

ENVIRONMENTAL MANAGEMENT

GREENING AND LANDSCAPING

Central Kowloon Route

20,000 m²
landscaped deck to be created

Tuen Mun-Chek Lap Kok Link

6,300 trees
planted

33 hectares
landscape areas formed

3,390,000 shrubs
planted



BENEFICIAL REUSE

Central Kowloon Route

1,500 m³
of marine sediment reused

Enhancement Programme of
Vegetated Slopes

230 tonnes
of wood upcycled

AIR QUALITY

Central Kowloon Route

The Air Purification System
removes

80%
of NO₂ and RSPs

Tuen Mun-Chek Lap Kok Link

The planted trees
absorb

41 tonnes
of CO₂ per year



CENTRAL KOWLOON ROUTE

STRIVING TOWARDS GREEN CONSTRUCTION



Introduction

The Central Kowloon Route (CKR) is a 4.7km-long dual 3-lane trunk road connecting east and west Kowloon, 3.9km of which is a tunnel underneath central Kowloon. It provides an alternative route bypassing the existing congested at-grade road network in central Kowloon area. Upon the anticipated commissioning in 2025, the journey time between Yau Ma Tei and Kowloon Bay during peak hour is expected to shorten from 30 minutes to about 5 minutes. With reduced traffic on the existing at-grade road network, the emission of traffic noise and air pollutants such as carbon dioxide, nitrogen oxides and respirable suspended particulates from vehicles will be greatly reduced, leading to improvement of noise level and air quality in the nearby neighbourhood including Yau Ma Tei, Ho Man Tin, Wong Tai Sin and Kowloon City. With an aim to promote sustainable development, the CKR project adopts a wide range of environmentally friendly design and construction methods throughout different stages of project implementation.



Alignment of the Central Kowloon Route

— Viaduct/at-grade road — Tunnel/depressed road

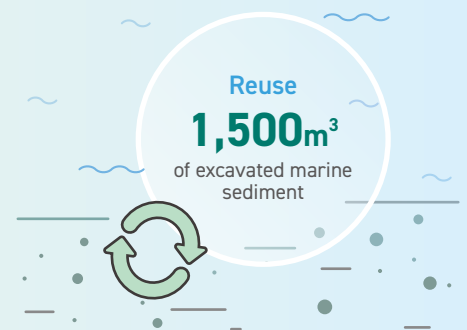
Extensive Greening and Landscaping

To improve the environment in the vicinity of the CKR, a landscaped deck will be constructed at the western tunnel portal of the CKR at Yau Ma Tei. The 20,000m² landscaped deck, spanning 250m-long from east to west and 270m-long from south to north, covers the CKR depressed road and the section of elevated Hoi Wang Road between Yan Cheung Road and Lai Cheung Road. The deck provides additional greenery and leisure facilities for public enjoyment. It will also be connected to the landscaped deck of the West Kowloon Station of Guangzhou-Shenzhen-Hong Kong Express Rail Link to form an elevated pedestrian route between Yau Ma Tei and the rail station and further south to the West Kowloon Cultural District, creating a large public space and amenity area for public recreation.



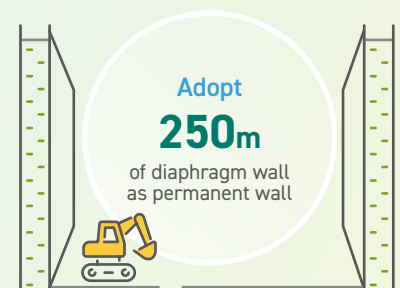
Maximum Reuse of Excavated Marine Sediment

Marine sediment is a layer of fine particles deposit on the seafloor and is often contaminated with heavy metals and organic matter. Particular care is required for disposal of marine sediment at designated open sea or confined marine disposal sites. In this project, special compartments were designed under the depressed road at Yau Ma Tei to accommodate the excavated marine sediment as permanent backfilling material. The marine sediment also serves as the counterweight to avoid floatation of the depressed road structure. This innovative use of excavated marine sediment not only reduces the volume of concrete used for the road structure, but also minimises the long distance transportation and disposal of the sediment, thereby reduces the carbon generation from the construction activities.



