



Demographic Change and Sustainable Mobility in Hong Kong

Simon K.W. Ng

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Room 701, Hoseinee House, 69 Wyndham Street, Central, Hong Kong

Tel: (+852) 2893 0213 Fax: (+852) 3105 9713

URL: www.civic-exchange.org

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I. Introduction

Transport is a derived demand. People travel from one place to another to take up opportunities that would bring benefits to them. It could be a journey to school that would bring them knowledge, a trip to the market that would bring them food, or a visit to the countryside that would bring them joy and pleasure. Generally speaking, there is a positive relationship between population and transport need. Transport demand will grow with a larger population.

Transport demand is also related to other factors. For example, the need for travel may vary among people according to their age, employment, income level and physical condition. Land use pattern and city planning, which in turn determines the location of home, work place and leisure facilities, will also influence the number of trips and the distance travelled. The movement of people and freight is also a function of the economic state of the city.

Conventionally, transport planners translate population and economic growth directly into an increase in transport demand over time. More roads and highways will then be built to accommodate the growing mobility need. While this 'predict and provide' approach in transport planning has served many cities well in the past, it is in conflict with the principles of sustainability. Building transport infrastructure is a capital-intensive endeavour that puts enormous financial burden on the government. Even if private funding can be sought to finance construction, new roads and highways are still eating up valuable land and space in the city, as well as causing negative impacts on the environment. This is financially and environmentally not sustainable.

The Hong Kong Government has a history of over-projecting future population¹, and public spending in areas like housing and transport infrastructure has hinged largely on the assumption of a fast-growing population and rising demand. It therefore makes interesting reading when the latest government projections are showing a slowing population growth². What opportunities can a stabilized population (against a fast growing one) bring to sustainable transport planning in Hong Kong?

To answer the question, this paper first reviews the latest global trends in urban development, city growth and mobility need. It then examines the concepts of compact cities and optimal population as a planning option for sustainable urban development, and their respective implications on transport. In the final section of the paper, the prospect of sustainable mobility in Hong Kong will be discussed in light of the city's changing demography.

¹ Christine Loh (2004) *An Alternative Policy Address 2005*, Civic Exchange, noted Hong Kong's track record in over-estimating population growth in the past.

<http://www.civic-exchange.org/publications/2004/apa05e.pdf>

² At one stage, government's population projection was 8.1 million in 2011 and well over 9 million in 2030. Latest population projection shows a declining growth rate, with 7.4 million in mid-2013 and 8.4 million in mid-2033. For the latest official projection, visit

http://www.info.gov.hk/censtatd/eng/interest/pop_proj/pop_proj_2033_index.html

For an introductory paper on Hong Kong's recent population change, see Yip, Lee and Law (2005) *Hong Kong's Challenge: Impact of Population Change*, Civic Exchange.

<http://www.civic-exchange.org/publications/2005/pop%20-%20yll.pdf>

II. Unsustainable development trends

Achieving sustainability is today *the priority* for global development. International agencies such as the United Nations (UN) and the World Bank are advocating responsible development strategies that integrate economic growth, social equity and environmental sustainability.³ It is also acknowledged that long term partnerships among different stakeholders hold the key to the successful implementation of action plans for sustainable development at different levels,⁴ ranging from the Millennium Development Goals⁵ to local Agenda 21.⁶

Despite a better understanding of the sustainability concept among the current crop of policy makers and an unprecedented level of collective efforts worldwide to make development sustainable, it remains uncertain whether the long term sustainability goals could be met. One potential obstacle is the relentless growth of the world's population. Since 1950, the world's population has already increased by a factor of 2.5 (Table 1). According to the latest UN report, the global population is projected to grow from 6.5 billion in 2005 to reach 9.1 billion in 2050.⁷ Additional population are mostly expected in developing countries.

³ The UN is advocating the integration of the social, economic and environmental dimensions of sustainable development in policy-making at international, regional and national levels. A cross-sectoral and broadly participatory approach should be adopted for the successful implementation of measurable goals and targets. The World Bank also calls for partnerships in action to look after the well-being of five key perspectives to sustainable development, namely financial capital, physical capital, human capital, social capital and natural capital.

