



Environmental Management

Environmental management is implemented at all stages of our works, including planning, design, construction as well as operation and maintenance. We systematically identify, control and minimize environmental impacts of our works.

Adoption of TBM construction for Sub-sea Tunnel of Tuen Mun - Chek Lap Kok Link

Tuen Mun - Chek Lap Kok Link (TM-CLKL) is one of the Hong Kong projects associated with the Hong Kong-Zhuhai-Macao Bridge (HZMB). TM-CLKL will provide a strategic route linking Tuen Mun Area 40 with the HZMB Hong Kong Boundary Crossing Facilities (HKBCF), the Hong Kong International Airport (HKIA) and the North Lantau. The total length is about 9km long, comprising the Southern Connection connecting the HKBCF and North Lantau Highway (NLH) in the form of sea and land viaducts; and the Northern Connection connecting the HKBCF and North Lantau Highway (NLH) in the form of sea and land viaducts; and the Northern Connection connecting Tuen Mun Area 40 and the HKBCF via a sub-sea road tunnel of about 5km long. Upon completion, the new route will significantly reduce the journey time between the North West New Territories and Lantau. It will also serve as an alternative route of NLH to HKIA (see Figure 1).

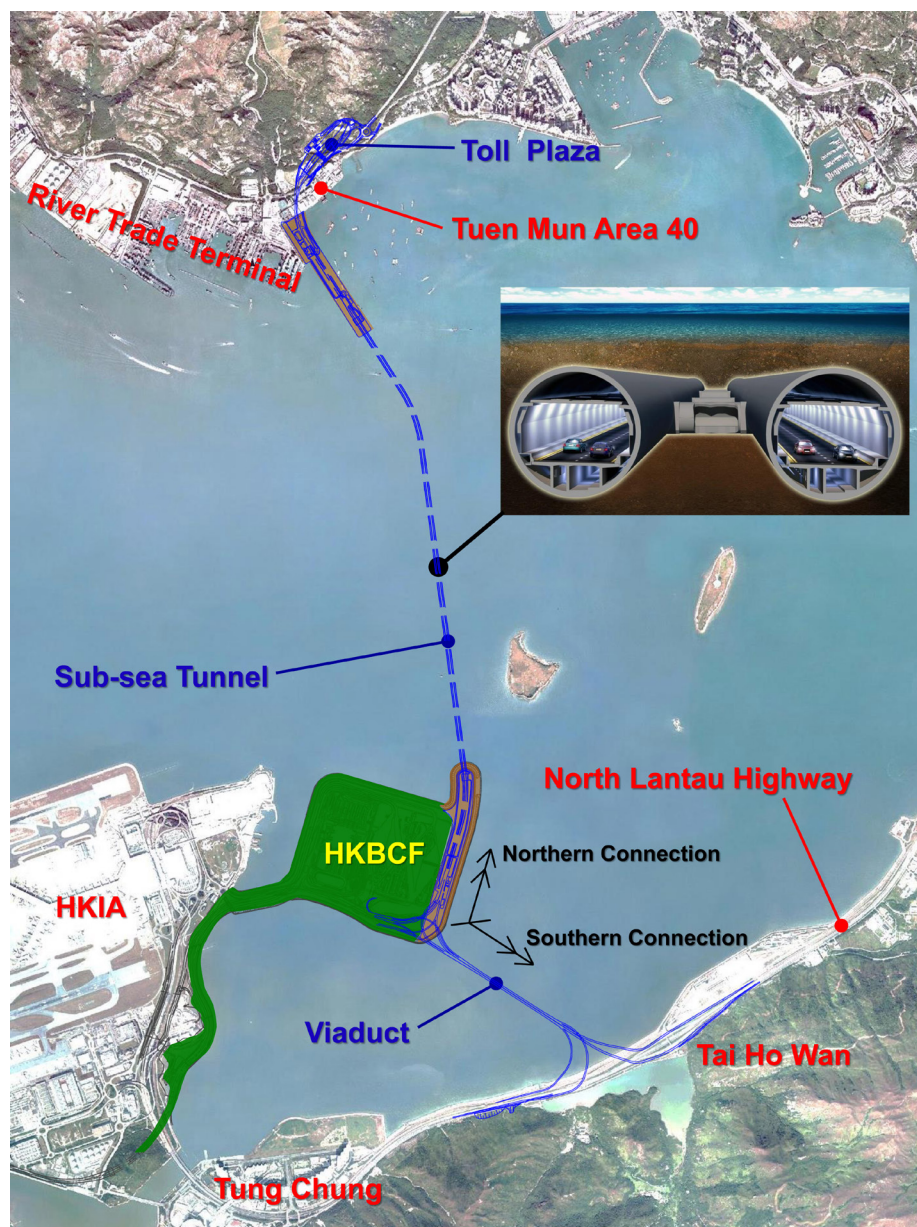
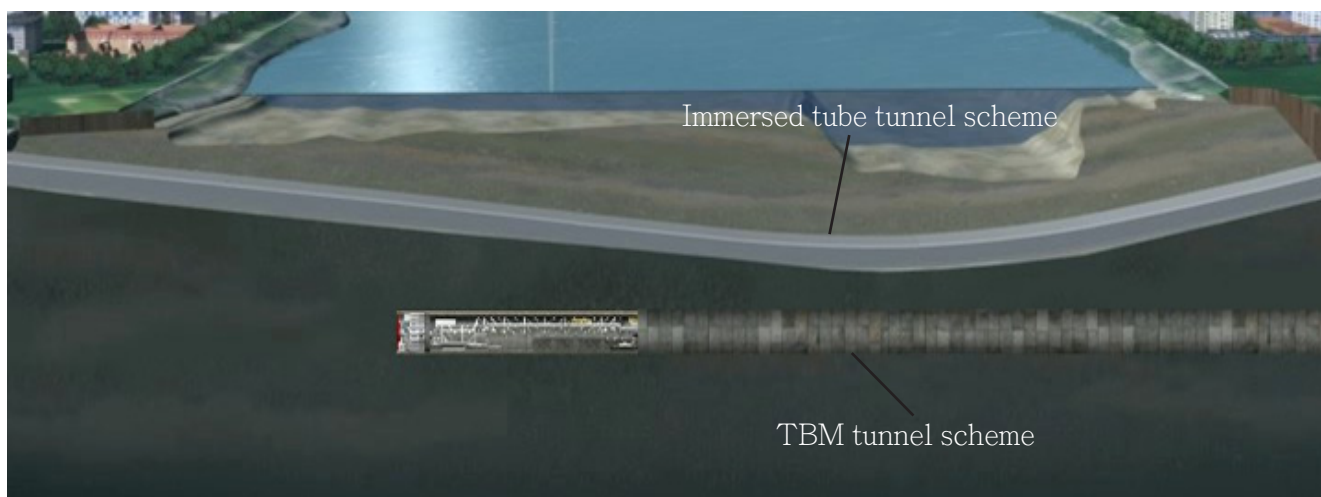


Figure 1: Layout of TM-CLKL- Project Location Plan



The TM-CLKL subsea tunnel is constructed by two Tunnel Boring Machines (TBM) with diameter of 14m at a maximum depth of about 60m below sea level. It will be the longest and deepest sub-sea road tunnel in Hong Kong. The traditional method of constructing subsea tunnel by immersed tube requires full dredging of the marine sediments and backfilling with sand for supporting the tunnel segments. There are environmental concerns and impacts associated with the dredging and dumping of the marine mud. Constructing the sub-sea tunnel by means of TBM reduces the dredging and disposal of some 11 million cubic metres of marine sediment that would otherwise be generated by traditional immersed tube method and hence minimizing environmental impacts brought about by the tunnel construction. Also, through the use of TBM, there are notable advantages in avoiding environmental impact on fisheries, Chinese White Dolphins, coral and other marine life habitats near the works area.



