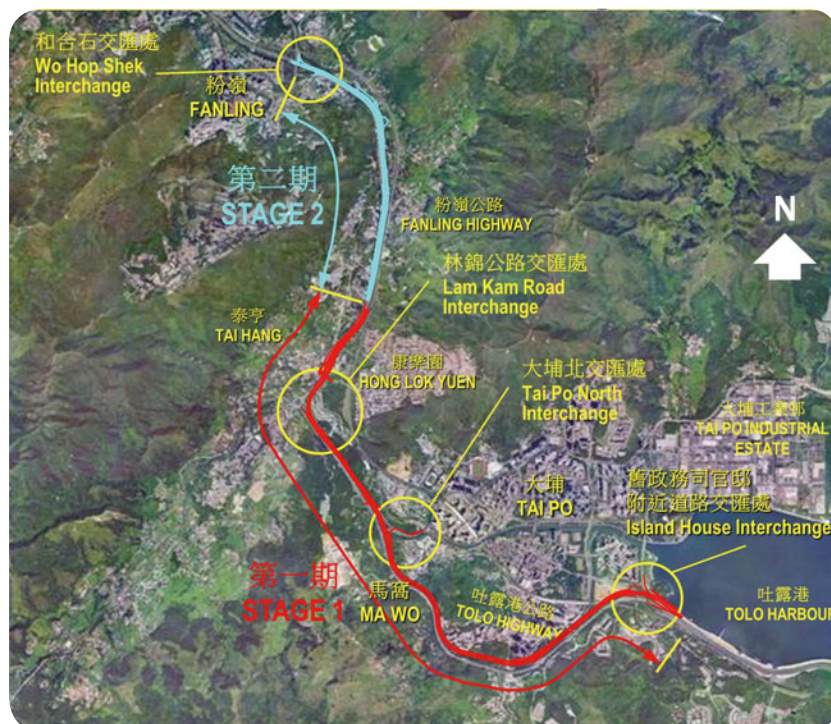


Protecting the environment during the execution of our works remains as one of our top commitments. We systematically manage impacts that our works may have on the environment and ensure that all our activities are carried out in an environmentally sustainable manner.

Environmental Management

Tree Preservation and Thematic Planting in the Widening of Tolo Highway /Fanling Highway between Island House Interchange and Fanling Project

Tolo Highway and Fanling Highway are expressways forming a vital section of Route 9. To alleviate the existing congestion problem and cater for future traffic demand, it has been proposed to widen the two existing highways from dual 3-lane to dual 4-lane carriageway. The road widening project is implemented in two stages. Stage 1 comprising the widening of the section of Tolo Highway/Fanling Highway between Island House Interchange and Tai Hang commenced in 2009 for completion in 2014. Stage 2 of the project includes widening the section of Fanling Highway between Tai Hang and Wo Hop Shek Interchange. It commenced in July 2013 and is expected to complete by 2018.



Tolo Highway/Fanling Highway widening Stage 1 and Stage 2 — Project Layout Plan

Tree Preservation and Reuse

During the planning of the Stage 1 road widening works, a number of measures have been adopted to mitigate the environmental impact of the project. They include preservation of existing trees as far as possible by such means like modification of the road alignment to minimize cutting of existing slopes with vegetation and forming of new slopes.

Of the 16,500 trees within the Stage 1 project boundary, about 4,500 trees have been preserved. The other affected trees are common species planted on the existing man-made slopes when Tolo Highway was constructed in the 1980s. Trees to be felled are either of invasive weedy species or assessed to have low post-transplantation survival rate, poor health or located on steep slopes, or impractical to prepare proper root balls. Felled species include *Acacia confusa*, *Leucaena leucocephala*, *Casuarina equisetifolia* and *Acacia auriculiformis*.



Preserved trees at the slope near King Nga Court

Five important trees have been identified. The species involved *Melaleuca quinquenervia*, *Celtis sinensis*, *Ficus microcarpa* and *Bombax ceiba*. Three of them have been retained and two removed due to poor health despite our extra efforts to preserve them.

Another measure adopted is to provide compensatory planting under the project. 4,000 heavy standard trees, 95,500 seedlings and 427,000 shrubs consisting of native species such as *Gordonia axillaris*, *Rhododendron simsii* and *Gardenia jasminoides* totaling about 6.1 ha of woodland planting area are being planted. The total number of trees to be planted exceeds the total number of trees affected.



