LOWER CARBON EMISSIONS AND TRANSPORTATION
Hong Kong has a well-developed public transport system with railway as its backbone. Going forward, we will facilitate walking as well as continue to provide a safe, efficient, reliable and environment-friendly transport system with multi-modal choices that meets the community’s needs.
Our key actions include extending rail services, as well as improving all public transport services – including smarter road usage management – so that public transport remains the preferred choice of commuters and Hong Kong’s transport sector has a low level of transport-related emissions per capita. Our policy also includes improving the planning of and design for universal accessibility with unique connecting infrastructure suitable for the city’s vertical topography to enable more people to walk for short and medium distances. Partnership with public transport operators, including the airport, to trial new technologies and reduce energy is also a top priority.

Profile of transport-related emissions

Carbon emissions from transport make up about 16% of the total emissions in Hong Kong. Figure 15 shows the transport sector energy end-use, which is aligned with their respective carbon emissions. The rail and tram systems are powered by electricity, while road vehicles are mostly powered by diesel, petrol and liquefied petroleum gas (LPG), and ships are powered by marine diesel.

Hong Kong has a well-developed public transport system with railway as its backbone. The Government’s aim is to provide a safe, efficient, reliable and environmentally-friendly transport system with multi-modal choices that meets the community’s needs. About 90% of Hong Kong’s daily passenger trips (about 12.6 million in number) are made by public transport. The proportion is amongst the highest in the world. Hong Kong’s public transport was ranked first among 84 cities in an international survey published in 2014. Hong Kong’s levels transport-related emissions is also relatively low on a per capita basis. The Paris Agreement reminds us that we must strive to do better still.

Better integrated planning

Whilst 90% of Hong Kong’s daily passenger trips are already by public transport, Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030 (Hong Kong 2030+) proposes to reshape the travel pattern to reduce vehicle-based commuting needs through spatial planning. More employment-related uses would be planned in NDAs and outside of the main urban area to bring jobs closer to homes.

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Keeping Hong Kong’s per capita transport-related emissions low

To keep Hong Kong’s per capita transport related emissions on the low side, the Government will continue to improve public transport and facilitate daily walking for short and medium distances.

**Overall Aims**

- Ensure public transport remains the preferred choice for the community
- Reshape travel patterns to minimise vehicle-based community needs and facilitate walking
- Improve traffic management systems to reduce congestion
- Save energy where possible
- Partner with stakeholders and community to optimise overall gains

**Going Forward**

- Expanding rail and better integration of urban planning, housing and transport
- Improving accessibility and connectivity for walking, and quality of urban footpaths and streetscapes
- Enhancing further the quality of public transport services
- Leveraging smart technology for better traffic management
- Fostering further a bicycle-friendly environment in suitable areas
- Partnering with public transport operators to further improve operational efficiencies, trial greener vehicles, study the applicability of green ferry technologies, as well as save energy
- Facilitating the introduction of new automotive technology
- Strengthening enforcement against traffic congestion offences
Our railway network serves as the backbone of Hong Kong’s low-carbon public transport network. The on-going investments to expand and extend rail-lines involve long-term planning and enormous expenditure, including overcoming many engineering challenges.

Serving more than 5 million rail passenger journeys per day in Hong Kong, the MTR Corporation Limited (MTRCL) has been making continuous investment in its railway assets to maintain service quality. The MTRCL has a 99.9% on time record. To keep this level of service, it invested more than $7 billion in upgrading, renewing and maintaining its railway assets and infrastructure in 2015. A further $9.3 billion has been earmarked to replace signalling systems of seven railway lines and the first generation trains, which will also increase capacity and help to save energy, as well as minimise carbon emissions.
Rail uses about 3% of Hong Kong’s total electricity consumption. The carbon emissions attributed to rail services in 2015 was about 994,316 tonnes CO2-e.\(^9\)

The MTRCL has a target of 21% electricity intensity reduction to be achieved by 2020 compared with 2008, and will consider further targets in due course.

The new rail lines MTRCL is building together with major enhancements to its existing networks are collectively creating ‘Rail Gen 2.0’ – a new era for rail travel in Hong Kong, which will benefit the community with enhanced connectivity and help drive economic and social development.

Moreover, population and activities would be planned within the catchments of public transport nodes, and walking and cycling are promoted to reduce vehicle-based travel, and hence carbon footprint. All in all, *Hong Kong 2030+* continues to pursue an integrated land use-transport-environment approach to promote more sustainable urban mobility with lower carbon emission.

