will give the campus a distinctive character and sense of place.

Within the naturalised waterways and the retention and detention ponds, wetland plants known for their water cleansing and filtration properties, as well as for their slope stabilising properties should be used. These plants should also provide habitat for native animals and birds. The goal of the planting selection and design is to mimic a natural littoral edge.

Minimizing hard surfaces should also involve the 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 permeable and porous paving materials.

1.5 Implementation of the Masterplan

The substantially integrated blue and green landscape corridor is an ambitious program of landscape program for the university. It will form a physical network as the backbone of proposed new built form on the university campus. It will be the fundamental principle and landscaping roadmap to follow through and implemented over the next 15 to 20 years.

Fig. 6. Nanyang Lake will be a storm water retention pond integrated with the broader system of on-campus stormwater to support native flora and fauna, as well as social interactive space.

2. Pilot Project – **Pioneer and Crescent Hall @ NTU**

2.1 Project Overview

The integration of a blue and green network was first tested in 2012. The landscape design of the
Pioneer and Crescent Hall at Nanyang Crescent is a combination of the naturalised waterway, wetland and ponds surrounded by a native landscape that is sensitively integrated to create a dynamic equilibrium of nature and man-made. Inspired by the big idea behind the masterplan, the six residential towers designed by the architect sprawling over a 3.5 Hectare of land is making an analogy of the stilt roots of the mangrove tree sitting over the pool of natural water body.

An underlying principle of the landscape design is the landscape/ecological theory of 'Patches, Corridors, Matrix developed by Richard Forman (1995). The deep topography depression of the site presents a unique opportunity for integrating 'Active, Beautiful, Clean Waters' features in the landscape design (ABC Waters Program). Existing concrete drains, stagnant water bodies and an isolated lily pond, are transformed and connected by a green and blue landscape 'Corridor' of natural stream and water cascade, to new 'Patches' of the cleansing biotope, retention and recreational ponds, rain gardens, and marshland.

The naturalised drainage system provides

a habitat for native flora and fauna, increasing the landscape's biodiversity. The natural cleansing and filtering by water growing plants capture sediments and reduce the passage of pollutants. The continuous network of water elements established through the site provided a natural setting for a variety of spaces such as seating decks, gazebos, boardwalks, amphitheatre and outdoor classrooms, creating social, recreation and interpretive learning opportunities.

The fusion of landscape and architecture intermingling creates a spatial symbiosis between man and nature, resulting in a nurturing holistic environment that strikes the perfect equilibrium between study and play, rest and rejuvenation.

Fig. 7. Overall Site Plan of Pioneer & Crescent Hall at Nanyang Technological University, Singapore, Yunnan Garden Campus.

2.2 Key Observations of the Existing Site

Existing Lily Pond:-

The existing lily pond is a shallow pool of water with a depth of 500mm. There is no sign of algal bloom due to insubstantial Nutrients discharged through the inlet culvert and well-adapted water plants within the pond that are effective in removing nutrients from the incoming runoff.

Existing Open Earth Drain:-

Stagnant and muddy condition observed in downstream water body – the open earth drain. There are forming of algal bloom found near to the pipe culvert, and the majority of the water body is stagnant. The muddy water is a result of a shallow water body with an unlined bed.

Existing Concrete Cascading Drain:-

Signs of erosion were observed at some parts of the shallow water body. This indicated that the existing water body might have experienced fast flows in the past. The fast flowing condition could be even more pronounced due to fast flow for incoming cascading drains and the absence of energy dissipater.

Fig. 8. Diagram illustrating key observations of the site.

The Impact of the Proposed Student Housing Development:-

a. Runoff incoming into the water body is associated with the higher nutrient level and suspended solids compared to current grassed/vegetated surfaces.
b. Water quality within the existing water body may deteriorate further, especially within those shallow water bodies downstream of the lily pond. This is because these shallow water bodies do not have settling capacity as well as limited phytoremediation taking place within them. Coupled with its stagnant condition, the risk of algal bloom is expected to increase.
c. Water level fluctuation within the existing water body is supposed to be higher when more runoff is discharged from the new development.
d. More erosion is expected to take place at the banks of the water bodies as more runoff is discharged from the new development.

