



Kallang River @ Bishan-Ang Mo Kio Park

Integrating River and Park in an Urban World

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The simple act of getting close to the water and experiencing its natural rhythms and beauty can have a profound influence on the community's perception and sense of stewardship of its surrounding environment.

Cities are growing, the urban population is increasing, and space is becoming scarcer—all at an exponential rate.

Given this context, what is the role of nature within the city? How can infrastructure be integrated into public open spaces? How can engineering progressively adapt itself to facilitate such an integration?

These are questions that all cities should consider. They are also questions that were raised very early on, and then constantly revisited, in the process of redesigning Kallang River along Bishan-Ang Mo Kio Park.

Restoring the Concrete Canal

In the 1970s, Singapore embarked on a wide-scale conversion of its natural water systems into concrete culverts and drainage channels, in an effort to facilitate the efficient conveyance of rainwater and prevent flooding. It was also during this time that Kallang River was turned into a concrete canal. While such hard engineering has served the country well thus far, recent knowledge and technology have presented a real opportunity for adopting interdisciplinary thinking and integrated solutions that could simultaneously address the multifaceted challenges and needs of dealing with water in an urban environment.

In 2006, Singapore's national water agency, Public Utilities Board (PUB), initiated the Active, Beautiful and Clean (ABC) Waters Programme to transform the country's network of utilitarian drains, canals, and reservoirs into vibrant and beautiful streams, rivers, and lakes, seamlessly integrated with their adjacent land developments. This creates new spaces close to water for recreation and community bonding, and will turn Singapore into a vibrant city of gardens and water.

A major flagship project under the programme, the Kallang River @ Bishan-Ang Mo Kio Park ABC Waters project demonstrates the exciting changes that such a revitalisation could bring to both the environment and the communities around the park. It involved transforming the Kallang River that ran in a concrete canal along the edge of Bishan-Ang Mo Kio Park into a naturalised river that is seamlessly integrated within the park. Facilities in the park were also upgraded as part of the project. A joint collaboration between PUB and National Parks Board (NParks), it illustrates how government agencies with different disciplines (for example, parks and water) can work together to meet the challenges and opportunities ahead of them.

Atelier Dreiseitl partnered with CH2M Hill to design the redevelopment of one of Singapore's biggest and most popular parks—Bishan-Ang Mo Kio Park. Together, they rigourously developed a holistic approach that not only meets the functional drainage requirements of the river, but also leverages on this integration of river and park to bring biodiversity back into the heart of this city and create open recreational spaces for the community. Singaporeans can now get up close to water at the park—to play, learn, and live with local flora and fauna right in their backyard.

While the park is located between the two neighbourhoods of Ang Mo Kio and Bishan, the former 2.7-kilometre-long concrete channel ran continuously along the southern edge of the park, segregating both sides through its entire length, save for defined points of crossing. Yet, one wonders how pleasant the sight of an endless homogeneous concrete channel is. Hence the park had always turned itself towards the north, separated from its southern edge and the community beyond.



On the other hand, the new three-kilometre-long sinuous natural river through the park, with its natural rock bed and vegetated banks, beckons the surrounding community to enter and engage it from all sides. Before the park was even officially opened, a voluntary group called Friends of Kallang River @ Bishan-Ang Mo Kio Park was initiated by the community to enjoy the park and actively serve the public, improving everyone's experience of the park. Among other activities, they organise group visits to share fun facts about the park with the community, patrol the park on weekends, and clean up the park quarterly.

The redeveloped 62-hectare-large park also boasts a variety of new amenities, such as themed playgrounds for children of all ages, fitness areas, restaurants, a new lookout point called "Recycle Hill" (where recycled concrete slabs taken from the demolished canal are stacked up to form a lookout point), and plenty of open green spaces that complement the natural wonder of an ecologically restored river. These amenities are located strategically at various points around the park to ensure that each neighbouring community would have a convenient yet unique outdoor recreational space within their proximity.

The river, however, is the highlight of this project. The simple act of getting close to the water and experiencing its natural rhythms and beauty can have a profound influence on the community's perception and sense of stewardship of its surrounding environment. It is very easy for a pure urbanite to regard water as a commodity, assumed and expected to always be readily available with the turn of a tap. Yet the connection to water within the natural context—the experience of it flowing between our fingers, splashing amidst the laughter of our children, mirroring the passing cloud, and cooling the breeze that sways the leaves above—reminds one that this element flowing from our taps is, in actuality, a source of life to be treasured and protected.

Soil Bioengineering Innovations

Soil bioengineering techniques were applied at Bishan-Ang Mo Kio Park for river embankment stabilisation. This refers to the combination of civil engineering design principles with plants and natural materials, such as rocks, which control erosion and slow-down the flow of water. Unlike other technologies in which plants play an aesthetic role, plants have an important structural component in soil bioengineering—their roots help stabilise the riverbanks. As plants and natural materials are used, soil bioengineering structures are also characterised by their ability to evolve and adapt to their environment and constantly self-repair and grow. They are therefore significantly more cost-efficient to install and much more sustainable and economically viable to maintain than hard, concrete structures in the long term.