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**Railway Development Strategy 2014**

A well-planned railway network not only fulfils low-carbon travel needs but also unleashes the potential for strategic development along the alignments. New towns and railway expansion have a synergistic relationship that Hong Kong has exploited over the years. With the completion in due course of the seven new railway projects recommended under Railway Development Strategy 2014, the rail share in public transport patronage will rise from the current around 40 % to some 45% to 50% of the total number of trips, with 75% of the population having convenient access to rail. There will be other socio-economic benefits, including supporting land use development, improving connectivity across the city, creating jobs, reducing congestion and vehicular pollution, etc.

**Enhance complementarity of public transport services**

The Government’s Public Transport Strategy Study is examining the roles and positioning of various public transport services other than heavy rail so as to enhance the complementarity among them. The objective of the study is to provide more efficient, sustainable and well-coordinated public transport services to the travelling public.

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9. MTR Corporation Limited, Sustainability Report 2015
Enhance the quality of public transport services

Hong Kong’s rail and franchised bus services are highly efficient and the operators are keen to enhance the travel experience. A positive experience is conducive to encouraging even more people to opt for public transport services, and is thus an important aspect of discouraging private car growth and usage. Moreover, as it is not uncommon for passengers to make use of more than one transport modes in their journeys, the quality of modal interchanges plays another key role in encouraging the use of public transport. The facilities of the interchanges have improved over the years. The public transport operators have also been offering various interchange fare concessions to passengers. Currently, there are around some 450 bus-bus, bus-rail and green minibus-rail interchange schemes. The Government will continue to encourage public transport operators to enhance their quality of services.

Keeping the tramway going with the times

Hong Kong Tramways’ 160-strong home-built electric tram fleet provides an important road transport means that complements rail and bus services on the north Hong Kong Island corridor with the advantages of low fares, frequent and convenient at-grade stops and zero roadside emission. It carries on average 185,000 passengers daily and is the busiest tram line in the world.

In recent years, the operator has implemented various measures to ensure that the century-old service continues to improve. For example, Hong Kong Tramways has replaced wood with aluminium to rebuild tram bodies to reduce weight and improve durability. It has improved energy efficiency significantly through replacing the traction system and introducing regenerative braking system; and improved tram track maintenance technology to reduce friction as well as noise. Furthermore, information technology is being used to optimise tram dispatching and disseminate arrival information through mobile platforms.

Public light buses (PLBs)

Currently, there are a total of 4,350 PLBs operating in Hong Kong. Over 70% of them are fuelled by LPG with the rest by diesel. LPG is a lower-carbon fuel than other hydrocarbons. The Government has been considering various measures to help improve PLB service. For instance, the Transport Department (TD) is considering newly registered green minibuses to have a half-step at the middle door so as to facilitate the elderly and passengers with minor mobility difficulties. We have completed the priority study on PLB service and recommended increasing the maximum seating capacity of PLBs, which is currently at 16. Meanwhile, the Government is working with the trade to explore whether there are low-floor wheelchair-accessible PLB models suitable for trial use in certain hospital routes in Hong Kong.
WALKABILITY, CONNECTIVITY AND ACCESSIBILITY

The Government’s policy goals are to reinvent the public realm into quality spaces and enhance the walkability, connectivity and universal accessibility of the city. Hong Kong 2030+ has embraced the concept of walkability in the planning and design of the built environment and pedestrian networks. This concept will be adopted in projects at different planning levels.

Research shows that Hong Kong people walk a lot compared to residents of other cities, most of which is through walking to take transport.10 We have been putting in place various measures to encourage people to walk short and medium distances. We are working on more projects to promote walkability. Building on the solid foundation laid by our past efforts, we will further promote walkability under the theme of “Walk in HK” in a new Transport and Housing Bureau initiative to
i. “Make it smart”, by providing user friendly information on walking routes;
ii. “Make it connected”, by enhancing our pedestrian networks;
iii. “Make it enjoyable”, by making walking a pleasant experience; and
iv. “Make it safe”, by providing a safe and quality pedestrian environment.

Our aim is to make walking an integral part of Hong Kong as a sustainable city.