Tree planting at the slope near Grand Dynasty View



Schefflera arboricola planted at the planter on Bridge 15A near Tai Po Tai Wo Road

To promote reuse, some of the felled tree trunks have been collected and used by the Agriculture, Fisheries and Conservation Department (AFCD) to produce country park facilities such as park furniture, fences, benches and steps. Also, some of the felled tree trunks have been chopped to small pieces to produce mulch and compost for beneficial uses.



Delivery of the felled tree trunks for reuse by AFCD as country park facilities



Production of mulch and compost

Thematic Planting

When planning compensatory tree planting for the project, designer has adopted a seasonal planting theme alongside the widened highways. The theme can create a unique experience for the drivers and provide a beautiful scenery for local residents. This includes planting various species of trees, which would blossom with different flower colours or change leaf colours during different seasons of the year.

The thematic trees planted include :

1. *Crateva unilocularis* with white yellow flowers in spring
2. *Jacaranda mimosifolia* with purple blue flowers in summer
3. *Koelreuteria bipinnata* with yellow flowers in late summer, red leaves in autumn
4. *Sapium sebiferum* with yellow and red leaves in winter



Crateva unilocularis



Jacaranda mimosifolia



Koelreuteria bipinnata



Sapium sebiferum

Typical Environmental Measures Taken in Construction Sites

Sustainable Energy and Energy Saving



Solar panel for carpark lighting



Provision of solar water heater

Tree Preservation and Greening



Proper protection of retained trees



Seminar from tree specialist

Dust Control



Erecting dust screen alongside works area



Covering the dusty materials with tarpaulin sheet

Noise Mitigation



Temporary noise barrier



Wrapping up the breaker tip with sound absorbing material

Waste Management



On site sorting of timber



Collecting and returning waste wooden pallets for reuse

Wastewater Management



Wastewater treatment facility



Deployment of wastewater treatment facility

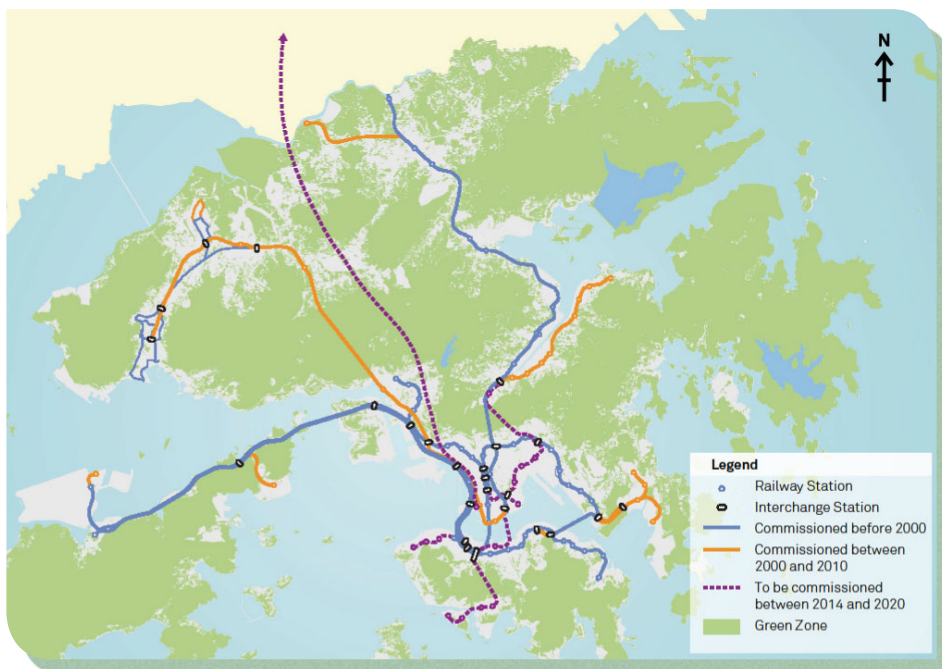
Development of Environmentally Friendly Railway System

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

Overview of Railway Development

The “Railway Development Strategy 2000” published in 2000 provided a blueprint for a new phase of railway development which included a number of new railway schemes to meet Hong Kong’s increasing transport needs in a sustainable manner. Less reliance on road-based transport will alleviate the pressure on transport systems, reduce overall tailpipe emission from vehicles and, in turn, lessen the impact on the environment.

