

Environmental Management

Our management philosophy puts the environment in front of all project activities. We systematically manage environmental impacts of our projects by carrying out our operations in an environmentally responsible manner.



The Brothers Marine Park (BMP)

Background

According to the Environmental Impact Assessment Report and the Environmental Permit of the Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities project, we are required to designate a new marine park in the vicinity of The Brothers for conservation of Chinese White Dolphins (CWD) habitats and fisheries enhancement.

Development and Implementation of the BMP

The preliminary study for the marine park was completed and the preliminary extent of the marine park was established in 2011. We commenced the detailed study in August 2013 to establish the boundary and management plan for the BMP, which was completed in August 2016.



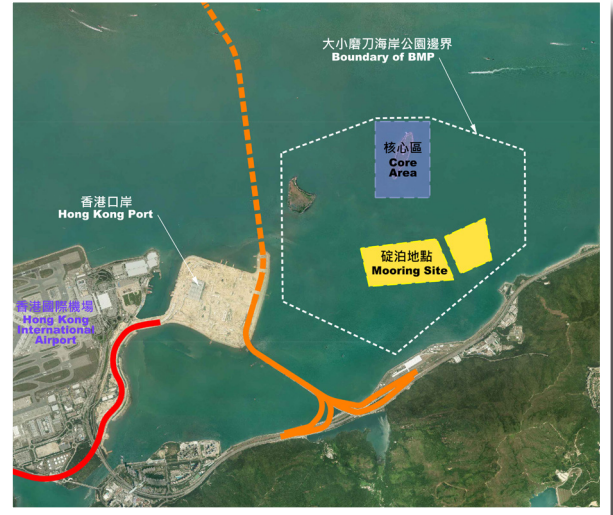
Chinese White Dolphin - born in grey and lighten to pink colour towards adult stage

Two stages of public consultation with relevant stakeholders on the proposed boundary and management plan of the BMP were conducted in 2014 and 2015 respectively. The consulted parties included fishermen organisations, marine operators, green groups, eco-tour operators, relevant District Councils, the Marine Parks Committee of the Country and Marine Parks Board and the Capture Fisheries Subcommittee of the Advisory Committee on Agriculture and Fisheries.

With due consideration of the views and comments received from stakeholders in the two stages of public consultation, the boundary and the management plan of the BMP had been finalised. In accordance with the Marine Parks Ordinance (Chapter 476), the designation order of the BMP was gazetted on 4 November 2016 and the order was effective on 30 December 2016.

Boundary and Management Plan of the BMP

The proposed boundary of the BMP was established based on a systematic and scientific dolphin habitat rating system approach which assesses the important CWD habitats around The Brothers. The BMP covers a sea area of about 970 ha. The management plan of the BMP was formulated by making reference to existing marine parks in Hong Kong. The management plan of the BMP includes zoning scheme which is adopted to offer appropriate protection of marine habitats and species within the marine park, whilst minimising conflicting uses of different marine park users. The designation of the BMP and the implementation of the management plan greatly help protecting the CWD and other marine life in the area. It also brings long-term improvement to the local marine environment. According to the Marine Parks and Marine Reserves Regulation (Chapter 476A), no person shall operate a power-driven vessel at a speed exceeding 10 knots within the BMP. Activity for the purpose of, or incidental to, any business is not allowed in the BMP except with a permit from the Agriculture, Fisheries and Conservation Department (AFCD). In addition, fishing is prohibited within the BMP unless marine park fishing permits are granted by AFCD. Information boards and notices are placed at suitable locations advising visitors about the prohibitions. Visitors are advised to keep the BMP clean and not to throw litter in the BMP.



Location plan of The Brothers Marine Park



Special features of the BMP

Zoning of the BMP

A Core Area and two Mooring Sites are zoned within the BMP.