2.3 Design Approach and Objectives

To minimise the impact of the development and to ensure proper water quality within the water bodies surrounding the development, the following approaches were adopted:-

a. Water quality sampling and analysis were carried out to identify nutrient levels from the incoming culvert and drain. This enables a better design of ABC Waters Design Features.
b. The current shallow water body was re-configured in term of their bed profile and shape to achieve the following:
   - Better settling capacity of the water body;
   - More shallow marsh, deep marsh or submerged marsh to be introduced around the water body as a buffer to reduce sediment from being discharged into the water body; as well as to promote nutrient removal by plants;
   - Better flushing by introducing cascading streams;
   - Separation of a large water body into various smaller water bodies, where each of them was designed as different ABC Waters Design Features, aiming to promote treatment train;
   - Energy dissipater (in the form of natural rocks) was introduced to dissipate energy for incoming drain so that to minimise soil erosion.

The ensure that the goal of the project will be achieved, the design team had outlined the following objectives:-

a. To remove pollutants/nutrients from existing/new development before discharging into the water body.
b. Encourage stormwater harvesting and reuse.
c. Re-configuration of existing water body to enhance self-cleansing capability and encourage phytoremediation processes.
d. The utilisation of water body as a lifestyle.

2.4 Key Design Considerations

Flood Control

a. Proper by-pass system from ABC Waters design features must be provided and connected to the storm drain so that the surrounding area will not be flooded. As a result, an emergency spillway was proposed as a flow bypass of downstream wetland for events up to the 10-year ARI event.
b. Minimum engineering requirements for surface water drainage must be met.

Performance Targets

a. ABC waters features to be designed to meet the stormwater quality objectives
b. Removal of 80% for TSS, 45% for TN and 45% of TP (for 90% of all storm events)

Erosion and Sediment Control

a. Prevent sediments form construction sites from flowing into drains during rain events. Proper slope gradient were considered during the design process.
b. Employing soil stabilisation techniques such as bioengineering

Mosquito Control

a. Prevent mosquito breeding

2.5 Design Implementation – The Living Water bodies

Based on the site topography, site characteristics and design intention, the following treatment train of ABC Waters Features is proposed to achieve sustainable stormwater management:

a. Sedimentation Basin
b. Linear Wetland
c. Bioretention Basins (Rain Gardens)
d. Cleansing Biotope
e. Pond

Fig. 9. Diagram showing the design principles and idea.