UNIVERSAL ACCESSIBILITY PROGRAMME

The Government is progressively enhancing barrier-free access facilities at public walkways (i.e. public footbridges, elevated walkways and pedestrian subways maintained by HyD) under the Universal Accessibility Programme. Having completed more than 40 projects as at the end of 2016, the Government will press ahead with the remainder of about 160 projects in all 18 districts, including the three priority projects identified by each District Council (DC). From December 2016, the Government has been inviting the DCs to further nominate not more than three existing walkways in each district for the implementation in the next phase of the programme. The walkways eligible for consideration by the DCs will no longer be confined to public walkways maintained by the HyD, provided that certain criteria are met.

Hong Kong is hilly with heavy population on hillsides. With the success of the Central Mid-Levels Escalator Link commissioned in 1993, we have also built the Centre Street Escalator Link on Hong Kong Island that together carry about 100,000 people every day. The older Central Mid-Levels Escalator Link will be refurbished in phases starting from 2017. The new escalator link at Tsz Wan Shan will be fully completed by 2017. Construction works for one lift and pedestrian walkway system project commenced in December 2016 and two more will commence within the first half of 2017, whilst design studies and preliminary technical studies are being carried out in another seven projects, which will add substantially to the walking experience and improve accessibility for many people every day.
At the same time, the harbourfront will also become increasingly accessible and connected. Walking will be more pleasant since strolling is a form of recreation, especially along the harbourfront where long promenades are being created. These efforts will minimise the need for mechanised transport over short and even medium distances and hence are zero-carbon choices.
URBAN FOOTPATH MAINTENANCE

HyD is gradually replacing concrete footpath with paving blocks when suitable opportunities arise. The carbon reduction from the difference in footpath design and materials used between 2017 and 2022 is about 480 tonnes annually. In addition, these more environmentally-friendly paving blocks also make it easier to maintain, which also results in annual carbon savings amounting to 4,600 tonnes per year. With HyD’s continued replacement of concrete footpath with paving blocks, this additional carbon reduction will continue to improve by about 120 tonnes per annum between 2017 and 2022.

Cycling where appropriate

There are extensive cycling opportunities in Hong Kong although mainly for recreation, as cycling in the dense urban areas present safety challenges that cannot be easily resolved.

New Territories Cycle Track Network

Since 2009, the Government has been building in phases a tailor-made recreational cycle-track network in the New Territories to provide a continuous east-west cycle track from Ma On Shan to Tsuen Wan with a total length of 82 km. The network comprises a backbone section from Ma On Shan to Tuen Mun (60 km) – of which the section from Ma On Shan to
Sheung Shui has been completed and the section from Sheung Shui to Tuen Mun is in progress. The section from Tuen Mun to Tsuen Wan (22 km) is being planned.

Cycling in new towns and NDAs
The Government’s policy is to foster a bicycle-friendly environment in new towns and NDAs, so as to promote cycling as a zero-carbon mode for short-distance commuting or leisure, and to reduce the use of mechanised means of transport. TD has commissioned a consultancy study and drawn up a list of about 900 sites in new towns for implementing improvement measures at cycle tracks. The first batch of improvement works for about 100 sites, which include additional bicycle parking spaces, safety enhancement at and extensions to existing cycle tracks, have started in 2016 in phases, with a target for completion in two years. Improvements will be on-going.

CONTROLLING RATE OF PRIVATE CAR GROWTH

There are now over 578,000 (as at the end of July 2016) licensed private vehicles (i.e. private cars and motorcycles) in Hong Kong, accounting for 78% of the total vehicle fleet. The average annual growth rate of private vehicles over the past 20 years (1995 to 2014) was over 3%. The growth rate is affected by a variety of factors, such as population and household growth, Hong Kong’s overall economic performance, vehicle and energy prices, currency fluctuations, public aspirations and the government’s fiscal measures to curb vehicle growth, etc. The annual private vehicle growth rate from 2010 to 2015 has surged to about 5% and this is clearly unsustainable by any measure in terms of land requirements, supporting infrastructure, car parking facilities, added traffic and the consequential environmental and climate impacts. The Government has been adopting a multi-pronged approach in tackling road traffic congestion, namely improving transport infrastructure, enhancing public transport system and managing road use. The Government has also undertaken to implement in phases the recommendations made by the Transport Advisory Committee (TAC) in its earlier study report on road traffic congestion (including enforcement, fiscal measures and road charging), having regard to stakeholders’ views, feasibility of available options and overseas experiences, etc.