Core Area

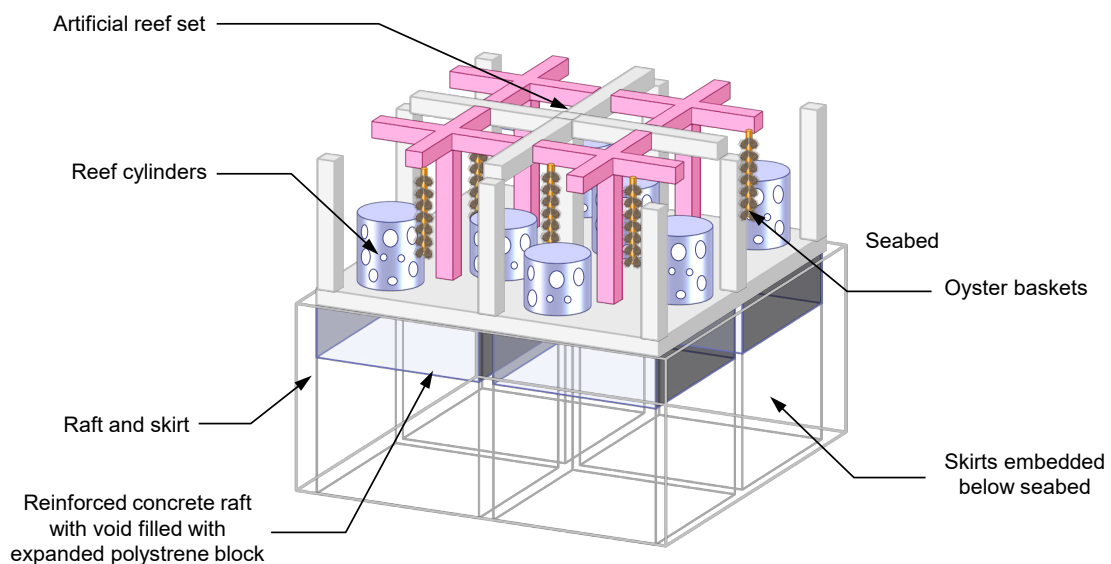
The designated Core Area, which is about 80 ha, provides the highest level of protection to fisheries resources therein. Fishing activities are not permitted within the Core Area, even for fishermen possessing marine park fishing permits. According to the fisheries resources survey completed for this project, the waters around Siu Mo To supports relatively high abundance and biomass of fisheries resources, and demonstrates the need to offer protection to the area. By imposing stringent restriction, the Core Area enhances fisheries resources and helps rehabilitate fish stocks so as to provide overall beneficial effects to the ecosystem.

Mooring Sites

Vessel mooring within the Mooring Sites, which is about 109 ha, is allowed. Marine operators need to observe and comply with the Marine Parks and Marine Reserves Regulation (Chapter 476A). For example, no person shall collect any marine life and resources in/from a marine park, and shall not pollute water of a marine park in any way. Hence, in-taking of sea water as ballast water within the Mooring Sites is prohibited, and shipboard operations shall not cause any water pollution to the BMP.

Marine Ecological Enhancement Measures

We plan to deploy over 10,000 m³ of artificial reefs (ARs) and release fish fry in the Core Area of the BMP. These measures would provide shelters for adult and juvenile fish, and further enhance the biodiversity conservation and fisheries resources in neighboring water.



Proposed design of artificial reefs

Implementation Programme of Artificial Reefs

The proposed deployment of the ARs was gazetted under the Foreshore and Sea-bed (Reclamation) Ordinance (Chapter 127) and approved in end 2018. The tendering for the deployment of ARs was gazetted in September 2019 and the works of the deployment of ARs are expected to complete by 2021. The release of fish fry will be carried out in the Core Area about one year after completion of the deployment of the ARs.

The Central Kowloon Route (CKR)

The CKR is a 4.7 km long dual 3-lane trunk road comprising a 3.9 km long tunnel linking Yau Ma Tei Interchange with the Kai Tak Interchange and the road network of Kowloon Bay. The construction of the CKR is in full swing with works at Kai Tak, Kowloon Bay, Ma Tau Kok, Ho Man Tin and Yau Ma Tei.



A construction site of the CKR

Noise Mitigation Measures for Construction of Ho Man Tin Access Shaft

The Ho Man Tin Access Shaft is a 21 m diameter and 107 m deep vertical shaft for the transportation of plant/materials and mucking out the excavated materials from the tunnel. The construction of the shaft requires the removal of over 19,000 m³ of rock. Blasting method has been adopted for rock excavation in the shaft. To mitigate the noise impact arising from the blasting operation, a noise enclosure with a surface area of about 630 m² has been constructed to fully cover the shaft opening with ancillary facilities such as air ventilation system, generator and access platforms.