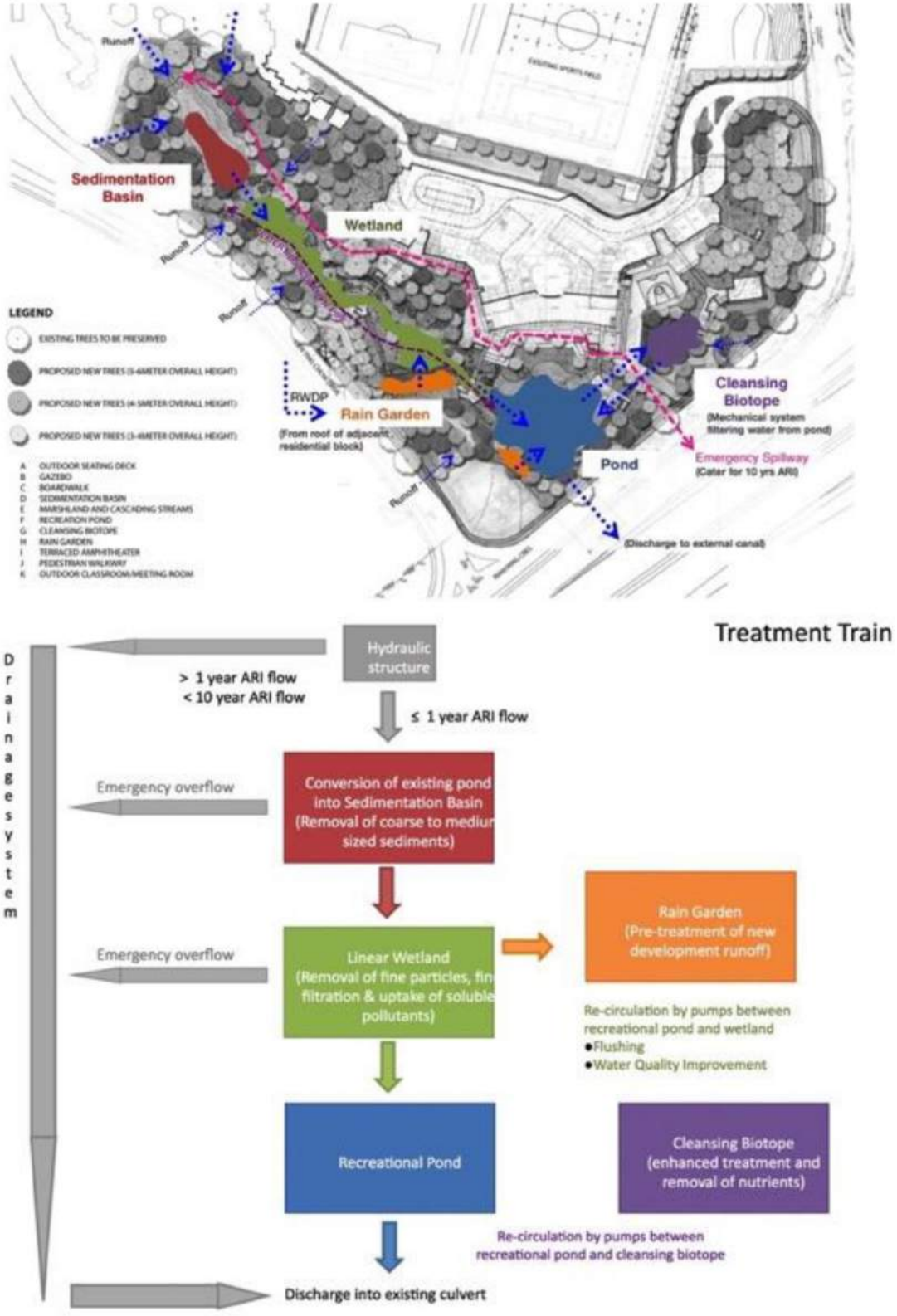


Fig. 10. Treatment train diagram illustrating the stormwater system designed for the landscape area. It explained how water was being collected, treated and conveyed.

Cont. from Point 2.5

Sedimentation Basin (@ RL+117.0)

Reducing sediment loads is an important way to improve stormwater quality. Sedimentation basins can form an integral component of a stormwater treatment train and are specifically employed to remove (by settling) coarse to medium-sized sediments from the water column. As such, the existing lily pond furthest and highest in terms of topography is proposed to be converted into a Sedimentation Basin, which will retain any coarse sediment before discharging runoff into a Linear Wetland.

Linear Wetland (@ RL+116.0)

The Wetland is a shallow extensively vegetated water body using enhanced sedimentation, fine filtration and pollutant uptake processes to remove pollutants from stormwater. Water levels rise during rainfall events and outlets are configured to slowly release flows, typically over three days, back to dry weather water levels. The relationship between detention time, wetland volume and the hydrologic effectiveness of the system were optimize to maximise treatment given the wetland volume site constraint. Plant material was carefully selected to ensure proper nutrient uptake.

Biorentention Basins/ Rain Gardens (@ RL+117.0)

The two Bioretention Basins/ Rain Gardens will pre-treat runoff from impervious surfaces of the new development and the rainwater discharge from the roof of the residential towers before discharging it into the Wetland and Pond.

The basins were densely planted with surface vegetation as a means of pre-treatment before they infiltrate/percolate through a prescribed filter media. During percolation, pollutants are retained through fine filtration, adsorption and allowing some biological uptake.

The Cleansing Biotope (@ RL+116.0)

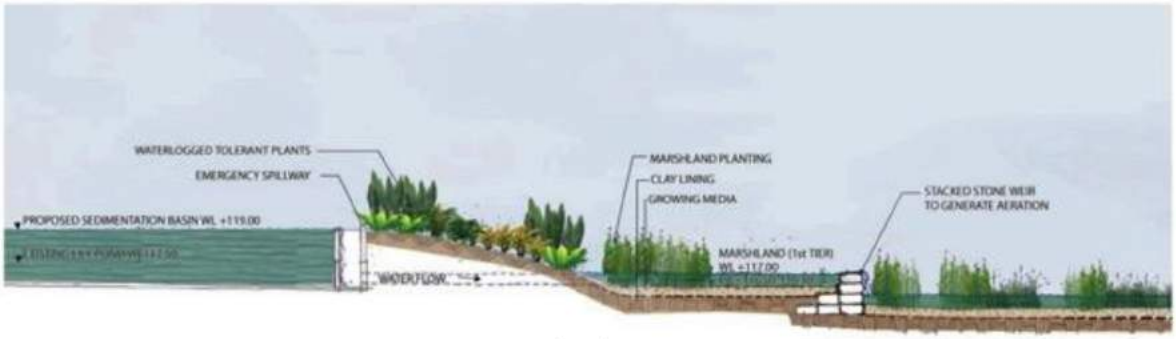
The Cleansing Biotope, a form of artificially constructed wetland, consisting of nutrient- poor substrates that are planted with wetland plants which are known for their water cleansing capacity, is proposed in the eastern part of the project site. The water runoff is filtered through the substrate layers, collected by the underneath perforation pipes, which finally discharge the treated runoff out from the biotope system. The biotope is designed to provide higher treatment to the sites runoff by re-circulating water from the pond to the cleansing biotope and – after further treatment – discharging back into the pond thru mechanical system (Water Pumps).