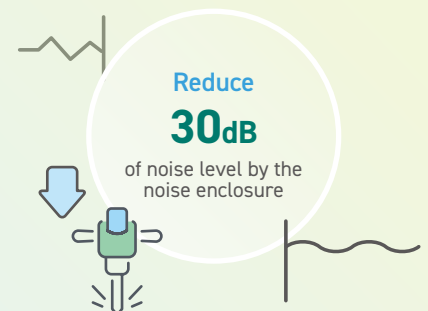
Sustainable Diaphragm Wall Construction

For the depressed road construction of the tunnel entrance at Yau Ma Tei, diaphragm wall is adopted in lieu of conventional pipe pile wall with socketed H-piles to retain the ground. The diaphragm wall also serves as permanent wall which eliminates the need of temporary retaining structures. In comparison to the conventional method, adoption of diaphragm wall construction greatly reduces the use of heavy plants and volume of excavation and backfilling materials as well as shortens the construction time. With such significant advantages, the construction carbon footprint of the CKR is greatly reduced.



Reduced Impacts from Blasting Operations

Drill-and-blast method is adopted for constructing the CKR tunnel at deep rock stratum in urban area. The blasting works are carried out underground in an enclosed environment. A series of mitigation measures are implemented, including installation of filter in the ventilation system and construction of temporary noise enclosure to fully cover the access shaft, in order to further reduce the environmental impacts to the nearby residents. The noise enclosure is a composite structure comprising reinforced concrete side walls and steel roof panels covered by acoustic material to achieve maximum noise mitigation effect. The enclosure structure also confines the dust generated from the blasting operations within the access shaft in which the air will be filtered before emission.



Better Air Quality

The CKR introduces an advanced Air Purification System (APS) to treat the vehicular exhaust conveyed by the tunnel ventilation system during the operation stage of the CKR. The APS is installed in three ventilation buildings at Yau Ma Tei, Ho Man Tin and Kai Tak Development Area. The operation of APS consists of two main processes. First, it involves the use of electro-static precipitators to remove portion of suspended particulates, including particles with diameter of 2.5 micrometers or less (PM2.5), from the air extracted from the tunnel. After that, the air is fed into a Nitrogen Dioxide (NO₂) removal system under the second main process to reduce the concentration of NO₂. The purified air is then discharged from the ventilation shafts to the atmosphere. The APS is capable of filtering 80% of the NO₂ and respirable suspended particulates (RSPs) from the vehicular exhaust, hence improving the overall air quality in the neighbourhood.



Environmental Excellence

The CKR project always aims at higher standards in green construction. The project's contractors actively participated in various environmental promotion campaigns and activities, and attained excellent achievements:



GOLD AWARD
Hong Kong Green Awards 2021
 by the Green Council



BRONZE AWARD
Hong Kong Awards for Environmental Excellence 2020
 by the Environmental Campaign Committee alongside the Environmental Protection Department



BRONZE AWARD
Outstanding Environmental Management and Performance Awards 2021
 by the Development Bureau and Construction Industry Council