The noise enclosure is a composite structure comprising 3 m high reinforced concrete side walls and steel roof panels. Concrete is chosen as the material of the side walls because of its good noise attenuation performance. Steel panels covered by acoustic material are installed as the roof of the noise enclosure. With the provision of the noise enclosure, it is anticipated to achieve a reduction in noise level by about 46 dB(A) at the nearby noise sensitive receivers.

Apart from mitigating the noise nuisance, the enclosure also confines the dust generated from the blasting operations.



Noise enclosure at Ho Man Tin construction site

Recycling Yard Waste for Sustainable Development

Under the CKR, trees and plants will be preserved or transplanted as far as possible. For the inevitable tree felling, a pilot scheme on producing wood chips is implemented for reusing the yard waste thus generated. Yard waste will be collected and shredded into small chips and delivered to Environmental Protection Department’s Organic Resources Recovery Centre. These wood chips will be used as bulking agent for the biological processes of recycling food waste into useful products such as biogas and compost.



Cutting tree trunk into tree log

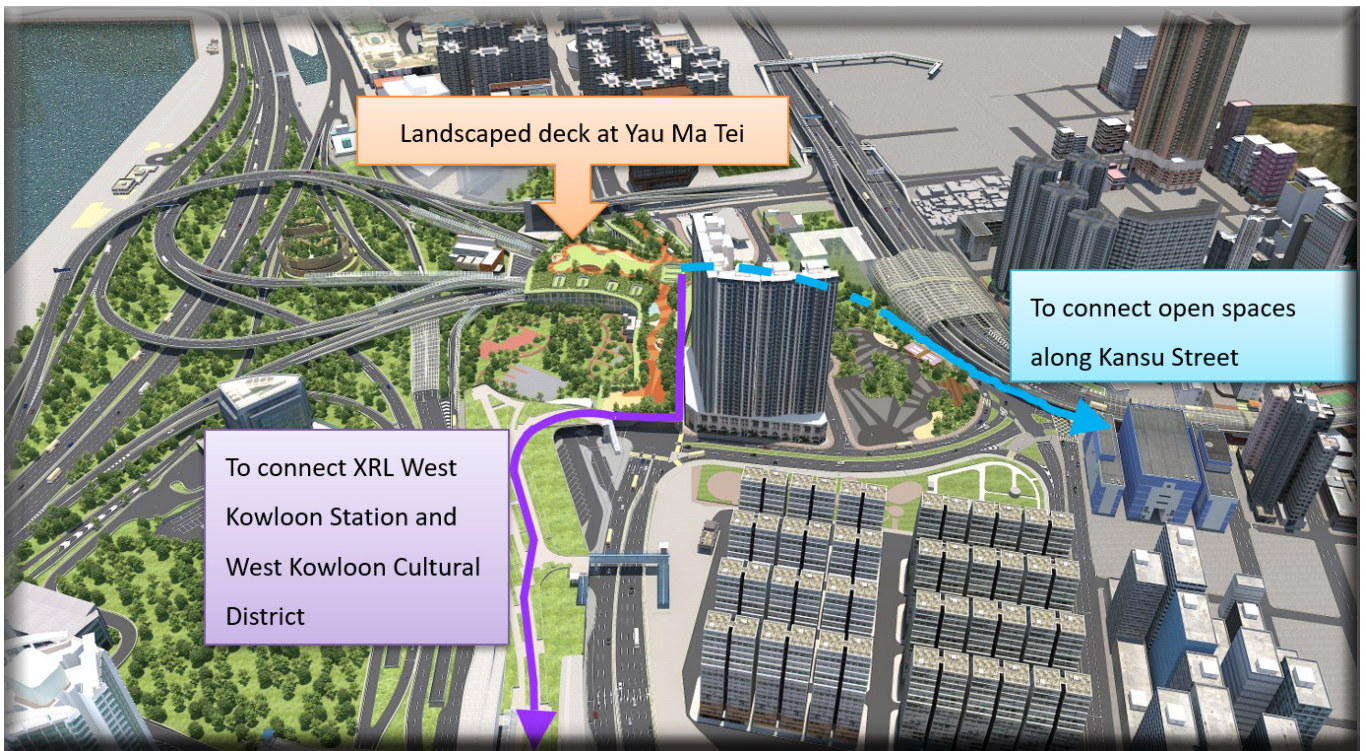


Shredding the tree logs into wood chips

Innovative Design for the Landscaped Deck, Open Spaces and Promenade

With the mainlines of the CKR in tunnels, its overall visual impact is minimal. We take the opportunity of constructing the tunnel portals at both ends of the CKR tunnel to improve the environment through greening, provision of amenity spaces and enhancing connectivity.