Pond (@ RL+115.0)

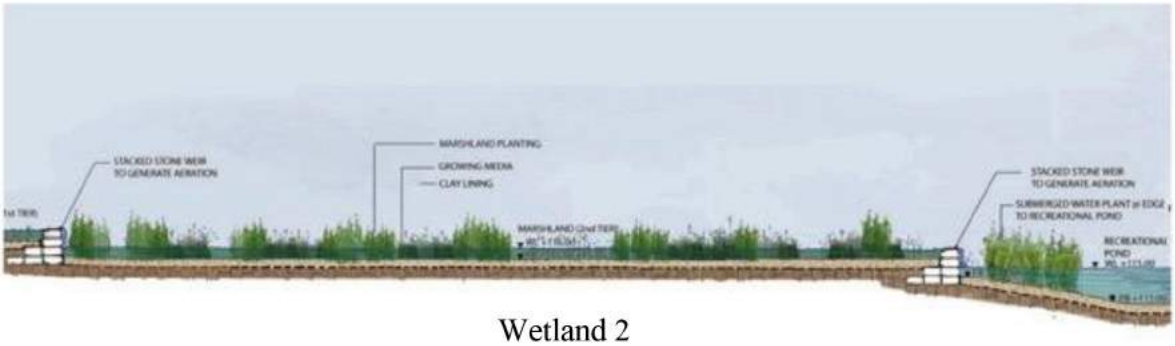
The central pond adjacent to the canteen represents the predominant water body of the development due to its proximity to the new residential halls and gathering places. It is for that reason that the water quality present in this pond is of upmost importance and can only be achieved by a series of pre-treatment and re-circulation.

The introduced re-circulation between pond and the top of the wetland will not only improve the treatment of stormwater and therefore the water quality of the pond but only avoid any stagnant water by creating a continuous moving water body.

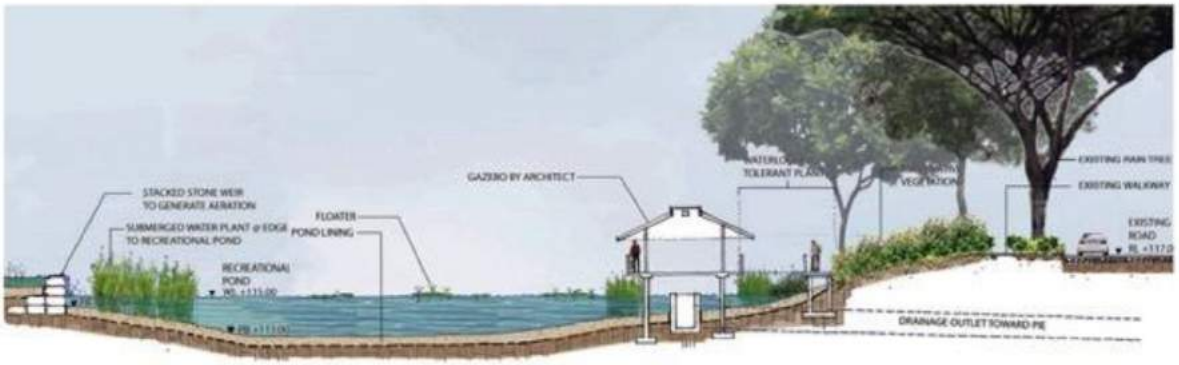
Sedimentation Basin



Wetland 1



Wetland 2



Recreational Pond

Fig. 11. Schematic section through the Sedimentation Basin, Wetland and the Pond. Breakout spaces and boardwalk were added as amenities to the dwellers.