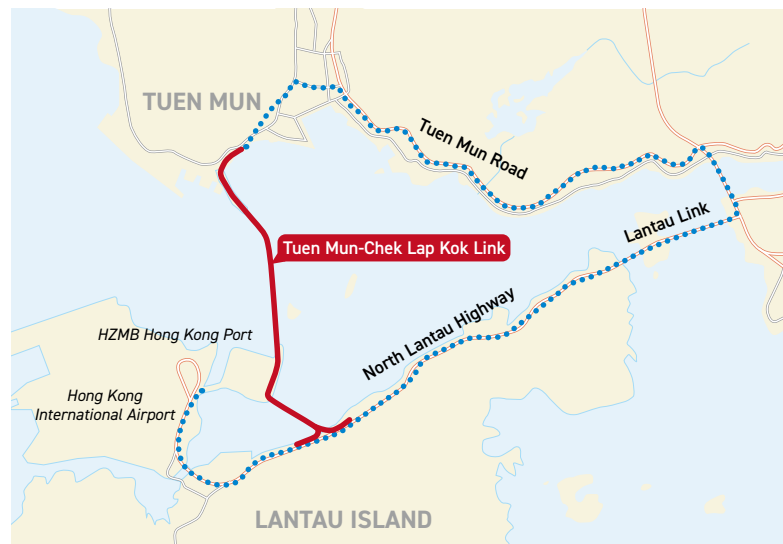
TUEN MUN - CHEK LAP KOK LINK

CREATION OF ATTRACTIVE GREEN SPACES



Introduction

The entire Tuen Mun-Chek Lap Kok Link (TM-CLKL) was opened to traffic in end 2020. The TM-CLKL provides a strategic link connecting the Northwest New Territories with the Hong Kong Port of the Hong Kong-Zhuhai-Macao Bridge, North Lantau and the Hong Kong International Airport. The TM-CLKL is not only a transport infrastructure but also a piece of landscape artwork. The project brings extensive green spaces to the community which help build a more liveable and greener city. According to the Environmental Impact Assessment of the project, around 6,300 trees and 33 hectares of landscape areas (i.e. equivalent to about 46 soccer fields) will be provided by this project. The extensive green spaces are provided at the northern and southern landfalls (i.e. the reclaimed land for construction of the sub-sea tunnel of TM-CLKL), roadside areas in Tuen Mun, green roofs of ventilation buildings, etc.



Alignment of the Tuen Mun-Chek Lap Kok Link

- Original Route between Tuen Mun & Hong Kong International Airport
- Tuen Mun-Chek Lap Kok Link

VIVID WAYS TO CREATE GREEN SPACE

Landmark Scenery

The green space created at the northern landfall becomes a recognizable landmark. Besides beautiful scenery of palm trees along the waterfront, flowering plants such as *Lantana montivendensis* (小葉馬纓丹) and *Catharanthus roseus* (長春花) are also planted. Their pink and purple flowers add striking colours to the palette of greens in the landscape.



Landmark scenery at the northern landfall



Colourful landscape at the northern landfall



Landmark scenery with palm trees at the northern landfall

Seaside Green Space Scenery

The northern and southern landfalls provide a very good platform for accomplishing a comprehensive planting objective. The newly reclaimed lands create opportunities for having beautiful seaside landscape with a wide range of attractive plant species, including *Livistona chinensis* (蒲葵), *Plumeria spp.* (雞蛋花), *Pongamia pinnata* (水黃皮), *Scaevola taccada* (草海桐) and *Wodyetia bifurcata* (狐尾椰子).



Seaside landscape scenery at the southern landfall



Seaside green space scenery at the northern landfall

Striking colours at the southern landfall



Roadside Green Space Scenery

The project team seized every opportunity to enrich the TM-CLKL landscape areas. Apart from the northern and southern lanfalls, extensive green spaces are also created at rooftop of buildings, roadside areas and the newly created or modified slopes. The roadside green spaces help to balance the mobility and liveability of the city.

Roadside landscape area at the northern landfall



Green space scenery along a footway/cycle track near Butterfly Beach



Green space scenery near Lung Fu Road roundabout

Green Roofs

Planting on the roofs is another effective way to create quality green space in the TM-CLKL project.



Rooftop greening at the Tuen Mun Customs Marine Base



Rooftop greening at North Ventilation Building

Floral Attraction and Sustainable Habitat

The plants adopted in the TM-CLKL project comprise both native and exotic species. The mix of evergreen and deciduous plant species offers aesthetics and diversity in all seasons. Butterflies feed on nectar of flowers were observed. Different kinds of birds were also witnessed perching in the landscape areas.