The Government also endeavours to promote green mobility, such as enhancing walking by improving connectivity and universal accessibility (see above) to reduce the reliance on vehicle-based transport mode.

FIGURE 17
AVERAGE ANNUAL GROW RATES (1995-2014)
Smart management of road usage
Hong Kong transport system is extensive and extremely busy. To maximise the utilisation of our limited road space through the application of innovative traffic management, TD has been developing the Intelligent Transport Systems (ITS) under a three-pronged approach, viz. for dissemination of traffic information to the public, for traffic control and for traffic enforcement support. TD will continue to enhance effective road usage through the development of ITS. Various ITS has been in operation, for example, the Journey Time Indication System, HKeRouting, HKeTransport and the mobile application “eTraffic News”. The MTRCL and the franchised bus companies will also continue to provide information through ‘smart’ means (see relevant sections below), which also forms a part of improving the overall travel experience for passengers.

Electronic road pricing
Electronic road pricing (ERP) is an effective traffic management tool to tackle localised road traffic congestion by rationalising traffic through levying appropriate charges on vehicles following a “user pays” principle. The Transport and Housing Bureau completed a three-month public consultation exercise in March 2016 on an ERP pilot scheme in Central and its adjacent areas. An in-depth feasibility study will be conducted having regard to the comments received to develop detailed options of the pilot scheme to facilitate decision-making.

Partnering with public transport operators
Public transport services in Hong Kong are run by private operators on commercial principles to maximise efficiency and cost-effectiveness. The Government has been working closely with the operators to ensure the provision of proper, efficient and reliable public transport services.

Energy saving and route rationalisation
All the operators have a direct interest in energy saving. The energy saving efforts of the MTRCL and franchised bus companies that have been described in Energy Saving Plan and will not be repeated here.

Bus route rationalisation is an ongoing task of TD. Bus routes with persistently low patronage would be rationalised and resources so saved would be used to strengthen existing services with increased demand or introduce new services with a view to better utilising resources, enhancing bus network efficiency, alleviating traffic congestion and reducing roadside air pollution. Since 2013, TD and the franchised bus companies have been pursuing bus route rationalisation with greater vigour through the annual route planning programmes and taking an area approach (i.e. TD will consider the transport service package for a district/area in a holistic manner instead of by individual routes). This makes the bus service rationalisation proposals more beneficial to the district/area concerned from the traffic and environment angles in overall terms. Area approach rationalisation has been implemented in the North District, Tuen Mun, Yuen Long, Sha Tin, Tsing Yi, Tai Po and Kowloon in the past few years. In tandem with the expansion of the railway network, road-based public transport services in the catchment area of new railway lines are reorganised to meet the changing demand. Route rationalisation, however, has not been easy. The Government will continue to canvass support from the community for rationalisation proposals.
NEW VEHICLE TECHNOLOGIES USES AND TRIALS

- Hybrid light bus
- Hybrid medium goods vehicles
- Electric light goods vehicles
- Electric taxi
- Electric bus
- Supercapacitor bus
- Hybrid bus
**Trial of new technologies**

Beyond energy saving, higher efficiency and lower carbon can be achieved by changing technology. There have been trials with more environmentally-friendly vehicle types in Hong Kong for franchised buses, PLBs and taxis.

The current franchised bus standard is Euro 5 and will change to Euro 6 by 2018. While there will be significant pollutant emissions reduction with Euro 6, its fuel efficiency performance may only be similar to that for Euro 5. The Euro technology runs on diesel and is well-known to the operators in terms of its performance and operation cost. Nevertheless, the Government and the franchised bus operators have embarked on a few trials of new technologies that can reduce or even eliminate roadside pollutant emissions and/or save energy.

We are partnering with the franchised bus operators to trial several types of new technologies. There are currently hybrid-electric (Euro 6 and electric) double-decked buses, as well as battery and super-capacitor single-decked buses on trial in Hong Kong, where the purchase costs of the buses were covered by the Environmental Protection Department (EPD). The purpose of the trial runs is to assess the operational efficiency and performance of the hybrid/electric buses under local conditions. The Government will need to assess the performance of the hybrid/electric buses as well as the operational and financial implications.