At the Yau Ma Tei side, we will provide landscaped open spaces of about 14,000 m² along Kansu Street and west of the junction between Yan Cheung Road and Ferry Street. Adjacent to the Yan Cheung Road open space a landscaped deck of about 20,000 m², equivalent to about 3 full-size soccer pitches, will be constructed near the western tunnel portal. Apart from providing a pleasant resting area, the deck will link with the landscaped deck of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) public transport interchange to serve as a grade-separated pedestrian route between Yau Ma Tei and the XRL West Kowloon Station and further south to the West Kowloon Cultural District.



Conceptual image of western portal of the CKR upon completion

At the Ma Tau Kok side, we will construct a promenade of about 6,400 m² for the public to enjoy the harbourfront and provide connectivity to the Kai Tak District. A continuation of waterfront walk will be created with feature paving and amenity soft landscaping. Leisure facilities such as jogging track, pavilion and sitting-out area may also be provided.



Conceptual image of Ma Tau Kok waterfront promenade

Typical Environmental Measures Taken on Construction Sites

Air Quality Control



Set up full enclosure for controlling dusty activities



Suppress dust on haul road with water mist cannon



Monitor the use of Ultra Low Sulphur Diesel

Noise Mitigation



Erect acoustic fabric barriers along site boundary



Cover plant with acoustic fabric for noise mitigation



Use quality powered mechanical equipment to reduce noise impact

Water Pollution Control



Deploy silt curtains during marine works



Use wastewater treatment facilities



Implement water quality monitoring

Waste Management



Recycle and reuse materials for greening



Adopt recycling bins



Adopt food waste processor

Site Cleanliness



Wash wheels to reduce dust/dirt on public roads



Prevent mosquito breeding near construction site



Implement good housekeeping on site

Sustainable Measures



Use renewable energy in site office, lighting and mosquito killing devices for energy saving

Development of Environmentally Friendly Railway System

Railway is a safe, efficient and environmentally friendly mass public transportation carrier. The Government policy places emphasis on railway development as the backbone of public transport. We adhere to this policy and aim at planning and implementing the railway system to world-class standard.

Environmentally Friendly Measures for Shatin-to-Central Link

The Shatin-to-Central Link (SCL) is a 17 km strategic rail line connecting several existing lines. Tai Wai to Hung Hom section linking Tuen Mun and Ma On Shan, upon commissioning, will be named as “Tuen Ma Line”; and Hung Hom to Admiralty section as an extension of the existing “East Rail Line” to Hong Kong Island, will continue to adopt the existing name of “East Rail Line” for the entire railway line after its commissioning.

Since the commencement of construction works for SCL in 2012, the project team has been implementing various good practices on site in order to comply with statutory environmental requirements and minimise potential environmental impacts on the community. Effective mitigation measures and initiatives for environmental protection and enhancement have been put in place for continuous improvement.

Cultural Heritage in Sung Wong Toi Station

Following the completion of the archaeological field surveys in the area of Sung Wong Toi Station in 2014 and the completion of the post-excavation works such as artefacts processing and recording of archaeological finds, the display cabinets at the concourse level of Sung Wong Toi Station have been installed for the future display of suitable archaeological relics selected by the Antiquities and Monuments Office. With the arrangement, the cultural heritage in the vicinity could be preserved and the archaeological displays may also serve as art pieces in this railway station.



Conceptual image of Sung Wong Toi Station concourse area featured with display cabinets for archaeological relics

Energy Saving Initiatives

Different energy saving initiatives are implemented in various stations of SCL. With air-conditioning accounting for a significant share of energy consumption of a railway station, Sung Wong Toi Station and Kai Tak Station will be the first two railway stations in the territory employing the district cooling system (DCS) in lieu of traditional water-cooled air-conditioning system (WACS). The DCS is implemented by the Electrical and Mechanical Services Department and would serve both public and non-domestic private developments in Kai Tak Development. As compared with WACS, it is estimated that adopting DCS can consume 20% less energy while providing the same cooling capacity to a station. The cooling capacity is provided by DCS in an energy-efficiency manner in its primary network, and exchanged to the secondary network via a dedicated DCS substation within a railway station.