Plant species adopted



Rhodomyrtus tomentosa
桃金娘



Raphiolepis indica
車輪梅



Lantana montivendensis
小葉馬纓丹



Catharanthus roseus
長春花



Terminalia mantaly
小葉欖仁



Scaevola taccada
草海桐



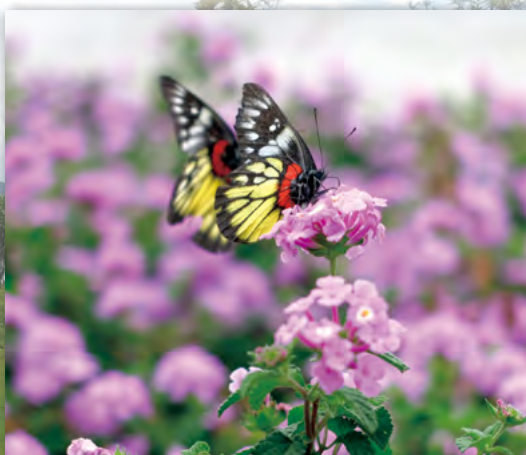
Pongamia pinnata
水黃皮



Plumeria spp.
雞蛋花



"Visitors" at the northern landfall



Challenges were encountered in considering plant species to be adopted under different conditions. Due to the requirements on bird control because of the vicinity to the airport, plant species at the southern landfall were carefully selected to modify the ecological character to ensure that large birds or birds staying in flocks, which would cause hazards to the flight path at the airport island, were not attracted to the area. Plant species that produce fleshy fruits were also avoided so the planting area would be less attractive to birds and other wildlife which feed on these fruits.



Greenery roadside aesthetics at Lung Mun Road, Tuen Mun

Innovative Greening

Another challenge falls on the integration of greening into infrastructure components that are considered unfavourable habitats for plants. For example, the highly visible retaining wall along Lung Mun Road below the road deck, which is shaded from sunshine, is not suitable for planting. To reduce the adverse visual impacts of this huge structure, instead of planting, vitreous enamel cladding panels with aesthetic design were installed on the wall surface, fostering a more interesting and attractive streetscape.

Sustaining Conservation Spirit

To sustain and pass on the spirit of conservation, environmental education is crucial. In this regard, community planting activities were organized upon completion of the project to promote community involvement of our next generation and to raise their awareness on greening and environment conservation.

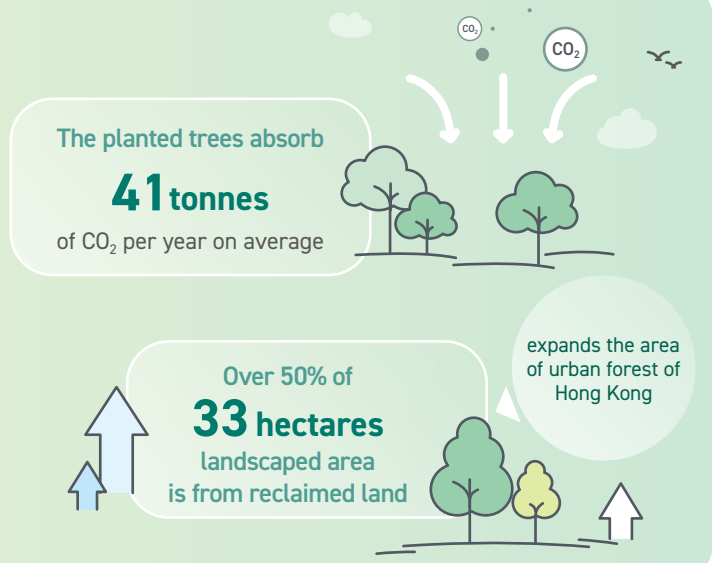


Community planting at the southern landfill

TM-CLKL – The Remarkable Landscape Artwork

The greening works of the TM-CLKL project have brought remarkable environmental benefits to the public. Greening not only beautifies the townscape, but also improves the environment by lowering atmospheric temperature and absorbing pollutants.

Despite numerous challenges encountered, the project team endeavoured to maximise the greening feature through continuous efforts of collaboration and adopting innovative ideas. Upon completion of the project, more than 6,300 trees and 3,390,000 shrubs were planted, 3,000m² of green space was created on building rooftops and 33 hectares of land were landscaped. We will continue to make contributions towards shaping a greener Hong Kong with greater mobility.



SUSTAINABLE DESIGN FOR TUNG CHUNG EAST STATION



Railway is a safe, efficient and environmentally friendly mode of transportation. The Government policy has positioned railway as the backbone of public transport system. We adhere to this policy and aim at planning and developing our railway system to world-class standard.

Proposed Tung Chung East Station under the Tung Chung Line Extension Project

The proposed Tung Chung Line Extension is one of the projects recommended in the Railway Development Strategy 2014. It comprises the extension of the existing Tung Chung Line (TCL) westward by 1.3km from its existing terminus (i.e. Tung Chung Station) to a new station in Tung Chung West (TCW), and an intermediate station, Tung Chung East (TCE) Station, which involves modification of about 1.2km long existing TCL railway tracks near the Tung Chung New Town Extension (TCNTE) (East) reclamation area. It is targeted for commissioning in 2029 to provide enhanced railway services to the population in Tung Chung area.