Aerial view of Northern Landfall

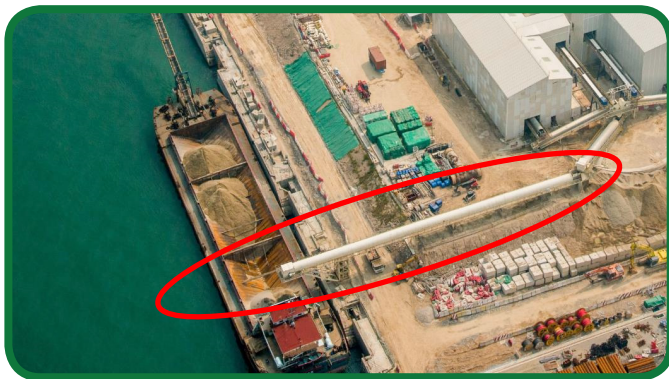


General view of Tunnel Boring Machine

In addition, the following environmental mitigation measures recommended under the Environmental Impact Assessment report have been implemented throughout the tunnel construction with a view to minimizing impacts on our environment.



Noise Pollution Abatement – Noise enclosure at Slurry Treatment Plant



Air Pollution Abatement – Fully enclosed conveyor belt system for disposal of TBM spoil material



Air Pollution Abatement – Hydroseeding for surcharge slope to prevent dust dispersal



Wastewater Management - Wastewater treatment facilities on site



Waste Management – Segregation of different types of waste for recycling

Air Purification System under CWB Project

The Central – Wan Chai Bypass

If you travel along the northern coast of Hong Kong Island, you will see a lot of active construction sites from Central, Wan Chai, Causeway Bay, Victoria Park to North Point. Some of them are the works sites of the Central – Wan Chai Bypass (CWB) which are now under full steam construction.

CWB Sites:



In Central



Near Cross Harbour Tunnel



In Causeway Bay Typhoon Shelter



In Victoria Park



On Island Eastern Corridor, North Point

CWB is a 4.5km long dual three-lane carriageway, in which 3.7km is tunnel. It starts from the west in Central in front of the International Finance Centre, passing under the Central Reclamation Area and the Hong Kong Convention and Exhibition Centre. It then continues to run underneath the Cross Harbour Tunnel and the Causeway Bay Typhoon Shelter, finally emerging from the ground at the North Point Reclamation Area to join the Island Eastern Corridor Link at the eastern end. This Bypass also has slip roads catering for the traffic from Tin Hau and Wan Chai North areas.



CWB alignment with ventilation buildings

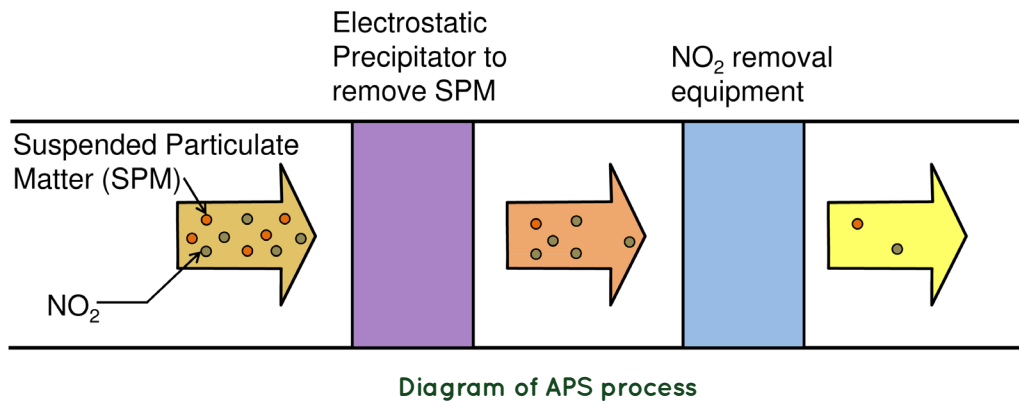
The CWB is served by three ventilation buildings which are located in Central, Wan Chai and North Point.