Eight new railway lines, or extensions of existing lines, were commissioned between 2002 and 2009. Besides, five new railway lines are under construction, including the West Island Line, the South Island Line (East), the Kwun Tong Line Extension, the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link and the Shatin to Central Link.



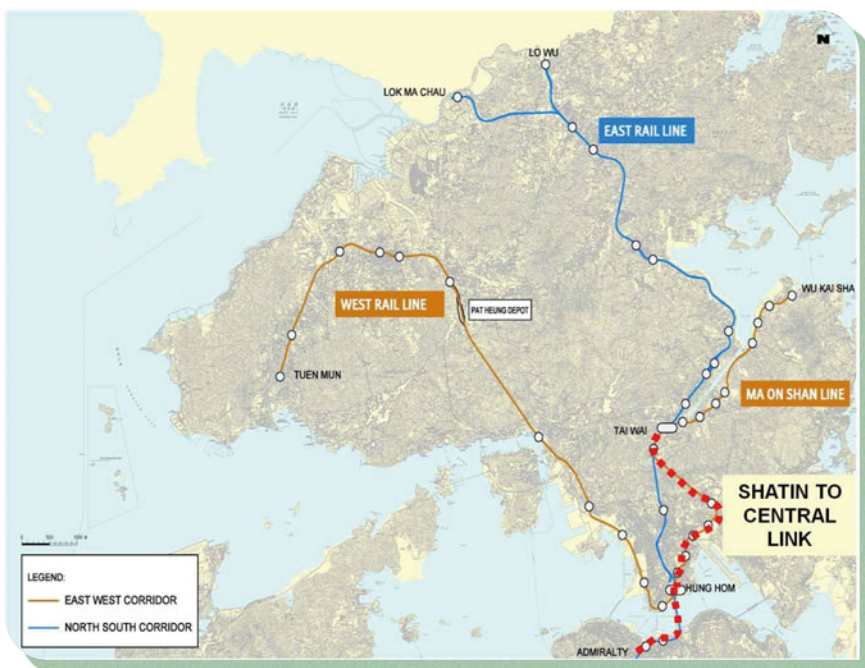
Alignments of railway lines

We commenced the consultancy study for the Review and Update of the Railway Development Strategy 2000 in March 2011 to further our policy of using railways as the backbone of the passenger transport system in Hong Kong. Upon its completion in 2014, the Government will announce the way forward for further development of the railway system.

Environmentally friendly Measures for Shatin to Central Link

The Shatin to Central Link (SCL) is a 17 km strategic rail line connecting several existing ones to form two railway corridors, namely the “East West Corridor” and the “North South Corridor”. It will improve connectivity and provide efficient and reliable access to more areas of Hong Kong. Not only will this bring substantial social and economic benefits, it will also bring environmental benefits.

Before the public can enjoy these benefits, some environmental disturbance is inevitable during the construction of the project. To mitigate the disturbance, since the start of construction in 2012, the project team has been endeavoring to minimize the impacts by its commitment to sound environmental management,



Alignment of SCL

environmental initiatives and continuous improvement. Independent consultants have also been appointed to carefully assess the possible environmental impacts and to check against the requirements of the Environmental Permits (EP). The project team will continue to work with stakeholders to implement good site practices and ensure that the design, construction and operation of SCL comply with the relevant statutory environmental protection requirements and that all necessary measures are implemented to reduce the project's impact on the public and the environment.

Highlights on Environmental Management

Cultural Heritage

As per Environmental Impact Assessment recommendations and with archaeological findings during the course of works in the To Kwa Wan Station area, archaeological survey works were conducted to cover the whole station and part of the associated adit areas. Some artifacts and features dated to late Qing Dynasty and Song-Yuan Dynasties were identified (e.g. pottery, ceramic shards, wells and damaged building foundations). The project team will continue to be in close discussions with Antiquities and Monuments Office on the findings and preservation proposals for their consideration with the Antiquities Advisory Board.

The conservation works for the historic structures (namely the Former Royal Air Force Hangar and the Old Pillbox) and archaeological sites (namely Lung Tsun Stone Bridge and Former Kowloon City Pier) were also implemented according to EP requirements. Extensive communication and collaborative efforts between engineers, building heritage experts, archaeologists, Antiquities and Monuments Office and the public are being put in to preserve the heritage values while serving the transport needs of the community.