Alignment of the proposed Tung Chung Line Extension

Existing Tung Chung Line Proposed Tung Chung Line Extension



Conceptual images of Tung Chung East Station concourse area featured with raised ceiling and large glazing area

The proposed TCE Station sits at a unique location surrounded by future development sites to the north and backed by the natural beauty of the Lantau Country Park to the south. It forms the transportation hub for the TCNTE development and adopts a "transit-oriented development" planning concept to guide the design of the development. The proposed TCE Station is located adjacent to the Metro Core Area which is a key centre for the entire TCE. The station is an above-ground station with elevated concourse.

The roof at both ends of the concourse provides a key focal point for the public plaza at the Metro Core Area. The raised ceiling levels at the paid and unpaid areas also create a dramatic sense of space to enhance passenger experience.

Sustainable Design for TCE Station

The proposed TCE Station will be a recognizable building at the future TCE new town. To promote sustainability and energy saving, the following sustainable designs will be adopted:

Sustainable Green Roof

With the adoption of a green roof design, the station could be well isolated from solar radiation. The energy required to cool the station could therefore be reduced, alleviating the overall heat island effect in the area. The proposed green roof also mitigates visual impact for the future commercial and residential neighbours by blending into the background of surrounding hillsides.

Adoption of Glazing Area and Use of Shading Devices for Concourse Area

The raised concourse roof allows the capture of natural daylight and overlooking of both the plaza and the surrounding hillsides. The roof also incorporates an overhang for shading the south façade and integrates skylights with openable glazing for natural ventilation. With the capture of natural daylight, the electricity consumption for lighting would be reduced. The shading devices could also prevent the penetration of solar radiation into the station in summer and allow certain solar heat gains in winter, which both lead to thermal comfort with significant energy savings.

Roof Mounted Photovoltaic (PV) Panels

The roof of the station provides spacious area for installation of PV panels. The electricity generated from the PV panels will be used for the station lightings, air conditioning, etc., and hence reducing the overall electricity consumption from the power grid.

Utilization of District Cooling System (DCS)

It is intended to utilize DCS in the TCNTE (East) to provide chilled water for the air-conditioning systems for the station. The DCS will have a much better energy efficiency performance than that of traditional isolated air-conditioning systems in individual buildings. The heat island effects at TCE could also be reduced with the adoption of DCS as the heat producing equipment and chillers of air-conditioning plants will not be required for individual user buildings within the TCE area.

ROAD MAINTENANCE MONITORING SYSTEM FOR ROAD MAINTENANCE WORKS

Introduction

The Government has determined to drive the modernization of the local construction industry by promulgating the "Construction 2.0" with a view to uplifting the productivity, capacity and sustainability of the industry. As one of the measures under "Construction 2.0", the Government launched in 2020 the Digital Works Supervision System (DWSS) for implementation in capital works contracts. Riding on the protocol of the DWSS and considering the unique characteristics of our road maintenance works, we take the initiative to introduce the Road Maintenance Monitoring System (RMMS) to support our road maintenance works.



What is RMMS

RMMS is essentially a workflow-enabled system to digitalize operation workflows and capture submissions, checking history and inspection records as well as to issue notifications to designated officers for timely follow-up actions.

Maintenance of Roads and Related Assets

Our road maintenance contractors carry out routine day-to-day maintenance works while our engineering staff conducts audits and inspections to assure the quality of works.

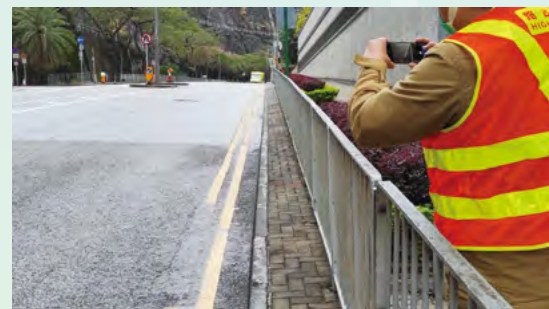
To cater for the expanding road network in tandem with the rapid development of Hong Kong, and maximize the effectiveness of road maintenance, a two-tier arrangement is adopted in the maintenance of road assets. Under the arrangement, routine inspections are carried out by the term maintenance contractors, who will classify the severity of the defects identified and complete small scale defect rectification works according to the time limits stipulated in the contracts. Our engineering staff will carry out audits to gauge the performance of the contractors in defect identification and timely completion of the rectification works. For defects of larger scale, we will issue works orders to the contractors for carrying out the rectification works.