⁴ The Johannesburg World Summit on Sustainable Development (WSSD) was held in August 2002 with an overriding theme to promote action and to foster partnerships. A Plan of Implementation was put in place with targets and timetables to spur action on a wide range of sustainability issues. For details of WSSD and the Johannesburg Plan of Implementation, visit <http://www.johannesburgsummit.org/index.html> and http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm, respectively. For updated information on partnerships for sustainable development, visit the UN Commission on Sustainable Development Secretariat's website <http://www.un.org/esa/sustdev/partnerships/partnerships.htm>

⁵ The Millennium Development Goals (MDGs) is a set of measurable targets agreed by world leaders during the United Nations Millennium Summit in September 2000 for combating sustainability issues such as poverty, environmental degradation and illiteracy. For more information, visit <http://www.un.org/millenniumgoals/>

⁶ According to Chapter 28 of Agenda 21, each local authority is encouraged to engage local residents, organizations and private enterprises so as to formulate the best sustainable development strategies for the local area. See <http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter28.htm>

⁷ This is the projected figure in the medium variant, with fertility being projected to decline from 2.6 children per woman today to slightly over 2 children per woman in 2050. If fertility were to remain at the current rate, world population would reach 10.6 billion by 2050. See United Nations (2005) *World Population Prospects: The 2004 Revision*. New York: United Nations, Department of Economic and Social Affairs, Population Division. http://www.un.org/esa/population/publications/WPP2004/2004Highlights_finalrevised.pdf

Table 1: Global and urban population for selected years, 1950 – 2050

	1950	2005	2030	2050
World population (in millions)	2,519	6,465	8,130	9,076
<i>More developed regions</i>	813	1,211	<i>n.a.</i>	1,236
<i>Less developed regions</i>	1,707	5,253	<i>n.a.</i>	7,840
Urban population (in millions)	733	3,172	4,945	<i>n.a.</i>

Note: n.a. -- not available

Sources: United Nations (2005) *World Population Prospects: The 2004 Revision*; and United Nations (2004) *World Urbanization Prospects: The 2003 Revision*.

Another UN report predicted even faster growth for the world's *urban* population, rising from 3 billion in 2000 to 5 billion by 2030, at an annual average rate of 1.8 percent (almost twice the rate of global population growth). By 2007, half of the world's population is estimated to live in urban areas, and the percentage will rise further to 61 percent by 2030.⁸ By then, 82 percent and 57 percent of the population in the developed and less developed regions, respectively, will live in urban areas.⁹ Expanding urban population also creates larger cities. There will be 61 cities in 2015 with a population of over 5 million, 22 of which will be the so called mega-cities¹⁰. The corresponding numbers for 2003 were 46 and 20.¹¹

In general, rapid population growth and the swelling of urban settlement will lead to higher consumption of natural resources. There will also be greater needs for mobility, causing car ownership and the use of motorized transport to rise.¹² Indeed, demand for passenger and freight transport tends to grow faster than population and Gross Domestic Products (GDP)¹³. Since 1950, the world's vehicle fleet has expanded tenfold to almost 700 million¹⁴. It is now growing at a rate of roughly 5 percent or 16 million

⁸ United Nations (2004) *World Urbanization Prospects: The 2003 Revision*. New York: United Nations, Department of Economic and Social Affairs, Population Division.

<http://www.un.org/esa/population/publications/wup2003/WUP2003Report.pdf>

⁹ For a discussion on world urbanization prospect, see United Nations (2004), *ibid.*, pp.13-35.

¹⁰ Mega-cities are defined as urban agglomerations of 10 million inhabitants or more.

¹¹ See United Nations (2004), *op. cit.*, pp.72-83, for a discussion on population growth in cities. There were twenty mega-cities in 2003, including Tokyo, Mexico City, New York, Sao Paulo, Mumbai, Delhi, Calcutta, Buenos Aires, Shanghai, Jakarta, Los Angeles, Dhaka, Osaka-Kobe, Rio de Janeiro, Karachi, Beijing, Cairo, Moscow, Metro Manila, and Lagos. By 2015, Istanbul and Paris will also join that list.