Fig. 12. Sedimentation basin transformed from isolated lily pond as part of the "Active, Beautiful, Clean Waters" feature designs, contributing to sustainable water management system and increasing the landscape's bio-diversity.

Fig. 13. Night view of outdoor classroom (Pavillion by Architect) overlooking marshland and cascading stream.

Fig. 14. Outdoor seating deck and Gazebo with view of pond and cascading stream.

Fig. 15. A glimpse of the introduced natural system from the student hostel above. The integration of nature and built form was carried out with the aim of creating a biophilic living environment for the staff and student.

3. Conclusion

The master plan in 2010 had outlined the key strategy to address ecological fragmentation by stitching the natural system back together, based on modal of "patches, corridors, and matrix. As a result, integrated blue and green landscape networks were introduced as part of the essential framework.

The sensible design strategy represents a unique opportunity to create a cohesive, inclusive and high-quality private realm which complements the University campus and existing context, creating a peaceful oasis within the vibrant campus compounds. In between, what oneself did not realise is that the integration between nature and the existing/ new built form had slowly turned the university into a biophilic campus.

The pioneer and crescent hall project have laid down a good foundation and earmark as a successful precedent for similar projects in the future. This had given a boost of confidence to the campus community in believing that the key landscape principle is the one to live by.

More projects of similar nature of different scale will be implemented campus-wide over the next few years as part of the Masterplan's recommendation. For instance, the up and coming Yunnan Garden and Nanyang Lake Upgrading Project which schedules to complete by the year 2020. With the strong momentum and continuous efforts, coupled with careful implementation, a biophilic NTU Yunnan Garden Campus is not far from being a reality.

Acknowledgments

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Masterplan Graphic extracted from:
2010 NTU Yunnan Garden Campus Masterplan Report

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Living in Sculptured Nature
A Case-Study of Three Private Residential Development

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Abstract

The landscape design of outdoor communal spaces within private high-density residential developments (condominiums) is not known to the public at large, as they are private spaces, only known and used by the residents of the developments. But this space contributes to around 40-60% of the footprint of each development, and that amounts to a substantial area where the landscape enhances the residents' experiences with and connections to nature, and also makes a contribution to the environment.

The immediate experience of the communal landscape space is visual, auditory and tactile. Outdoor amenities such as swimming pools, children's playgrounds, gardens, and seating areas are usually integrated into the landscape design. When the design of such spaces takes on forms, textures and materials derived from nature or natural elements, the result is the creation of spaces that strengthen users' connections with nature.

The visual experience of the landscape is from near and also from a bird's eye view, as the high-density developments have residential units on high floors with views down to the landscape space below. The use of sinuous, organic forms in the design of landscape elements mimic forms found in nature, such as curved lines of rivers, waves, branches or leaves, enhancing the visual experience both from near and afar. Overall patterns of these curved lines weaving across the built landscape, intersecting with each other, giving rise to spaces in-between the curves that are bursting with colours of blue and green, provide arresting images reminiscent of nature. At times, the straight lines of the architecture or of a landscape element such as a walkway cut across the curves and organic forms, creating contrasts that heighten the sensory experience of the landscape.

The auditory experience is contributed by features in the built landscape that create sounds of nature, such as a waterfall, a bubbling creek, a water spring. Other sounds of nature are borrowed from fauna such as birds and insects that are attracted to the natural plant elements in the landscape design.

The tactile experience of the landscape comes from the use of natural elements or materials. Colours of blue and green are formed by the natural elements of water in the pools and planting that surround the outdoor amenities and spaces. The use of natural materials such as granite and timber, add to the tactile experience of the users.
Keywords: High Density; Urban; Landscape Design

1. Case Study No. 1 – The Panorama

In the Panorama project at Ang Mo Kio, the design and layout for the landscape gardens was conceived as a lush tropical garden environment that corresponds to the site. Inspired by the naturalistic contours of the site, the genesis of the concept is an abstraction and manipulation of the notion of contours, the landscape design has 'ribbons' of walkways and decks weaving across the central open space between the residential blocks, in both horizontal and vertical dimensions, creating a multi-layered and pluralistic environment, linking together different amenity zones.

Fig 1. Aerial overview of the sinuous landscape at The Panorama. Photo by Robert Such; Robert Such Photography.

The planning of the building blocks around the perimeter of the site, surrounding a large central landscape space, provided the opportunity for aerial views of the overall landscape from the residential units at various levels and also from the roof terraces of each block.