Noise and Dust Mitigation Measures

Construction noise impact associated with the use of Powered Mechanical Equipment (PME) has been carefully controlled throughout construction. With the implementation of practical mitigation measure, construction noise impacts at sensitive receivers arising from works activities are controlled to acceptable levels. Apart from the use of movable noise barriers and quiet PME, mitigation measures in the form of noise enclosures have been adopted to mitigate construction noise coming from the shaft structures. At the works sites of Hin Keng Station for tunnelling works by drill and blast and the extension of Diamond Hill Station by tunnel boring machine, a specifically designed sound insulating

enclosure equipped with proprietary acoustic panels and silencers at the ventilation exhaust, was built over the large shaft structure and designed with a noise reduction of around 51 dB(A) and 31dB(A) respectively.



Noise enclosure at Hin Keng

In order to minimize the potential dust impact from the Kai Tak barging point, 3 sided screen with top tipping halls have been provided. Moreover, hard paved haul road, regular watering and wheel washing facilities have been provided in order to reduce the dust impact owing to the truck movement within the barging point.



Tipping hall at Kai Tak Barging Point

Trees Preservation and Greening Measures

Trees retained in construction sites were properly protected with close monitoring by the appointed certified arborist under the EP. The transplanted trees were maintained with care in both receptor locations and nursery. In the former Tai Hom Village, 2 large banyan trees weighted between 140 – 200 tonnes with 10m diameter rootballs have been transplanted within the site successfully. Transplanting such large trees have rarely been done in Hong Kong and required careful engineering design and tree expert input.



Transplantation of a banyan tree

In addition, new landscape resources such as green roof, shrub planting and climbers, etc, are proposed as alternative compensatory planting to optimise greening opportunities.

Being the largest site office of SCL, Hung Hom Site Office has adopted numerous green design initiatives. For example, the seafront is flanked by rows of bamboo and green wall with climbers to shield the office from the western sun to reduce heat absorption. At the main

entrance foyer, the glazed wall and skylight provides ample natural daylight saving a lot of energy on artificial light. Artificial turf was also laid on the roof to minimize visual impact to adjacent residents and provide additional thermal insulation to the roof. Inside the office, false ceilings were omitted to reduce future construction wastes. Other green initiatives include external solar light poles, solar tubes, sunshades above windows, use of water fittings with Grade 1 water efficiency labels etc.



Rows of bamboo and glazed wall at Hung Hom site office

Stone Wall Tree Pruning Operation in Bonham Road

Stone wall trees are attractive and valuable natural features in Hong Kong's streetscape. The Highways Department (HyD) is currently responsible for the management and maintenance of 214 stone wall trees, including the 6 Chinese banyan (*Ficus microcarpa*) alongside Bonham Road parallel to St Stephen's Lane (Slope No. 11SW-A/R577). Bonham Road is a busy street with heavy traffic for most of the day. Pedestrian footpaths are relatively narrow and congested at peak times, particularly around the bus stop immediately below the stone wall trees. During a routine inspection of these banyans in 2010, it was observed that a portion of the roots of one tree (T4) had become detached from the wall. As the tree overhangs Bonham Road, it was considered necessary to take remedial action to prevent the tree from falling and injuring passers-by or



Location of the concerned tree



Photo of the concerned tree (Indicated by Red Arrow)

damaging adjacent property. However, the challenging site constraints had to be overcome.

A tree specialist was invited to assess the condition of the stone wall trees and propose remedial measures. It was determined that there was an alarming risk of Tree T4 becoming totally detached from the wall and falling into the road. The tree specialist suggested for further investigation a number of different methods to stabilise the branch, including installation of cable ties anchored to adjacent buildings in St Stephen's Lane or steel frame props set into the Bonham Road pavement below to support the tree. However, upon review of these

proposals by HyD, and after consultation with the Tree Management Office and Expert Panel on Tree Management (EPTM) of DEVB, none of the proposals was considered to be feasible due to the site constraints and close proximity of pedestrians and road users. To mitigate the safety risk on one hand and to address public aspiration to preserve the tree on the other, it was decided that, instead of a complete felling, a substantial pruning operation to remove a large branch of T4 overhanging Bonham Road was the best course of action and should be carried out urgently.

The local District Council (DC) members and the Central and Western District Council were informed of the proposed tree surgery work to promote the public's understanding of the need to prune this prominent stone wall tree for safety reasons and the comprehensive investigation carried out before coming up with the proposed operation.