¹² Many urban areas in western countries like the United States and Canada have expanded geographically at a rate much higher than their population growth. It has resulted in low densities, higher waste of space, dissociation of work place and residence, higher car ownership and car use, longer traveling distance, higher energy consumption and more pollution problems.

¹³ According to the World Bank, demand for freight and passenger transport in most developing and transition countries is growing 1.5 to 2.0 times faster than GDP, with the bulk of this increase in road transport. <http://www.worldbank.org/transport/whysimp.htm>

¹⁴ Various sources have quoted different historic global fleet numbers. According to Faiz, there were 630 million vehicles in 1988, representing a tenfold rise over the previous 40 years. According to American Automobile Manufacturers Association quoted in World Resources

vehicles each year¹⁵. At this rate, there will be well over 1 billion vehicles on the roads by 2025¹⁶. Motorization will put additional stress on the environment in two major ways: energy use and pollution. It is estimated that global oil consumption will grow by 1.6 percent each year up to 2030, with the bulk of increase coming from the transport sector. In 2030, transport will account for 55% of the world's oil consumption.¹⁷ At a growth rate of 2.1 percent per annum for aggregate energy demand, transport will overtake industry as the largest end-use sector in the 2020s.¹⁸ Pollution-wise, rising oil consumption and motor vehicle use will lead to further increase in global carbon dioxide (CO₂) emissions. It is projected that the global transport sector's CO₂ emissions will increase by over 85 percent from 2000 to 2030.¹⁹ All these trends are unsustainable and they have to be reversed.

Regional and local trends are more diverse. Depending on the stages of development, individual cities and regions are facing urban growth pressure of different scales. Developing regions, for example, are put under enormous population pressure especially in the sprawling cities. They are in greater and urgent demand for transport facilities and other infrastructure, and are less reluctant to compromise the environment and the general quality of life for economic growth and development. With a large population at risk, the social costs stemming from unsustainable and irresponsible development practices could be extremely high in these regions. At the other end of the spectrum, developed countries are in general experiencing slower population growth. It could open up excellent opportunities, given the right policy formulae, for a more sustainable development path. However, affluent societies often breed unsustainable lifestyles, such as car dependency and environmentally irresponsible consumerism²⁰. Resistance to change personal habits and public policies is usually strong.

III. Sustainable urban development

According to Wheeler²¹, the planning for urban sustainability²² is still in an infant stage. City planners, architects and academics have only begun to look deeper into

1998-99, there were 70 million vehicles in 1950 and 630 million in 1994. United Nations Statistical Yearbook shows that there were 663 vehicles in 1998. For details, see Faiz (1993) "Automotive emissions in developing countries – relative implications for global warming, acidification and urban air quality", *Transportation Research A*, 27(3), pp.167-186; World Resources Institute (1998), *World Resources 1998-99*. New York, Oxford University Press, pp. 171-173. http://population.wri.org/pubs_content_text.cfm?ContentID=1524 ; and United Nations (various years) *Statistical Yearbook*, New York.

¹⁵ See World Resources Institute, op.cit., p.172.

¹⁶ It was suggested that India and China, where motor vehicle ownership is growing at double-digit rates, would have a combined 1.7 billion vehicles at their current population levels if they achieve the car ownership rate of the United States which stands at 1.3 persons per motor vehicle. See <http://earthtrends.wri.org/text/environmental-governance/feature-54.html>

¹⁷ It is believed that no other fuel will mount a serious challenge to oil in road, air and maritime transport up to 2030. See International Energy Agency (2002) *World Energy Outlook 2002*. Paris, p.59. <http://www.iea.org/textbase/nppdf/free/2000/weo2002.pdf>

¹⁸ Ibid., p.66.

¹⁹ Ibid., pp.78-80.

²⁰ For example, consumption of disposable products like plastic bags.

²¹ Stephen Wheeler (1998) "Planning sustainable and livable cities", in LeGates and Stout (2003)(eds.) *The City Reader*, third edition, London: Routledge, pp. 486-496.