Apart from auditing, our engineering staff will also conduct Engineer Inspections on critical works, such as placing of structural concrete, laying of bituminous materials, installation of soil nail, etc., to enhance the overall quality of the maintenance works.

Currently, the records of audit, site checking, inspection and defect rectification are partly paper-based. The transmittal of the non-digital records amongst the frontline and supervisory staff and the contractors not only takes time, limiting the effectiveness of data gathering and analysis, but also consumes considerable amount of paper.



Engineer Inspection - traffic sign



Engineer Inspection - road marking



Engineer Inspection - unwanted vegetation

Planned Phases of RMMS for Road Maintenance

With the expanding road network in association with the developments in the territory, we have been exploring different initiatives to uplift the capacity and sustainability in respect of road maintenance. Apart from adopting innovative construction and material technologies, we are looking into means to extend the digitization of the maintenance supervision system to smoothen the workflow, increase the work efficiency and reduce the amount of paper for record handling. In this connection, we plan to implement RMMS in our term road maintenance contracts in phases to manage the workflows of inspection and site activities more effectively.

With RMMS in place, the workflows related to Engineer Inspections, Engineer Audits, and checking of reports on completion of works will be digitalized to enhance efficiency in carrying out these works. As compared to the existing paper-based workflows, the system will be able to send our inspection and audit results to the contractors more expeditiously so that the contractors could follow up and rectify defects identified as soon as possible.

We have started a trial implementation of RMMS in an existing road maintenance contract. Subject to the successful implementation and incorporation of necessary refinements, we plan to incorporate the RMMS into upcoming new road maintenance contracts.

In the longer term, we will also explore the feasibility of checking the contractor's inspection programme and progress, and the progress of the associated defect rectification works digitally.

Environmental Benefits

The introduction of RMMS in road maintenance works not only improves the operational efficiency but also brings environmental benefits. As the need of paper-based processes (e.g. contractor's submissions and our subsequent approvals at various stages of works) will be substantially reduced, we anticipate that we could save 300kg of paper per year after the implementation of the first phase of RMMS.

Our Goal

The first phase of RMMS for road maintenance is largely limited to site supervision works. To achieve effective prioritization of maintenance works and management of maintenance activities, we plan to further extend the digitalization of our asset management with application of digitalized inspection technologies and real-time asset condition monitoring.

With a well-planned maintenance works strategy, we could reduce frequency and defer the need for extensive repair or reconstruction works. In this sense, road facilities will become more durable with longer service lives. This will reduce large-scale maintenance works, which in turn cut down the overall consumption of natural resources (e.g. sand, aggregate and fossil fuels), and minimize the environmental nuisance and inconvenience to the public during the life cycle of roads.

To shoulder our responsibility in conserving the nature and reducing carbon footprint, we strive to achieve our ultimate goal to create a paperless environment for the whole cycle of road maintenance works.

WOOD UPCYCLING

SUCCEED • SUSTAIN



Trees on vegetated slope maintained by the Highways Department

We maintain approximately 600,000 trees on our slopes and within expressway boundary. The vegetation maintenance works would inevitably generate certain amount of yardwaste. In order to minimize the yardwaste delivered to landfill sites, we have proactively recycled and upcycled the yardwaste generated as far as practicable through the SUCCEED • SUSTAIN SLOPESCAPE: Enhancement Programme of Vegetated Slopes.

Wood Recycling and Upcycling

Recycling is a process of converting waste into new materials for use while upcycling in general is a creative reuse process, in which materials originally considered as waste are transformed into new materials or higher quality products. Many of the upcycled materials have artistic or environmental values.

Tree twigs and leaves can be recycled as mulch and compost while tree trunks can be upcycled to wood planks and boards for making furniture, signage and other artwork.

Vegetation maintained by us is mostly located on roadside slopes and/or within expressway boundary, which poses limitations for on-site sorting of yardwaste, therefore on-site recycling or off-site upcycling are applied depending on different site contexts.