Fig 2. Night aerial overview of sinuous landscape at The Panorama. Photo by Takeo Sugamata; SWITCH.

The sinuous lines of the landscape weave across the site like ribbons, gradually flowing up and down along and across the center of the open space. The lines take on a 3-dimensional form, with a tree-top wall sweeping across the landscape, over pools, walkways, a playground, and lush planting beds, providing a varied experience of walking across these elements at different heights. The spaces between the lines are filled with a soothing composition of colours from natural elements of water (blue), planting (green), timber deck (brown), granite stones (yellow and gray), offering a rich visual experience.

Fig 3. Sinuous lines at landscape flow up and down. Photo by Robert Such; Robert Such Photography.

Fig 4. Lines take on a 3-dimensional form – a tree-top walk sweeps across, over a playground. Photo by Author; Yeo Seow Nan.

Fig 5. Organic forms expressed at an intimate level, with curved benches rising out of the floor. Photo by Author; Yeo Seow Nan.

The organic forms derived from nature are also expressed at a more intimate level, in a lookout deck with a stretched canopy, a mesh walkway that weaves between trees in a curvilinear form, down to even smaller details such as the curved benches that rises out of the floor at the roof terrace.

Fig 6. A mesh walkway weaves between trees in curvilinear form. Photo by Takeo Sugamata; SWITCH

The gentle bubbling of extensive pools in the central landscape space provides a calming auditory experience. A curved waterwall cascading from the ground level down the basement drop-off area creates soothing waterfall sounds that mask vehicular noises. Quiet reflective pools surround the drop-off area.

The tactile experience is crafted with a careful choice of materials. The lightness of the mesh railing of the treetop walk allowed users to feel close to the surrounding elements, and at the same time, fulfill authority–specified safety requirements. The detail of the mesh selected, weaving of metal in ribbon form, is consistent with the overall landscape form. Natural timber was selected for the main pool deck areas, o outdoor dining spaces, lookout decks at the ground level and roof terraces, to provide a softer tactile experience as these are activity spaces where users spend more time, compared to circulation spaces finished with the harder granite material.

Fig 7. A curved waterwall cascades from ground level down to the basement drop-off area. Photo by Robert Such; Robert Such Photography

The landscape area within the development is extensive, covering 75% of the site area. Half of this landscape area is green, where a large variety of plant species (around 25 different trees species, and 70 shrub species) were used to increase the biodiversity of the site.

2. Case Study No. 2 – Helios Residences

The landscape design for the Helios Residences is composed of a series of garden terraces with water elements that negotiate the vast level differences of the site. Each of the garden terraces has different water elements to create a unique spatial character and provide a soothing auditory experience throughout the landscape.

Amorphous shapes suggestive of natural forms, are used in landscape elements at the different terraces, as planters, timber decks, skylights in an overhead pool and a large reflective pool in the middle of the drop-off plaza.

Fig 8. Amorphous shapes used in a timber deck. Photo by John Gollings; John Gollings Photography

Nature seemed to take over the architecture in this development, where climber plants scale up the façade of the building, cling on to and wrap around columns at the 1st storey terrace, transform an entrance wall to soft green and turn into a thick green hedge wall around the tennis court.

Fig 9. Climber plants wrap around the façade of the building. Photo by John Gollings; John Gollings Photography

Fig 10. Nature takes over the architecture, with climber plants scaling up the building. Photo by Goh Weixiang; STX Landscape Architects

2.1. Central Waterwall and Urban Forest of trees

The overall organization and composition of the landscape is based on a central waterwall along Cairnhill Circle road. The dramatic 6m high waterwall has water gently rippling down its surface and it drops to 9m and subsequently 12m as the site levels drop. Water from the waterwall flows down into a continuous base reflecting pool, which wraps around the entire length of the ground storey lobby and landscape terrace.

The water level is the same as the lobby floor level, making the pathways and lift lobbies appear to be floating on the surrounding water body.