²² Ibid., p.491. Sustainable urban development is defined by Wheeler as "development that improves the long-term social and ecological health of cities and towns". At the preparatory

sustainability issues in the context of patterns of city development since the early 1990s²³. Among the early works²⁴, one of the common themes was to look for the right urban development strategies to create sustainable cities. It is arguable whether a self-sustaining city (sustainable city in an absolute sense) would ever exist²⁵, especially in a time when most cities are connected one way or another to the rest of the world. Realistically, as most people would agree, it is more important and practical for a city to show encouraging signs of becoming more sustainable, like “moving towards greater resource efficiency, environmental quality, social equity, and community vitality, while moving away from automobile dependency, non-renewable resource consumption, hazardous waste generation, and inequality”.²⁶ Based on the works of others, Wheeler has outlined nine emerging directions for urban sustainability as follows:

- ◆ Compact and efficient land use;
- ◆ Less automobile use and better access;
- ◆ Efficient resource use, less pollution and waste;
- ◆ Restoration of natural systems;
- ◆ Good housing and living environments;
- ◆ A healthy social ecology;
- ◆ A sustainable economy;
- ◆ Community participation and involvement; and
- ◆ Preservation of local culture and wisdom.

Compact cities

One of the most discussed and debated urban development strategies over the last 15 to 20 years is the compact city approach which many believe is one of the keys in achieving sustainable urban form.²⁷ It came as a counter strategy in response to the sprawling of cities disproportionate to the growth of population in most western countries particularly during the 1970s and 1980s.²⁸ Such rapid decentralization and

meeting for the URBAN21 Conference in 2000, sustainable urban development is defined as "improving the quality of life in a city, including ecological, cultural, political, institutional, social and economic components without leaving a burden on the future generations. A burden which is the result of a reduced natural capital and an excessive local debt. Our aim is that the flow principle, that is based on an equilibrium of material and energy and also financial input/output, plays a crucial role in all future decisions upon the development of urban areas."

²³ This new focus coincided with the adoption of Agenda 21 at the Rio Earth Summit in 1992, which lays down directions and action plans for sustainable human settlement development. See UNECD (1992) *Agenda 21*, Chapter 7.

<http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter7.htm>

²⁴ Such as Yanarella E J and Levine R S (1992) "Does sustainable development lead to sustainability?" *Futures*, 24(8), pp.759-774; Houghton G and Hunter C (1994) *Sustainable Cities*. London: Regional Studies Association.

²⁵ Josef Leitmann (1999) *Sustaining Cities: Environmental Planning and Management in Urban Design*. New York: McGraw-Hill, p.21; Wheeler, op.cit., p.490.

²⁶ Wheeler, op.cit., p.491.

²⁷ As starters, see a trilogy of books on compact cities and sustainable urban form: Jenks, Burton and Williams (1996) (eds.) *The Compact City: A Sustainable Urban Form?* London: E & FN Spon; Williams, Burton and Jenks (2000) (eds.) *Achieving Sustainable Urban Form*. London: E & FN Spon; Jenks and Burgess (2000) (eds.) *Compact Cities: Sustainable Urban Forms for Developing Countries*, London: Spon Press.

²⁸ For example, the population of New York metropolitan area grew by only five percent between 1965 and 1990, while the developed area expanded by 61 percent. See de Roo and Miller (2000) (eds.) *Compact Cities and Sustainable Urban Development: A Critical Assessment of Policies and Plans from an International Perspective*, Aldershot: Ashgate, p.5.

suburbanization often resulted in low density development, high waste of space, loss of agricultural land, high dependence on private cars, long travel distance, high costs of infrastructure provision, high consumption of energy, and high vehicle emissions. In essence, the compact city approach advocates the manipulation of urban size, form and structure to produce high-density, compact urban layouts with mixed land use in close proximity. Variations on this approach, such as transit-oriented development²⁹ and smart growth³⁰ are also gaining momentum in some developed countries like the United States (US) and New Zealand.