With its commissioning, the CWB will provide an efficient traffic route between Central and North Point, with travelling time greatly reduced to 5 minutes!

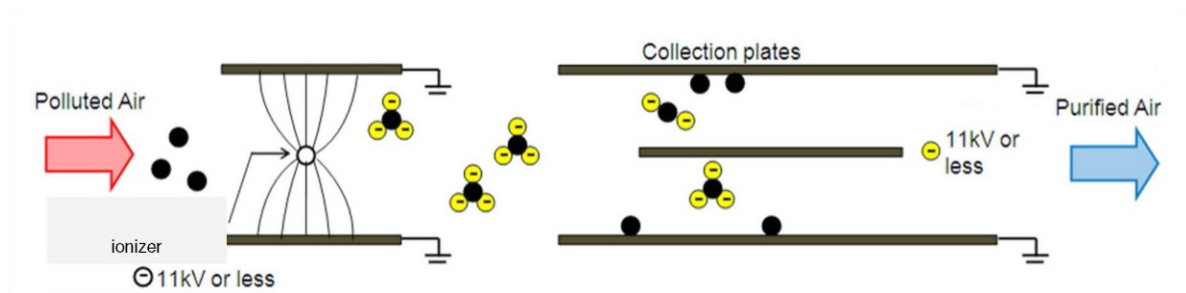
The Air Purification System

The CWB Environmental Impact Assessment Report was approved by EPD in 2008 meeting all the air quality requirements. Nevertheless, to address the ever-increasing public aspiration for better air quality, HyD took an active step to incorporate an air purification system (APS) into the CWB tunnel ventilation system, which is a pilot application in local road tunnels.

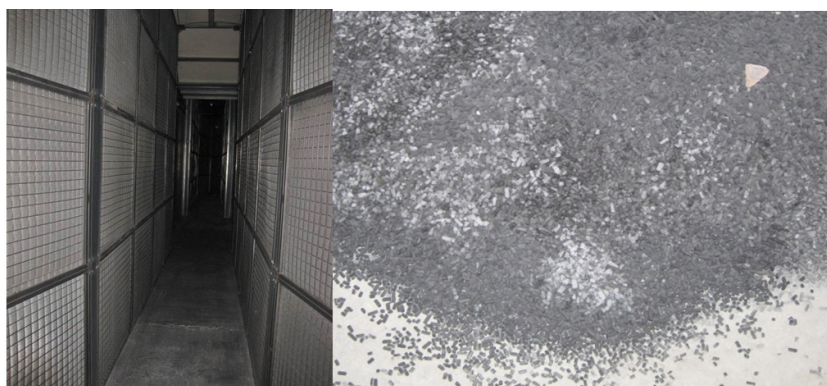
APS consists of two main components, an electrostatic precipitator and a De-NO₂ filter with the capacity to reduce at least 80% of RSP and 80% of NO₂ in the tunnel exhaust.



The operation of the APS is not complicated. The vehicular exhaust in tunnel driven by the tunnel ventilation system first passes through the electrostatic precipitator in the ventilation buildings. The ionizer of the electrostatic precipitator, which is continuously charged with high voltage, produces electrons in the air. These electrons attach to the RSP in the vehicular exhaust, providing them with negative charges. Finally, the charged RSP are deposited on the positively charged collection plate and are removed from the airstream.