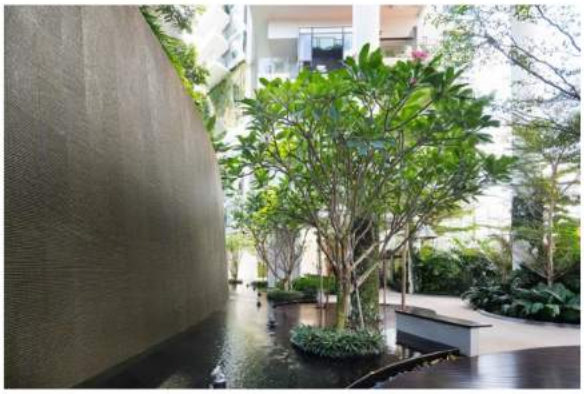

Fig 11. Dramatic waterwall with water gently rippling down into a base reflective pool that wraps around the ground floor lobby and landscape terrace. Photo by John Gollings; John Gollings Photography

The landscape terrace at the 1st storey is based on the concept of an urban forest of trees. Trees extend out of the terrace among columns covered with the *Ficus pumila* climber.

Fig 12. Nature takes over architecture with climber plants scaling up the building columns. Photo by John Gollings; John Gollings Photography

Amorphous-shaped planters are located in the reflecting pool, and repeated in the timber deck areas, creating various pockets of spaces for activity, linked by a sinuous pathway and the surrounding water body.

Overhead, an amorphous-shaped skylight hovers from the pool above the terrace. The terrace links to the Multi-Function Room Terrace at a lower level. At the Multi-

Function Room level, there is a balcony overlooking a reflecting pool and surrounded by waterwalls.

There is a flight of stairs leading down to an open-to-sky timber deck, which serve as a BBQ area. A green mesh wall with *Thunbergia grandiflora* climbers terminates the axis of the central water wall. Beyond this green wall is the tennis court.

Fig 13. An urban forest of trees reaches out from the 1st storey landscape terrace to the cantilevered pool overhead. An amorphous-shaped skylight frames a piece of the sky. Photo by John Gollings; John Gollings Photography

Fig 14. Nature takes over architecture, with creeper plants cascading down a high wall on one side and creeper plants forming a thick green wall around the tennis court. Photo by John Gollings; John Gollings Photography

2.2. Cairnhill Road Entrance

At Cairnhill Road, small side gate entrance is framed by walls fully covered by the *Ficus pumila* climber, like an entrance to a secret garden. After the green wall is a still reflecting pool framed by green hedges. A path leads across the reflecting pool, through a green veil of vines planted on vertical cables, into the lift lobby.

The waterfeature at this level symbolically connects to the central waterwall and reflecting pools at the ground storey.

Fig 15. Entrance to a secret garden - climber plants cover a low entrance wall. Photo by Author; Sherman Stave

2.3. Cairnhill Circle Main Entrance Waterwall

The main entrance is approached along Cairnhill Circle road. Along the main approach drive is a long waterwall and reflecting pool with a row of bubbling water jets, which provides a backdrop for the entrance signage, which is placed in front of it. A row of palms run parallel to the waterwall.

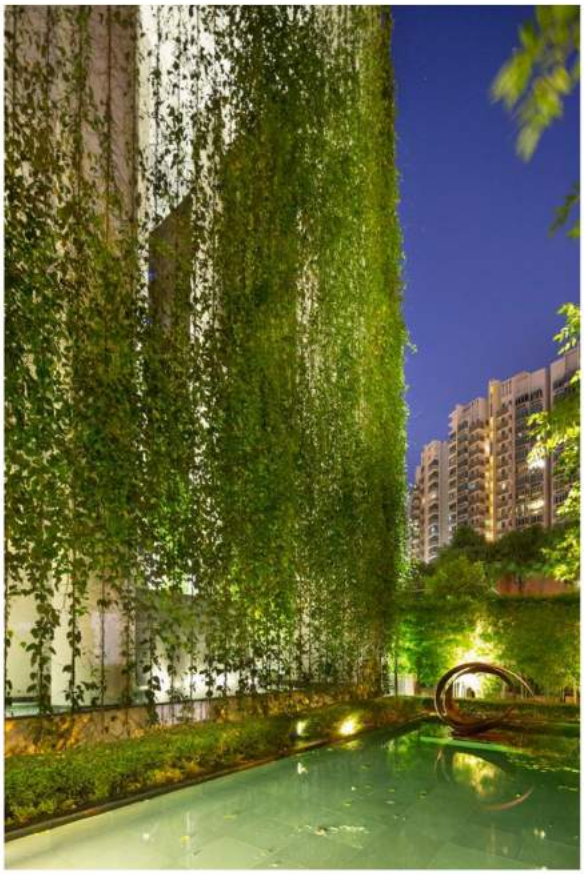

Fig 16. A still reflective pool is framed by hedges and a green veil of climber plants. Photo by John Gollings; John Gollings Photography

2.4. Green Trellis at Main Entrance

The green trellis is similar in character to the vertical vine cables forming the green skirt of the buildings. It is composed of a series of 4.5m high steel fins along the boundary wall. The steel tension cables span across the driveway and are spaced at 500mm apart. The trellis provides a veil of greenery yet maintains a sense of openness with the sky.