Unsurprisingly, the impact of urban form on transport has become the focal point of many compact city debates. It is generally believed that a compact urban form and mixed use development will bring people closer to places they need to go everyday, like their work place and local facilities. This will reduce travel demand, travel time, and the use of private cars. Through improved urban design, people will be encouraged to walk and to cycle for short distance journeys. High population densities will also better support public transport and make it more efficient and cost-effective. Overall speaking, traffic emissions will be reduced, and there will be fewer traffic accidents.³¹

Despite all the optimism in theory, it is becoming apparent that the compact city model has fewer benefits to offer than first expected.³² Questions have been raised as to whether a compact city or high-density development would actually contribute to achieving sustainable mobility.³³ Firstly, it is indeed difficult to isolate the benefits of planning on sustainable transport from other major trends and forces that shape travel patterns and demand, such as socio-economic change and consumer choice. Even if it can be separated, some would argue that personal attitudes are more strongly associated with travel behaviour than urban form and structure.³⁴ Secondly, it is unclear whether the compact form is superior to other urban layouts for sustainable transport. Instead, side effects of a dense urban development pattern may exacerbate the adverse impact of traffic pollution. Thirdly, high-density and mixed use development is very unpopular among urban residents in western countries. Some consider urban compaction as 'town cramming' and this is in conflict with their vision of liveable communities.³⁵ Others consider it as a way to force people onto public transport.³⁶

²⁹ Transit-oriented or transit-focused development essentially promotes concentrations of high density development around public transport nodes, such as rail station. See Cervero, R., Hall, P. and Landis, J. (1992) *Transit Joint Development in the United States*, Monograph 42, Institute of Urban and Regional Development, University of California at Berkeley; and Transportation Research Board (1997) *Transit-Focused Development: A Synthesis of Transit Practice*, TCRP Synthesis 20, Washington, D.C.: National Academy Press.

³⁰ The United States Environmental Protection Agency defines 'smart growth' as "development that is good for the environment, community, and economy. It represents an approach to planning and development that: fosters efficient land use; encourages transportation and housing choice; and minimizes impairment of air and water quality." For more information on smart growth in the United States, visit Smart Growth Online

<http://www.smartgrowth.org/default.asp>. For smart growth in New Zealand, see <http://www.fulbright.org.nz/voices/axford/eleyc.html>

³¹ See Williams K (2005) (ed.) *Spatial Planning, Urban Form and Sustainable Transport*, Aldershot: Ashgate, Chapter 1, pp.1-13.

³² See Levine J (1998) "Rethinking accessibility and jobs-housing balance", *Journal of the American Planning Association*, 64(2), pp.133-149.

³³ Williams, op.cit., p.2-3.

³⁴ Matt K (2002) "The compact city: conflict of interest between housing and mobility aims in the Netherlands", in Stern, Salomon and Bovy (eds.) *Travel Behaviour: Spatial Patterns, Congestion and Modelling*, Cheltenham: Edward Elgar, Chapter 1, pp.3-19.

³⁵ For the dilemma in the Netherlands, see Matt, *Ibid*.

Salomon and Mokhtarian³⁷ also attacked the assumption underlying the compact city model that individuals will use the opportunity to reduce their travel if they are given that option. They argued that people who live in compact cities will probably use the time saved in shorter commuting to make additional journeys.

The proposition that compact cities are conducive to sustainable urban and transport development is still inconclusive. The merits and demerits of compaction will be time and space variant. It is, however, crystal clear in the urban sustainability research that the land use planning and urban development decisions to be made today will have a long-lasting effect for many generations, both on the physical environment and the natural landscape.³⁸ Today's cities are mirrors of past development strategies, and today's policy decisions will shape tomorrow's cities.³⁹

Optimal population

While there are urban development strategies like the compact cities approach that optimize urban form, population density and distribution in pursuit of sustainability goals, very little has been explored on managing the population size of a city as a way to achieve urban sustainability. One possible explanation is people's general infatuation with growth.⁴⁰ In most urban areas or regions, periods of rapid population growth usually coincide with periods of rapid economic growth. People intrinsically associate population expansion with economic progress, whereas decline in population is paired with economic stagnation or recession. As such, city planners and policy makers would rather not interfere with population growth, and normally treat it as a given condition for future development plans. Sometimes, assumed population growth becomes a constraint to sustainable planning.