DCS substation in Kai Tak Station

For Hin Keng Station as an aboveground station, natural ventilation is adopted without air conditioning to reduce energy consumption. With solar gain reduced by the architectural fins on the building façade, natural cross ventilation with sufficient air movement is facilitated at the platform and concourse public area of Hin Keng Station through gaps of architectural fins on the eastern and western sides of building façades to achieve thermal comfort.

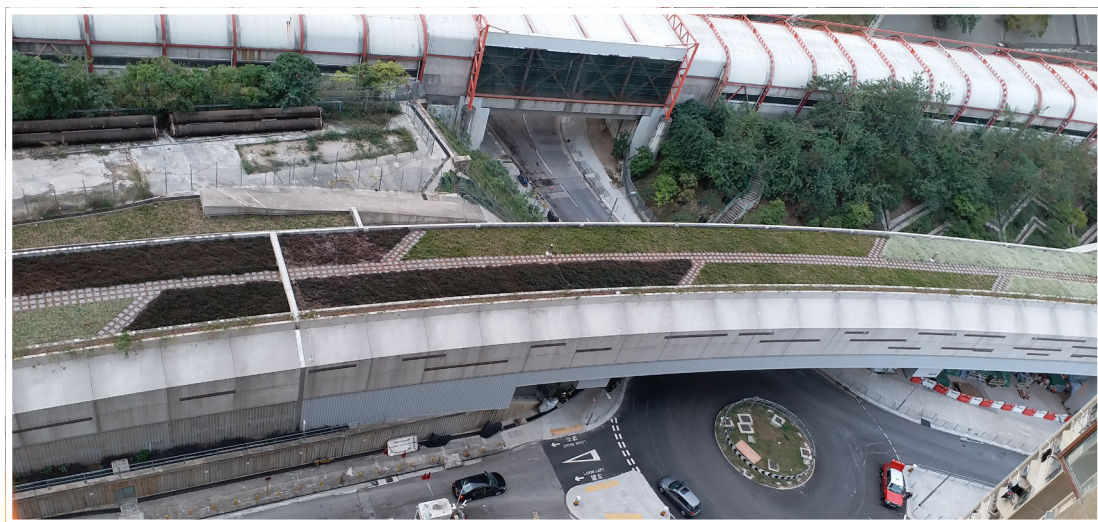


Natural ventilation design of Hin Keng Station

For building services design in SCL, energy efficient fluorescent light fittings, LED type light fittings and exit signs, variable speed chillers pumps and fresh water-cooled oil-free chiller pumps are adopted to achieve energy efficiency.

Greening Measures

SCL adopts the use of green roofs, vertical climbers and planting of shrubs as far as practicable for stations and viaduct structures, ventilation buildings and emergency access buildings to soften the solid building mass, and create an insulation layer to reduce heat gain in the internal area. About 6,000 m² of green roof has been provided. These measures enhance the landscape and visual quality of the areas and help blend the completed works into the surrounding environment to uplift the quality of the environment as well.



Green roof on viaduct between Hin Keng Station and the Lion Rock

Adopting New Technologies in Tree Management

Urban trees are important in mitigating air pollution, moderating urban heat island effect, and sequestering carbon. Trees provide habitats for fauna population in the man-made environment, and provide aesthetic and recreational benefits for city dwellers. But trees in the vicinity of densely populated metropolitan urban could be potentially hazardous if failure occurs. In addition, the severe hit to Hong Kong by Typhoon Mangkhut in September 2018 pointed to the need for timely update of tree inventory soon after disastrous incidents. Prompt updating of inventory enables quantitative evaluation of the damage and the formulation of remedial works. A system to timely monitor tree health and manage the tree inventory could help reduce the potential tree failure risk and enhance the urban greenery.