Ecology has been another key priority from the get-go of the design process, especially since the geographical context of Bishan-Ang Mo Kio Park has endowed it with a fantastic potential for biodiversity. The naturalised river teems with life, as the use of soil bioengineering techniques has created a huge variety of microhabitats, which not only increase biodiversity but also ensure the resilience of the species within the park, thus ensuring their long-term ability to survive.

The Malay Archipelago is one of the world's greatest biodiversity hotspots (second only to the Amazon) and the tropical rainforest climate is home to an abundance of lush vegetation. In addition, Singapore lies within the Asian-Australasian Flyway, so the park can expect to receive some special migratory bird visitors. A few surprise visitors have already been spotted, including the Zanzibar Red Bishop, native to Africa, the Spotted Wood Owl, native to the jungle forest in Indonesia, the Long Tailed Parakeet, native to the Andaman Islands, and the Orange Cheeked Waxbills, native to western and central Africa. Birds that are seldom seen in a high-density urban neighbourhood (such as



2. New bridges across the river stitch both sides of the park together.

3. The re-naturalised riverbanks double up as usable space during dry weather.

4. The concrete channel prior to its re-naturalisation, typical of many canals around Singapore.



In a heavy downpour, however, the park land that is next to the river doubles up as a conveyance channel, carrying the water downstream.

the purple herons, munias, and water hens) have also been spotted (and even roosting) among the new vegetation. The ecology of the site has been monitored throughout the construction process and it is estimated that biodiversity has increased by 30 percent with the completion of the project.

This is the first river naturalisation project in the tropics to incorporate soil bioengineering techniques to stabilise the riverbanks, protect them from erosion, and provide habitats for the flora and fauna, and it will serve to be a vital reference source for future projects in the region.

In 2009, a test bed was constructed, testing about 10 different soil bioengineering techniques and a wide variety of native plant species along a length of 60 metres at one of the side drains in the park. This test bed was used to optimise the construction methods and refine the selection of appropriate techniques and plants. Seven of these techniques were then selected for use along the main river. These include fascines, riprap with cuttings, geotextile-wrapped soil-lifts, brush mattresses with fascines, reed rolls, gabions, and geotextile with plantings.

A hydraulic model of the planned river was also used to examine and understand the dynamics of the river, and explore the possible variations of river design. This facilitated the identification of key locations where the velocity of water is higher and a higher degree of erosion control is needed, so designers could allocate more robust plant species to these areas and apply softer plantings of lower density where there are larger areas of gently sloping banks.

In dry weather, these gentle riverbanks provide generous open spaces for recreational activities, such as kite flying, running, and picnicking. In a heavy downpour, however, the park land that is next to the river

doubles up as a conveyance channel, carrying the water downstream. The alignment of the newly created river channel also integrated meander bends and varying widths to create diverse flow patterns, which are characteristic of natural river systems and create ecologically valuable, natural, and diverse habitats for increase of biodiversity. Learning from nature's gracious ways of adapting spaces for multiple functions is undoubtedly one of the keys to the effective design of open spaces within an urban context.

In addition, the park presented an opportunity for the installation of the first cleansing biotope in Singapore, which offers effective water treatment while maintaining a natural and beautiful environment. Cleansing biotopes are natural cleansing systems that consist of carefully selected plants that help cleanse the water by filtering pollutants and absorbing nutrients. Located upstream in the park, the cleansing biotope helps maintain the water quality of the ponds without the use of chemicals. The new water playground at Bishan-Ang Mo Kio Park is supplied by cleansed pond water that has been filtered through the cleansing biotope as well as an ultraviolet (UV) treatment.

Without the willingness to test, improve, and adapt new knowledge, one would not be able to stride boldly towards a vision—of a city park that can function simultaneously as an ecological, hydrological, and recreational infrastructure; of conveying water from an urban catchment; of creating a space in the heart of urbanity where man can observe, preserve, and nurture wildlife. It is hardly an exaggeration to say that this project will change the lives of Singaporeans. Childhoods will be marked with weekends of wading wet feet. Environmentalists will speak about school excursions to the park in their earlier years. But the Kallang River @ Bishan-Ang Mo Kio Park ABC Waters project shall, above all, be remembered as a project that stretches our imaginations towards the reality of a smart, beautiful, and liveable city. 

5. Vegetated swales in the park have replaced concrete drains.

6. The pink turret at the Adventure Playground.

7. The cleansing biotope cleanses water from the pond and circulates clean water to the Water Playground.

8. The Water Playground promotes interactive play with water and other children.



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9. Overview of the cleansing biotope at the park.





10. Aerial view of the bridge across the restored river.

11, 12. The project has created a recreational space for residents, where they can fish and exercise.