In 1969, President Richard Nixon of the US established a Commission to study population growth and its impact on the American future. Chairman of the Commission, John Rockefeller, upon completion of the study in 1972, made the following remarks in the Letter of Transmittal:

“After two years of concentrated effort, we have concluded that, in the long run, no substantial benefits will result from further growth of the Nation's population, rather that the gradual stabilization of our population through voluntary means would contribute significantly to the Nation's ability to solve its problems. We have looked for, and have not found, any convincing economic argument for continued population growth. The health of our country does not depend on it, nor does the vitality of business nor the welfare of the average person.”⁴¹

³⁶ See Atkin “Smart growth: do we really want to turn Auckland into Hong Kong?” http://woppit.com/atn/Smart_Growth.html

³⁷ Salomon and Mokhtarian (1998) “What happens when mobility-inclined market segments face accessibility-enhancing policies?” *Transportation Research D*, 3, pp.129-140.

³⁸ De Roo and Miller, *op.cit.*, p.1.

³⁹ Kaul and Kirdar “An agenda for making cities fit for people”, in Kirdar U (1997) (ed.) *Cities Fit for People*, New York: United Nations, pp. 9-23.

⁴⁰ For an interesting account on reversing population growth, see Grant L (2000) *Too Many People: The Case for Reversing Growth*, Santa Ana, California: Seven Locks Press.

⁴¹ See the Report of the Rockefeller Commission on Population http://www.population-security.org/rockefeller/001_population_growth_and_the_american_future.htm

The Rockefeller Report also explains how a slower population growth can contribute to America's ability to solve its many problems, such as water supply and environmental pollution. Firstly, slower population growth can provide an opportunity for the administration to devote resources to the quality rather than the quantity of life. Secondly, slower growth in turn means slower accumulation of problems, and the administration can 'buy time' to find the right solutions.⁴² Some of the comments made in this report are highly relevant and useful to policy makers today who are keen to halt and reverse unsustainable development trends.

In the United Kingdom, Optimum Population Trust (OPT)⁴³ suggested that the government should consider reversing its pro-growth population policy. If not, the UK will never have an effective long-term transport policy.⁴⁴ According to OPT's estimation, there will be 10 million fewer (or 27 percent less) vehicles on the UK's road network if population stabilized at 52 million in 2050, instead of growing from 60 million to 71 million, according to the government's projection. Adding fewer people and vehicles will certainly put less pressure on land and natural resources.

IV. Sustainable transport for Hong Kong

Population and economic growth

Hong Kong emerged quickly in the 1960s and 1970s as a newly industrialized economy in the Asia Pacific region, and then more recently as an international finance and service centre. During this period of economic growth, Hong Kong also witnessed a rapid expansion of population, both of which contributed significantly to a swelling demand for transport. It had urged the government to systematically study Hong Kong's transport need and to plan for a better transport system. Emphases have been placed on expanding transport infrastructure, improving public transport, and managing road use.⁴⁵

To accommodate the ever-growing movement of passengers and freight, the Hong Kong Government over the years has invested heavily on transport infrastructure. Recent figures show that from 1997 to 2003, the government spent roughly 2.5 to 3 percent of its annual expenditure or close to HK\$ 7 billion each year on transport⁴⁶ (Table 2). In addition, there are also substantial public and private investments in the public transport sector⁴⁷.

⁴² Ibid.

⁴³ The Optimum Population Trust is an environmental organization whose concern is with the impact of population growth on the environment. Visit <http://www.optimumpopulation.org/index.html>

⁴⁴ Optimum Population Trust on transport. <http://www.optimumpopulation.org/opt.more.traffic.html>

⁴⁵ They were the three principles of transport development adopted in the first and second white paper on transport policy in Hong Kong, in 1979 and 1990 respectively.

⁴⁶ Expenditure by statutory organizations, in which the Government has only an equity position, such as the Airport Authority, the MTR Corporation Limited, and the Kowloon-Canton Railway Corporation, is not included. Besides, advances and equity investments from the Capital Investment Fund are also excluded.

⁴⁷ Such as Government's injection of equity capital into the rail corporations for new rail projects, and bus operator's annual investment in new fleets.

Table 2: Public Expenditure in Transport, Hong Kong, 1997 to 2003

	Transport	Percentage	Total
	(HK\$ million)		(HK\$ million)
1997 – 1998	7,212	3.1	234,780
1998 – 1999	6,656	2.5	266,448
1999 – 2000	6,559	2.4	269,484
2000 – 2001	6,395	2.4	267,507
2001 – 2002	6,399	2.4	269,359
2002 – 2003	7,732	2.9	263,520

Sources: Hong Kong SAR Government (various years) *Hong Kong Year Book*.