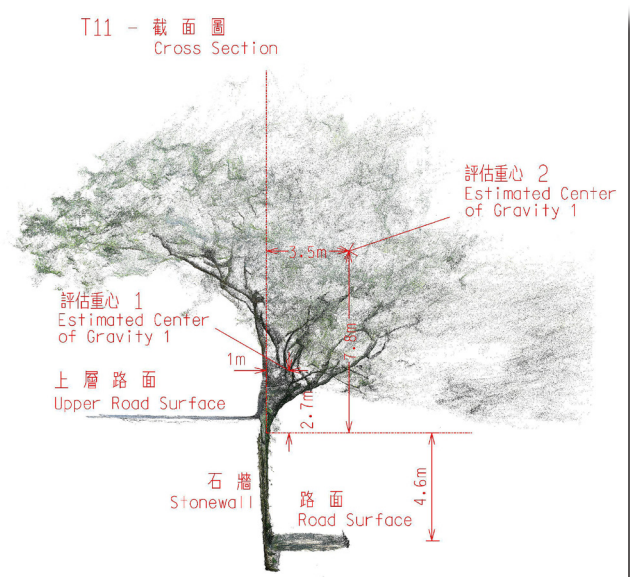
We maintain about 600,000 trees along expressways and on roadside slopes being maintained by the Highways Department all over the territories. Maintenance commitment is high due to extensive site coverage, diverse terrain types and accessibility difficulties. On-site inspection by tree specialists is labour intensive and time-consuming. Overall, the inspection results can only have limited capability of identifying trees that are under early stage of deterioration.



Mobile Mapping System

We have been adopting remote sensing technologies in vegetation maintenance for many years. Mobile Mapping System is being used as an asset management tool for trees along carriageway under our maintenance responsibility. Radio-frequency identification tags have been implanted on trees for site identification. In addition, 3D model of stonewall trees generated by close range photogrammetry technique is being used to draw up maintenance regime, such as measures to maintain structural balance and stability of these trees.

Detecting vegetation health condition by means of remote sensing technologies has been used overseas mainly on economic crops and afforestation. It has been proved to be an effective and low-cost approach. However, similar application in tree health monitoring in tropical and subtropical urban context is very limited. Riding on latest technological advancement, we are exploring the application of remote sensing technologies for efficient mapping of tree assets and monitoring changes in tree health over time.



Point cloud 3D image of a wall tree

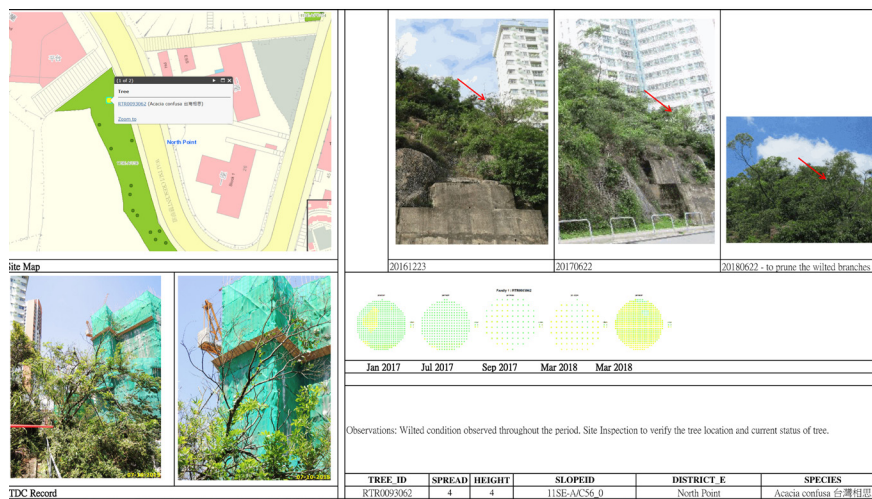
Studies on Remote Sensing Technology Application in Hong Kong

The essential data for tree management are tree location, size, species and health condition. We have initiated research studies with multispectral image, hyperspectral image and Light Detection and Ranging (LiDAR) technologies for acquiring data on tree health, species type, location and size respectively.

Multispectral Image - Vegetation Index for Tree Health

Surveillance of tree health with airborne multispectral image is derived from spectral response patterns of vegetation in the near-infrared and red portion of the solar light spectrum. The reflectance of light spectra changes with leaf cellular structure, chlorophyll content and other intrinsic factors such as plant species and season. Vegetation Index (VI) is generated by comparing the reflectance rate of tree crowns and has a high correlation with vegetation health and photosynthetic rate of trees. One of the advantages of VI is the ability to detect tree health deterioration before visible symptom, such as yellowing leaves, is apparent and hence could serve as an early tree health warning signal.