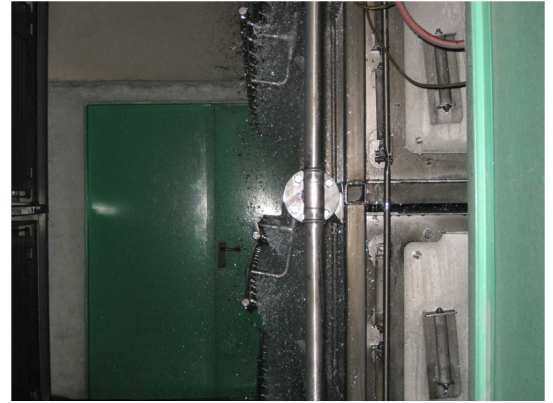
Having 80% RSP removed, the vehicular exhaust will then pass through the second part, the De-NO₂ filter. At this stage, activated carbon is used to absorb NO₂ by physical or chemical processes. The filter is a form of carbon in a shape of black grain and is widely used in water treatment, air purification and similar applications.



De-NO₂ filter and activated carbon

After this process, the treated tunnel exhaust will be discharged to the atmosphere through the ventilation buildings.

The maintenance of the APS is not too complicated. The collection plates of the electrostatic precipitator will be cleaned regularly using the automatic pressurized water jets while the De-NO₂ filters will require the replacement of activated carbon once every several years depending on the flow rate and pollution level of the air to be treated.



automatic pressurized water jets

Conclusion

This is the first time APS technology is used for treatment of tunnel exhaust in Hong Kong road tunnel to improve the air quality. Many issues on design, implementation, operation and maintenance, etc. have to be resolved by the project team. Nevertheless, we believe that the experience gained in this pilot project will provide valuable reference for the future road tunnel projects in Hong Kong.

Typical Environmental Measures Taken on Construction Sites

Dust Control



Cover the bare slope to prevent dust



Spray water on exposed surface to prevent dust

Noise Mitigation



Adopt Silent Piler to reduce noise and vibration



Noise enclosure to reduce noise impact

Water Pollution Control



Cover stockpile to prevent water pollution



Deploy wastewater treatment facilities to treat wastewater before discharging

Waste Management



Adopt 3-coloured bins for waste separation



Recycle/reuse TBM spoil material

Site Cleanliness



Wash the public road adjacent to the Site frequently



Clear up ocean garbage on daily basis

Sustainable Measures



Use solar-powered (renewable energy) flashlight



Install solar panel at site office compounds

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. HyD adheres to this policy and aims at planning and implementing the railway system to world-class standards.

Environmentally Friendly Measures for Shatin to Central Link

The Shatin to Central Link (SCL) is a 17km strategic rail line connecting several existing lines to form two railway corridors, namely the “East West Corridor” and the “North South Corridor”.

Since the commencement of construction works for the SCL in 2012, the project team has been implementing various measures on site to comply with statutory environmental requirements and minimise potential environmental impacts to the community. Effective environmental mitigation measures and sustainability initiatives have been put in place to protect the environment which are reviewed from time to time for enhancements and continuous improvement. Furthermore, emphasis has also been put on preserving cultural heritage.

Preserving Cultural Heritage

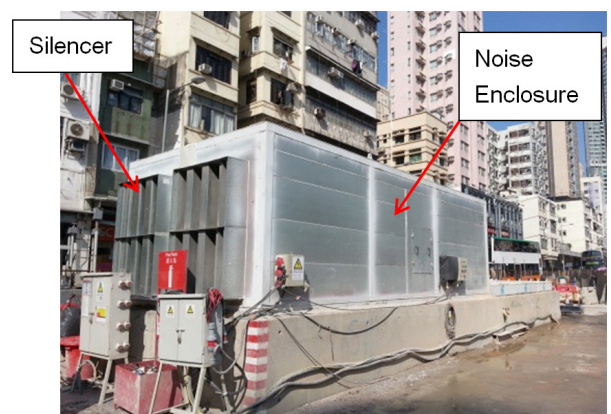
According to recommendations of the SCL Environmental Impact Assessment and requirements of the Antiquities and Monuments Office for artefacts found during the course of construction works in To Kwa Wan (TKW) station area, archaeological surveys were conducted to cover the whole station and part of the associated adit area. Various Sung-Yuan Dynasty relics including wells, building remains and stone structures were unearthed. The relics were handled in accordance with the conservation proposals announced by the Antiquities Authority after extensive consultations with major stakeholders including the Antiquities Advisory Board, Legislative Council and Kowloon City District Council. The conservation proposals have also been incorporated into the revised design of TKW station taking into account suggestions of the public. Close collaboration among stakeholders has resulted in solutions balancing the demand for heritage conservation and the community’s need for timely delivery of the new railway line.