On site meeting with EPTM



On site meeting with local DC member

Careful planning and detailed coordination were required to implement the pruning work. The pruning operation was carried out in two consecutive nights of 16 and 17 May 2013 as planned under the dedicated efforts of approximately 30 staff from the Contractor to operate machinery and control traffic as well as 10 staff from HyD including Engineers, Landscape Architect and site staff to supervise the work and communicate with public members as necessary.



Traffic congestion at the beginning of the operation



HyD professionals provided on-site supervision during the operation



The crane lorry transferred the pruned branches to the ground for clearance

After two nights of hard work, the major branch of T4 posing significant risk to public was removed and the road was re-opened to traffic at 6 am of 17 May, 2013.

With the threat to public's safety successfully mitigated and the valuable stone wall tree properly preserved, HyD's professional efforts striking the appropriate balance between protection of public safety and preservation of stone wall trees were well demonstrated. Yet, continuous efforts would still be needed to monitor the health and stability of the stone wall trees at the busy urban road junction.



Before the operation

Detached tree branches pruned



After the operation

Landscape Enhancement Management Plan

The Highways Department also proactively implements a Landscape Enhancement Management Plan (LEMP) to enhance the aesthetics and biodiversity of slopes managed and maintained by it. One prominent and exemplary case is the landscape enhancement work for slope 5SE-D/F68 completed in 2013.

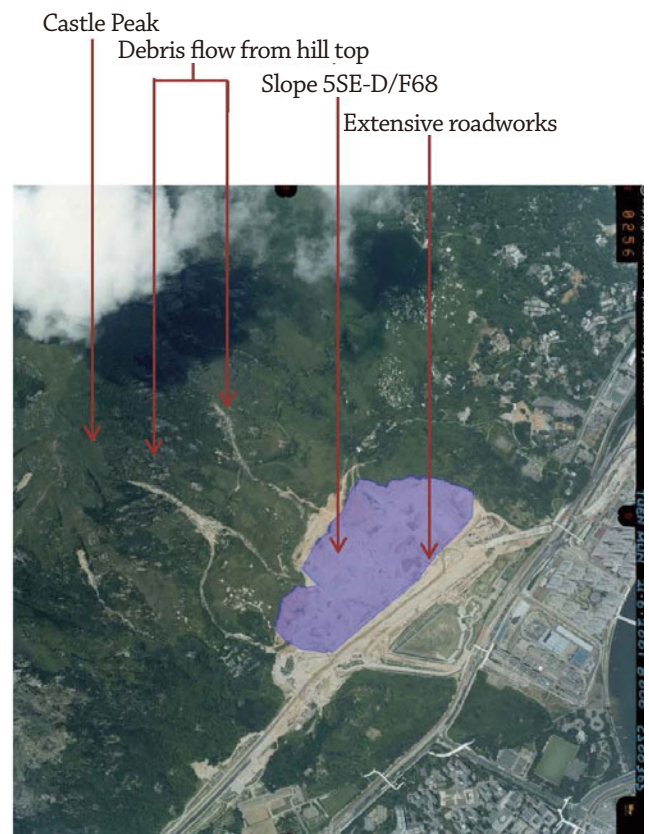
Project Description and Site History

- Location: Hill slope under Castle Peak in Tuen Mun New Town
- Area: 14 hectares
- Site History: A disturbed land from extensive landslides and road works

Vegetation History Before LEMP

After both natural (sizeable landslides) and human (extensive road works) disturbance, the site was planted with various woodland mix seedling species for quick initial green cover and short-term erosion control on sloping ground before handover to the Highways Department for long-term vegetation maintenance.

Our challenge was to make good a landscape with such history for better aesthetics and wildlife through landscape management.



Source : Aerial photo from Lands Department, HKSAR, 2001

LEMP for both Aesthetics & Biodiversity

From 2011 to 2013, we have launched a LEMP on the vegetation of Slope 5SE-D/F68 which includes the following:

Landscape Enhancement Management Plan – Step 1

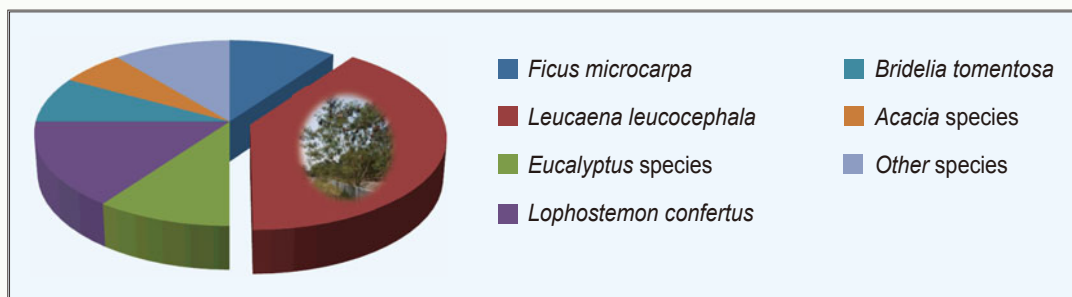
Monitor the landscape change

- To monitor the performance of each individual vegetation species and its contribution to the whole landscape as a base to transform it into a sustainable landscape
- To design a sustainable landscape which is aesthetically appealing and in balance with the local climate and environment

Landscape Enhancement Management Plan – Step 2

Vegetation survey on the performance of initial planting species

- A comprehensive vegetation survey was conducted in 2011, the findings are shown below:

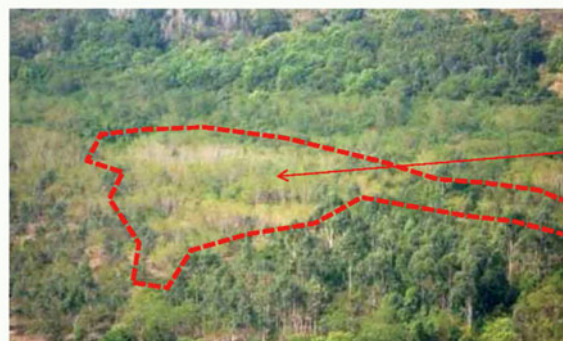


Landscape Enhancement Management Plan – Step 3

Identify undesirable species

From the vegetation survey, it was clear that *Leucaena leucocephala* was the most successful pioneer species on the disturbed land.

However, *Leucaena leucocephala* is a vigorous exotic species from tropical America. Its dominance would prevent natural succession of native species and disturb the biodiversity. As its historical role of establishing initial green cover had accomplished, it was therefore identified as an undesirable species to be removed to give way for desirable species and biodiversity.



Leucaena leucocephala dominated the slope before the enhancement works

Poor quality of greening from *Leucaena leucocephala*

Landscape Enhancement Management Plan – Step 4

Selective removal of undesirable species based on ground conditions

- Since the site was on sloping ground, gradual removal of the undesirable species - *Leucaena leucocephala* had to be carried out in phases
- A total of 3,000 *Leucaena leucocephala* with diameter at breast height over 250mm and numerous seedlings of *Leucaena leucocephala* were removed from slope surface area of over 147,609m²



Stump of *Leucaena leucocephala* not removed for slope stability but black plastic bags were used to prevent its regrowth

Gradual clearance of *Leucaena leucocephala*

Landscape Enhancement Management Plan – Step 5

Plant desirable species for aesthetics and biodiversity enhancement

- Native tree species were selected for replanting in the cleared land of *Leucaena leucocephala*
- Some were selected for seasonal effect such as *Castanopsis fissa* for beige yellow flower in Spring and *Liquidambar formosana* for red leaves in Fall
- Some were selected for the enhancement of biodiversity such as *Morus alba* and *Citrus maxima* to attract butterflies, insects and birds
- More than 11,000 number of plants were planted in the cleared land from *Leucaena leucocephala*
- The actual enhancement planting works were carried out in Hong Kong's planting season between February to May to save frequent watering on the extensive land
- Mostly whip size of trees (with some light standard size if the area is not steep) were planted for its easy adaptation and growth

Species for biodiversity enhancement:



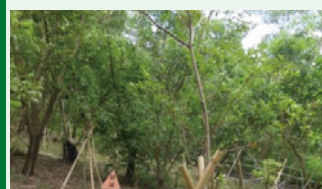
Morus alba



Citrus maxima



Poluspora axillaris



Rhus succedanea

Species for aesthetic enhancement:



Castanopsis fissa



Liquidambar formosana



Rhododendron simsii



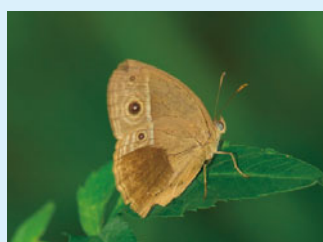
Rhus succedanea

Landscape Enhancement Management Plan – Step 6

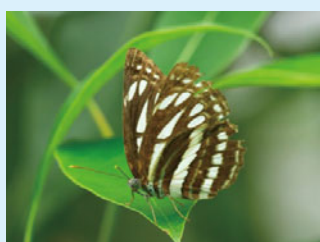
a) Check the results on biodiversity – butterflies

- Before the enhancement works: Only a few *Catopsilia pomona* were found
- After the enhancement works: As many as 13 Hong Kong's common butterfly species were found during the field counts as follows:

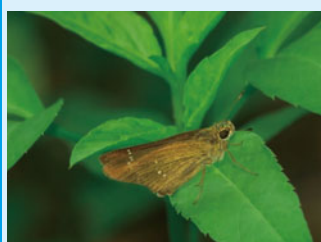
✧ <i>Blues species</i>	✧ <i>Faunis eumeus</i>	✧ <i>Neptis clinia</i>	✧ <i>Potanthus confucius</i>
✧ <i>Catopsilia pomona</i>	✧ <i>Hypolimnas bolina</i>	✧ <i>Papilio polytes</i>	✧ <i>Tirumala limniace</i>
✧ <i>Celastrina lavendularis</i>	✧ <i>Mycalesis mineus</i>	✧ <i>Parnara ganga</i>	



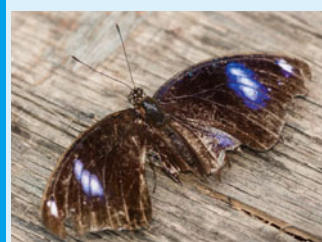
Mycalesis mineus



Neptis clinia



Parnara ganga



Hypolimnas bolina

b) Check the results on biodiversity – insects

- Before the enhancement works: The presence of insects was scarcely observed
- After the enhancement works: Insects like *Pantala flavescens*, *Hydrobasileus croceus*, *Orthetrum glaucum*, *Erthesina fullo*, *Xenocatantops brachycerus* and *Lymantriidae* family were found during the field counts in August 2013



Orthetrum glaucum



Xenocatantops brachycerus



Xenocatantops brachycerus



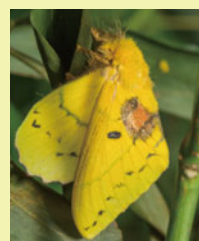
Pantala flavescens



Erthesina fullo



Hydrobasileus croceus



Family *Lymantriidae*

c) Check the results on biodiversity - birds

- Before the enhancement works: Only a few *Zosterops japonica* were found
- After the enhancement works: The following birds were also observed:

Zosterops japonica



Groups of *Zosterops japonica* were found on trees

Egretta garzetta



One *Egretta garzetta* seen in wet season in the downslope water catchment area

Sturnus nigricollis



Two *Sturnus nigricollis* in open area

d) Check the results on biodiversity – amphibian

One common native spotted narrow-mouthed frog *Kalophrynus interlineatus* which fed on mosquitos and red worms was found on site during rainy season. It indicated that our site had red worm that attracted insects as the food chain of the ecosystem.



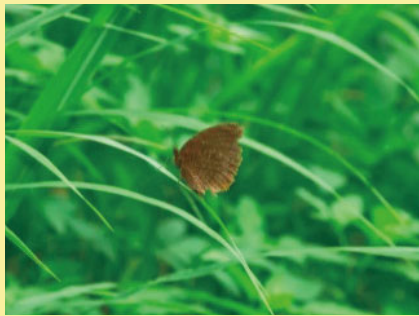
Kalophrynus interlineatus

e) Check the results on biodiversity – understory growth

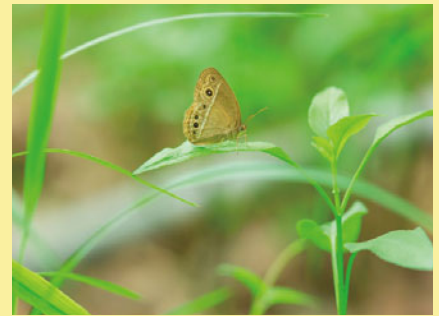
It was found that almost all butterflies and insects observed were resting on native undergrowth like *Bidens alba*, *Lantana camara* and *Miscanthus sinensis*. It proved that native tree attracts native understory growth.