On-site Recycling

On-site recycling is applied to sites where shredding machines can be used. The machines can process tree twigs and leaves to produce mulches on site which will then be applied in-situ to improve soil conditions and avoid weeds growing.



On-site shredding of tree twigs and leaves



Shredded mulch for in-situ application

Off-site Upcycling

Upcycling of tree trunks will be adopted as far as practicable for tree diameter greater than 250mm. We will engage wood specialist to collect and bring tree trunks to workshop for processing.

Work stages of upcycling work



Cutting of tree trunks to wood planks or required sizes for artwork



Wood drying



Making of different types of wood products from dried wood



Wood cutting with sawmill machine



On-site sorting of tree trunks



Wood drying with wood dryer

Collaboration on the Use of Local Wood Products

Our intention is to recycle and upcycle locally, as yardwaste is indeed precious resource of the community. Since the commencement of the slope enhancement programme in 2016, about 230 tonnes of wood have been upcycled. We have been actively collaborating with different government departments and non-government organisations on using upcycled products, and at the same time promoting local recycling and upcycling opportunities to the public.



Outdoor furniture for the Environmental Protection Department



Upcycled wood used in outdoor furniture workshop in the Technological and Higher Education Institute of Hong Kong



Upcycled wood used for art workshop at local primary school



Wood compost



Wood planks delivered to the Correctional Services Department for further processing



Wood logs delivered to the Chinese University of Hong Kong for educational purpose



Plant label of new planting at our slope



Wood signage of a stonewall tree at Bonham Road



Wood signage for Enhancement Programme of Vegetated Slopes

GREEN OFFICE MANAGEMENT

Resources Reduction & Waste Recycling

In support of the Government's drive to save natural resources, we are committed to making every endeavour to pursue the "green office" concept in different aspects of our day-to-day operation. In addition to energy saving as mentioned in the previous chapter titled "Clean Air Charter", we have been making our best effort to put in place a series of green policies and measures to promote the environmental awareness of our staff.



100%

of toilets in HMTGO were installed with water saving devices

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.



All of the
25,335 reams
of consumed paper
were recycled paper

Paper Saving

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

- Photocopy/print documents only when it is unavoidable and both sides of paper should be used;
- Encourage the use of recycled paper and reuse of paper office items;
- Exclude leader page for outgoing fax documents;
- Send unclassified documents without envelopes;
- Use emails for communication as far as practicable and adopt electronic templates of letterheads, memoranda and forms to avoid frequent reprinting for adjustment; and
- Put up a single-sided paper collection box (yellow box) and a waste paper recycling box (green box) near the photocopiers.

In 2021/22, we consumed 25,335 reams of paper, all of which were recycled paper.

To enhance efficiency in preserving and managing government records, the Government announced in the Policy Address Supplement published in October 2019 the roll out of Electronic Recordkeeping System (ERKS) to all departments by end-2025. To this end, we have been promoting staff's awareness of paper saving during the focus group meetings and training. Staff are encouraged to adopt a wider use of emails or other electronic means for business communication, in order to foster a digital workplace culture that maximises the value of ERKS and minimises manual efforts in records management.



17,787 kg

waste paper were collected for recycling

Waste Recycling

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

- Place the separated recyclables into recycling bins for collection by cleansing contractor or local recyclers;
- 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.

In 2021/22, 17,787 kg of waste paper including ordinary paper and other paper (e.g. newspaper, cartoon paper and booklets) were collected and delivered to local recyclers by the Government-appointed contractor.

Green Advice

We have adopted various measures to enhance environmental awareness of staff through the provision of green advice:



Re-circulate environmentally related departmental guidelines regularly through e-mail and the intranet



Invite staff to put forward suggestions on green management such as through the staff suggestions scheme



Display posters to promote economic use of resources and green housekeeping measures



Extend the green office concepts to daily life through activities such as recycling of used red packets, empty moon cakes/candy cans

Auditing: Environmental and Carbon

Annual Environmental Audit

We conduct annual environmental audits in all 25 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.

Audit results showed that our offices 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 2021 to monitor the effectiveness of greenhouse gas emission reduction effort. The relevant data are being studied by the Building Management Office.