The VI measures tree health condition scientifically and quantitatively. With the build-up of VI records over the years, we could chart the changes in tree health derived from multispectral aerial images and generate useful information on species specific and site specific tree growth pattern. The information could contribute to formulation of a more effective maintenance schedule.

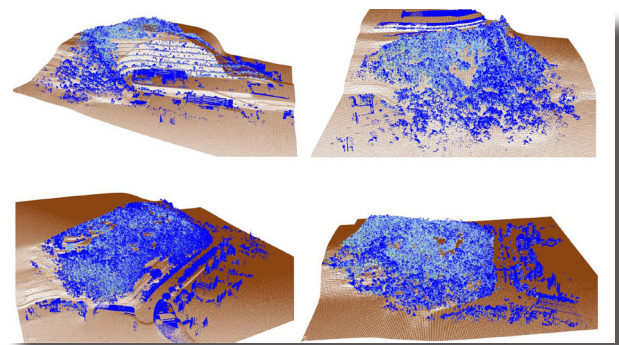


Multispectral images of sampled tree and the photo record showing correlation in tree health condition

LiDAR Technology - Measure Crown Dimension, Location and Diameter at Breast Height

Unlike other assets, tree will grow and hence regular updating of tree inventory is necessary. Tree attributes such as location, height, trunk and crown diameters, so far are mainly collected by ground survey method that are costly, labour intensive and time consuming. The coverage is also limited to some extent by accessibility.

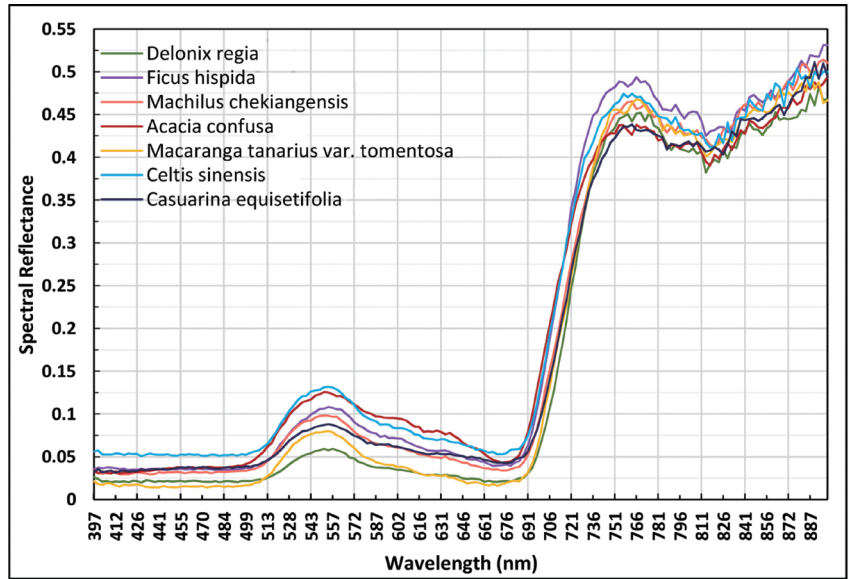
We are conducting a research on using Airborne LiDAR technology to acquire tree attributes over an extensive area. The major component of airborne LiDAR is made up of a laser scanner, a navigation system and a Global Positioning System carried out by a flying platform over the terrain. Georeferenced point cloud 3D images of trees will be formed for individual tree crown delineation and measurement.