**WATERBORNE TRANSPORT**

**Waterborne transport**

Being surrounded by water and with sizable population living on the outlying islands, ferry services form part of Hong Kong’s public transport system. For some areas, there is no alternative land public transport. There are currently 14 franchised and licensed ferry operators running 21 regular passenger and goods ferry services and two cross-harbour services and trips to new towns and outlying islands. Cross-boundary high-speed ferries to Macao and Mainland ports are also important – in 2015, over 26 million travellers used those services.

**Green ferries**

Green ferries are those adopting evolving technologies and/or new materials to lower their carbon emissions. Examples of green ferries include those powered by natural gas, battery or hybrid propulsion systems, and those using techniques, such as light-weight materials, to save energy. Cross-boundary ferry operators are beginning to replace their fleet with new vessels made of carbon fibre, which are much lighter and therefore more energy efficient. By 2030, we expect there will be many such vessels serving regional routes. There will also be opportunities where we can work with service operators to study how new technology vessels work, which is also subject to availability of supporting facilities, such as refuelling or recharging facilities and pier design. Consideration would need to be given to the impact on the financial viability of ferry operators and whether subsidies would be needed.

**Diesel electric vessels**

The Government launched two diesel electric vessels in 2015 for transferring sewage sludge from the Stonecutter Island Sewage Treatment works to T • PARK in Tuen Mun. A trial to retrofit a Star Ferry with diesel electric power system has been approved under the Pilot Green Transport Fund.
HKIA'S CARBON MANAGEMENT PROGRAMME AND NEW TARGET

On 3 November 2016, Airport Authority Hong Kong (AAHK) and 53 airport business partners committed to reduce airport-wide carbon intensity at Hong Kong International Airport (HKIA) by 10% between 2016 and 2020 from a 2015 baseline. This pledge followed the achievement of a 25.6% reduction in carbon intensity between 2010 and 2015 by AAHK and 40 partners, surpassing the target, set in 2010, of 25%.

The airport community completed more than 400 initiatives to achieve this goal. A key project was the replacement of over 100,000 traditional lights with LEDs. In addition to delivering significant carbon reductions, the replacement was supported by a strong business case; the total cost of ownership of LEDs has proven to be less than traditional lighting when maintenance and replacement costs are taken into account. As a result AAHK intends to replace a further 80,000 LEDs in Terminal 1 to further drive down energy costs and emissions. Other key carbon reduction measures either planned or implemented by AAHK and its partners include replacement and reconfiguration of cooling systems and the introduction of electric vehicles (EVs) and charging facilities, a re-commissioning programme to optimise the energy consumption of the Midfield Concourse and the conversion of apron high-mast lighting to LEDs.

AAHK is unique among operators worldwide in setting a carbon reduction target that includes the emissions of the majority of its business partners. AAHK takes this approach because some 60% of the airport's emissions are generated by the partners. Choosing to address this larger airport-wide carbon footprint has enabled AAHK to accelerate the rate of carbon reductions at HKIA. At the heart of the programme is AAHK's online carbon audit system. Designed to be both useful and easy to use, the system enables AAHK to gather key carbon data from participating partners and report collectively on the emissions for the whole airport.

A key outcome of this programme, which has earned HKIA a host of local and international awards for carbon management and reporting, was that in 2013 HKIA became the first airport in Asia Pacific to receive the Airport Carbon Accreditation “Optimization” certificate from Airports Council International. Looking forward, AAHK will work with the participating partners to achieve the new target through engagement with senior management and technical teams, and by developing benchmarking and recognition schemes to identify and share best practices in carbon reduction.

Airlines' low carbon contributions

Hong Kong-based carriers, Cathay Pacific and Cathay Dragon, are investing in renewable fuel, whilst studying the possibility of producing such fuels in Hong Kong. The use of low carbon jet fuel will reduce carbon emissions at the global level and may also have local benefits from the use of MSW and residues as the source of bio-jet fuel production.

of their wider usage in Hong Kong before considering the way forward.

Moreover, EVs require different types of infrastructure support for charging that present many challenges in Hong Kong, such as adequate land for charging facilities and road retrofits.

EPD’s $300 million Pilot Green Transport Fund, set-up in March 2011, is supporting the testing of green and innovative technologies for goods vehicles and the public transport sector. The fund has subsidised light goods vehicles, PLBs and taxis to trial new technologies. The experience has not always been immediately positive. New technologies trials require the full support of the new vehicle manufacturers since all sorts of technical assessment and adjustments are needed, including replacing vehicles as a result of breakdowns. The vehicle owners need to be willing and available to deal with such inconveniences.