Fig 17. A green trellis provides a veil yet maintains a sense of openness with the sky. Photo by John Gollings; John Gollings Photography

2.5. Drop-off Plaza

There is a large amorphous shaped reflecting pool in the center of the drop-off plaza. The pool has similar amorphous shaped planters within it. These amorphous shaped planters are a repeated pattern in the reflecting pool under the towers.

Fig 18. An amorphous-shaped reflecting pool with amorphous-shaped planters marks the drop-off plaza. Photo by John Gollings; John Gollings Photography

The pool cascades down a 1.3m water wall along the driveway ramp leading up from the

basement. At the lower level driveway drop off lobby, the space is defined by a waterwall that serves to terminate the axis of approach from the main entrance.

2.6. Sky Terrace Landscape

At the 4th storey Sky Terrace, pockets of deck spaces below the building overhand are wrapped around with a green veil, providing cool spaces for various activities – children's playground, children's pool and seating spaces. Waterwalls, water veils and bubbling waterfeatures animate these spaces.

The intimate pocket decks lead on to an infinity swimming pool that opens up to vast views of the surrounding skyline.

Fig 19. An infinity pool opens up to the vast views of the surrounding skyline. Photo by John Gollings; John Gollings Photography

3. Case Study No. 2 – Belle Vue Residences

The Belle Vue Residences is based on an archipelago concept where buildings and islands of amenities 'float' in a water lagoon.

The landscape of the Belle Vue Residences is a contemporary and exclusive setting for living in an urban forest. The unique landscape feature is its seamless fusion of nature and managed water to create a central "lagoon" around which the buildings metaphorically branch out. Units at ground floor enjoy water and planting just outside their living rooms or bedrooms. Reflecting images of nature and sky on the water surface create a calm, idyllic setting.

Fig 20. Overview of the landscape at Belle Vue Residences, based on an archipelago concept. Photo by John Gollings; John Gollings Photography

The lagoon consists of several separate water bodies that appear visually as one main water element. The water bodies making up the "lagoon" are: a 30m lap swimming pool, Jacuzzi area, aquatic pond and mirror reflecting pools.

Fig 21. Communal landscape appears as extension of private enclosed spaces, with natural planting or water edges. Photo by John Gollings; John Gollings Photography

Naturalistic forms flow through the central landscape space, with amorphous-shaped islands scattered on the "lagoon" and have planting that drapes over the water

edges to enhance the naturalistic impressions. The largest island contains the children's pool and playground.

The strong relationship of indoor & outdoor spaces for the units are reinforced in the form of private enclosed spaces and communal landscape islands which appear as extensions of indoor spaces with natural planting / water edges. The strong indoor & outdoor relationship is also reflected in the clubhouse design, where amenities and landscape are seamlessly integrated within a tropical garden setting.

Pedestrian pathways are formed by broad sweeping arcs that correspond to the flow of the architecture. The paths connect major spaces such as drop-offs, common lift lobbies and activity areas. Where the arcs intersect, they form punctuations in the landscape addressed by specimen plantings.

Fig 22. Naturalistic forms flow through the central landscape space, with amorphous-shaped islands, scattered on the water "lagoon". Photo by John Gollings; John Gollings Photography

The landscape area of the site is extensive and covered around 65% of the site, including both hardscape and softscape elements. Around 30% of the site area is green and planted with a large variety of plants. In consideration of several shady pockets in the development, a wide variety of lush, shade-tolerant plants were selected that can thrive in such an environment and provide sufficient screening between public and private spaces.

Fig 23. A wide variety of lush, shape-tolerant plants provide screening between public and private spaces. Photo by John Gollings; John Gollings Photography.

In all, the 3 selected projects have different characters and all sought to engage the human senses to nature, with a range of visual, auditory or tactile experiences. The presence of water, the use of biomorphic forms and patterns, a dialogue of complexity and order, come together to create a sense of Living in Sculptured Nature