Point cloud 3D image of trees on slopes

Hyperspectral Image - Tree Species Identification

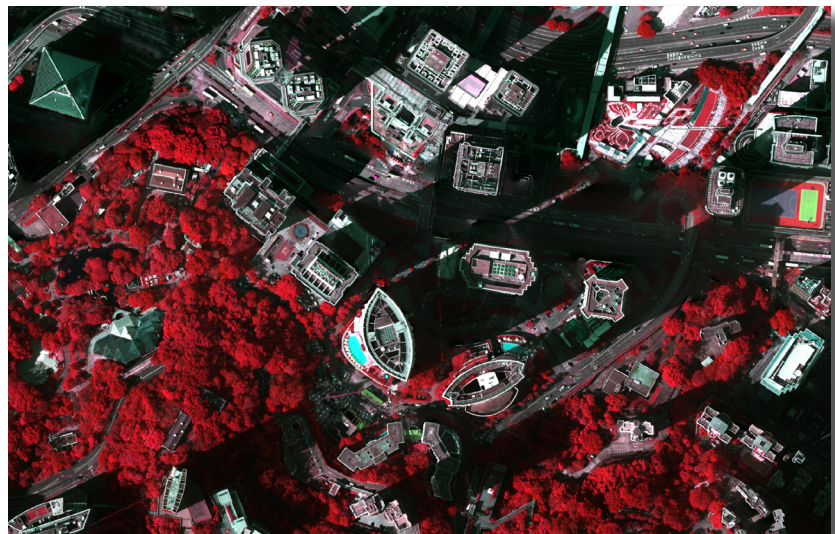
Hyperspectral imaging is a remote sensing technology that extracts hundreds of band signals in a spectrum, for instance, from visible light to far infrared. Researches indicate that each plant species exhibits specific spectral signature in hyperspectral image, which could serve as the finger print of plants in species identification. We have embarked on a pioneer study to explore the feasibility of creating a spectral library of major roadside tree species in Hong Kong. Hyperspectral image of selected tree species will be captured every 2 months in a year in order to study the seasonal effect on hyperspectral signature.



Hyperspectral profile of common roadside tree species

Technical Capability and Constraints of Remote Sensing Technologies

Remote sensing technologies have significant merits in monitoring tree health and upkeeping tree inventory as compared with the traditional on-site survey method in terms of fast response time, cost effectiveness, and advance alert on changes in trees health. Nevertheless, the challenge on applying these technologies in Hong Kong should not be underestimated. Hong Kong is unique in having trees growing in a metropolitan city amidst the compact skyscrapers. The shadow of high rise buildings and varying terrain coupled with closed and overlapping tree canopy imposed extreme technical difficulties in capturing quality data for analysis.



A false color image showing strong shadows cast from the tall buildings

On the other hand, while we are encouraged by the potential of remote sensing technologies in vegetation maintenance, we shall also be aware of the technological limitations such as the inability to detect structural stability of trees. Hence, regular tree inspections by specialists would still be required. But with the aid of remote sensing technologies, resources could be better focused on timely proactive actions on problematic trees.

Green Office Management

Resources Saving: Water, Paper and Waste Recycling

In support of the Government’s drive to save natural resources, we are committed to making every endeavour to make our green office management a greater success. In addition to energy saving as mentioned in the previous chapter titled Clear Air Charter, we have been making our best effort to save other resources.

Water Saving

To maximise water conservation, we have adopted the use of dual-flush toilets, automatic low flow water taps and sensor type urinals. These components can effectively control the duration of water flow and keep the water flow at low level.

Waste Recycling

We treasure waste with recycle value by taking the following measures over the years:

- put up green boxes to collect reusable envelopes and papers;
- collect computer printer toners and ink cartridges for refilling and recycling; and
- put up recycling boxes to collect used paper, CDs, plastic bottles, aluminium cans and rechargeable batteries for recycling.

Paper Saving

To align with the green office initiative, we would continue with the following measures on paper saving:

- minimise photocopying paper consumption;
- use both sides of paper for printing and photocopying;
- use the blank side of used paper for drafting/photocopying for internal document/ correspondence/fax document;
- use electronic means extensively for communication (for instance, use electronic files and keep the use of hard copies to the minimum);
- reuse envelopes and file covers;
- encourage the use of recycled paper; and
- exclude leader page for outgoing fax document.

In 2018, we consumed 19,265 reams of paper and 100% of which were recycled paper.

Auditing: Environmental and Carbon

Annual Environmental Audit

We conduct annual environmental audits in all 19 offices located in different premises with a view to maintaining the impetus of green measures in housekeeping. The objectives of conducting annual environmental audits are:

- to assess compliance with the green housekeeping guidelines;
- to identify non-compliance and recommend remedial actions;
- to promote good environmental management; and
- to increase staff awareness of green management and occupational safety and health initiatives.

Our offices have continued to comply with the green housekeeping guidelines. We have also taken the opportunity to share among the offices the green management best practices.

Carbon Audit

Carbon audit was conducted for Ho Man Tin Government Offices by the Building Management Office in 2018 to monitor the effectiveness of greenhouse gas emission reduction effort. The relevant data are being studied by Building Management Office.