A Sung-Yuan Dynasty well unearthed

Noise Mitigation Measure

As the SCL alignment runs through densely populated urban areas, minimising the impacts of construction noise to residents nearby is a challenge that the project team works hard to meet. Practical mitigation measures for the use of Powered Mechanical Equipment such as the use of movable noise barriers and quiet machines, good site practices and regular noise monitoring have been implemented in the construction sites to reduce the construction noise to acceptable levels. One challenging location is the Ma Tau Wai where sensitive receivers are in close proximity to the work sites. For the underground construction works at the Ma Tau Wai station, custom designed sound insulating enclosures and covers, equipped with proprietary acoustic panels and silencers at the ventilation exhaust, were built to



Noise enclosure and silencer for Ma Tau Wai station works

cover various openings, thus achieving a noise reduction by around 60dB(A).

Sustainability Initiatives

At the Hung Hom North Approach Tunnels, the contractor is striving to protect the environment by reducing carbon emission of its construction activities. The measures adopted on site included innovative designs that reduce construction waste and save construction materials, the use of B5 biodiesel to fuel the construction plants and the use of renewable energy and energy saving devices, such as wind turbine, solar heater and motion sensor, which significantly reduce embodied carbon emission.



Wind Turbine



Solar Heater



Motion Sensor

Energy saving devices used on site

Online Dante Tree Management System

For effective management of trees in the SCL project site, the project team has adopted the Dante Tree Management System. The System is a web-based platform, which is a seamless integration of domain knowledge and technologies with built-in local arboricultural knowledge and experience. It provides an audit trail on tree health data and supports tree health analysis for risk evaluation. It also provides alerts to managers as well as frontline staff for taking appropriate actions. The System has been developed since 2012 and has effectively facilitated tree protection and conservation work for the SCL project.

Greenings in Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link Project

With a total length of 26km, the Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) runs along a dedicated underground rail corridor from a new terminus at West Kowloon to the boundary near Mai Po.

The XRL project team is striving for the sustainable development of Hong Kong, and is committed to minimising the construction impacts to trees and providing greening measures to uplift the quality of the environment during project implementation.

More than 10,000 trees were found within the boundary of the XRL works sites. These trees were surveyed and assessed by certified arborists. Some of these trees were retained in-situ and protected with the designation of tree protection zones where practicable. For those trees which were unavoidably affected by the works and needed to be removed, priority was given to transplant the trees to a temporary holding nursery and then transplant the trees to final receptor sites when ready. For those trees to be removed from the site and considered not suitable for transplanting, compensatory planting was implemented.



Retained tree being protected throughout the project

Other greening measures to uplift the quality of the environment included the use of green roofs and planting of shrubs for ventilation buildings and maintenance shed. These measures enhanced the landscape and visual quality of the areas, and helped blending the completed works into the surrounding environment.



Green roof on maintenance shed in Shek Kong



Green roof on ventilation building

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 chapter titled Clean 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 new components can effectively control the duration of water flow and keep the water flow at low level. We would continue to adopt these water saving measures in the forthcoming renovation works.

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 have promulgated and 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; and
- encourage the use of recycled paper.

In 2015, we consumed 17,565 reams of paper (representing a saving of 1.60% of that of 2014) of which 99.80% 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

A carbon audit was conducted for HMTGO by the Building Management Office (BMO) in 2015 to monitor the effectiveness of Green House Gas reduction efforts. The relevant data are being studied by BMO.