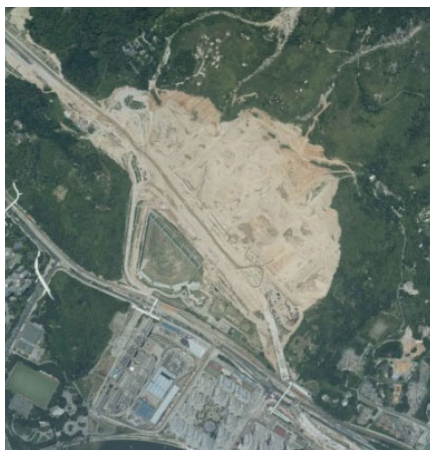
Catopsilia pomona on *Lantana camara*



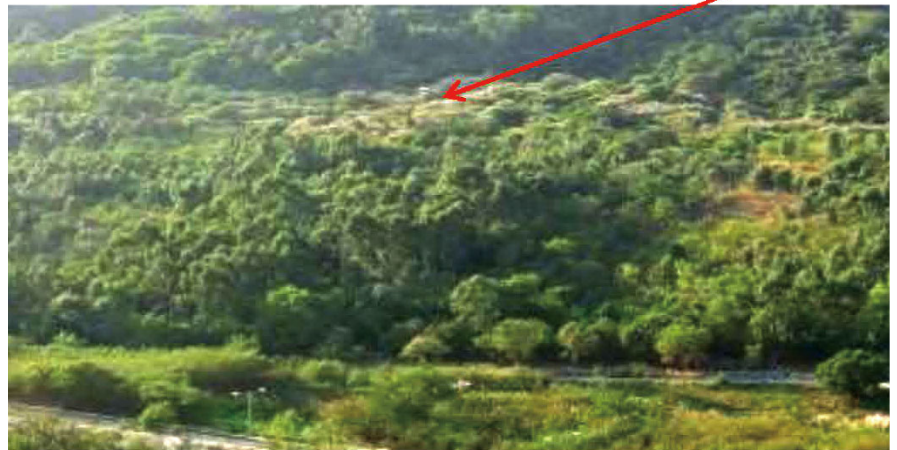
Elymnias hypermnestra on *Miscanthus sinensis*



Mycalesis mineus on *Bidens alba*



Before enhancement work -
A disturbed land in 2001



After enhancement work - A high ecological value woodland has been established in 2013

Flowering of *Bauhinia* species

Conclusion

In conclusion, the LEMP has not only enhanced the aesthetics, but also enriched the wildlife and biodiversity, making a better world through landscape management. HyD will continue to seek sustainable enhancements to landscape when suitable opportunities arise during the course of its vegetation management.

Green Office Management

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 under the chapter on "Clean Air Charter", we have been making our best effort to save other resources.

Paper Saving

To align with the green office initiative, we have promulgated and would continue with the following measures to minimise paper consumption:

- 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; and
- encourage the use of recycled paper.

In 2013, we consumed 18,322 reams of paper (representing a saving of 3.72% of that of 2012) of which all were recycled paper.

Waste Recycling

We encourage collection of 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.

Water Saving

The renovation works of 6/F toilets in HMTGO were carried out in November 2013. To maximize water conservation, we have adopted the use of dual-flush toilets, automatic low flow water taps and sensor type urinals. These new components could effectively control the duration of water flow and also keep the water flow at low level. We target to complete the renovation project by 2014.

Auditing

Annual Environmental Audit

We conduct annual environmental audits in all 16 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 been making continuous efforts 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

Two carbon audits were conducted for HMTGO by the Building Management Office (BMO) in 2013 to monitor the effectiveness of Green House Gas reduction efforts. The relevant data are being studied by the BMO.

Energy Audit

To upkeep our effort in energy saving, an Energy Audit for HMTGO had been conducted by the Government Property Agency (GPA) which identified three energy management opportunities. In 2013, we worked together with GPA and the Architectural Services Department (ArchSD) to take forward the remaining two identified energy management opportunities, being:

- the installation of motion sensors in carparking areas so that lighting would be switched off when no one moves around there; and
- the replacement of the existing fluorescent lighting fixtures by dual lights fixtures completed with motion sensors in staircases.

Installation work of motion sensors light in carparking areas of HMTGO will be carried out by ArchSD's Contractor from February 2014 to June 2014. The work schedule for the replacement of fluorescent lighting fixtures is being processed by the ArchSD.