Between 1973 and 2003, Hong Kong's population grew by 64 percent, the number of registered vehicles almost tripled, the length of public road almost doubled, and daily passenger journeys grew by roughly 100 percent (see Table 3). These figures show that the number of trips and the distance travelled have increased at a much faster rate than the population. It can be explained by a combination of factors: firstly, escalating mobility need has been positively related to the maturation of the baby boomers of the 1950s, as well as the movement of their offspring from childhood into adulthood. Secondly, an average person is making more trips today than thirty years in the past because of greater personal wealth and a different life style. Trip rate per person has risen significantly from 1.27 in 1973⁴⁸ to 1.82 in 2002.⁴⁹ Thirdly, decentralization of population into the New Territories and the further displacement of residence-work locations have contributed to longer commuting distances and journey times. Between 1973 and 2002, the estimated mean journey time increased from 17 to 24 minutes for private transport trips and from 37 to 43 minutes for public transport trips.⁵⁰ In 2004, each licensed vehicle in Hong Kong travelled an average distance of 57.5 kilometres per day⁵¹.

A higher income level has also led to a greater demand for good quality transport services. There is a growing demand for personalized transport as reflected in the rising trends of car ownership and car use as shown in Table 3. For the majority of Hong Kong residents who are regular patrons of public transport, they are demanding high frequency, high speed, door-to-door services provided by a variety of modes. The number of bus routes, for example, quadrupled to almost 650 routes over the last 30 years (Table 3).

⁴⁸ Wilbur Smith and Associates (1976) *Hong Kong Comprehensive Transport Study*, p.72.

⁴⁹ Transport Department (2003) *Travel Characteristics Survey 2002: Final Report*, p.11.

⁵⁰ *Ibid.*, p.12; and Transport Department (1993) *Travel Characteristic Survey: Final Report*, p.6–18.

⁵¹ Transport Department (2005) *The Annual Traffic Census 2004*, p.11.

Table 3: Selected Statistics for Hong Kong, 1973, 1986 and 2003

	1973	1986	2003
Population	4,159,900	5,588,000	6,803,100
Registered vehicles	202,775	300,995	591,502
Licensed vehicles	n.a.	266,777	524,249
Road length (km)	998	1,345	1,934
Franchised bus routes	167**	356	647
Daily passenger journeys	5,800,600	8,663,000	11,600,000 [#]
Average Daily Vehicle-kilometre (million)	n.a.	16.34	30.67

Notes: * Official figures for licensed vehicles only became available in 1977. The number for that year was 190,552.

** Figure as at March 1975.

Official figure not available. Estimation based on the assumption that the 10.5 million daily public transport passenger journeys in 2003 accounted for 90 percent of all daily passenger journeys.

n.a. not available

Sources: Wilbur Smith and Associates (1976) *Hong Kong Comprehensive Transport Study*; Hong Kong SAR Government (1987) *Hong Kong 1986*; Transport Department (1989) *Hong Kong Second Comprehensive Transport Study*; Census and Statistics Department (2004) *Hong Kong Annual Digest of Statistics 2003*; Environmental Protection Department (2005) *Environment Hong Kong 2005*; and Transport Department (2005) *Monthly Traffic and Transport Digest*. January 2005

City planning and transport

Whereas population and economic growth have always been the driving force behind the improvement and expansion of Hong Kong's transport system, much of the derived transport demand is in fact heavily influenced by the government's policy on urban development, city planning and transport.

With limited land resources and a mountainous terrain, Hong Kong has, by default, developed a high-density, compact urban form.⁵² Major urban developments have mostly followed past trends and concentrated along both sides of Victoria Harbour, where population density is among the highest in the world. On average, there are over 6,000 people for each square kilometre in Hong Kong⁵³, and the density could be as high as 50,000 people per square kilometre in the most populated districts⁵⁴. One major

⁵² Approximately only 17 percent of Hong Kong's land is built-up area. For discussions on Hong Kong's compact development, see Zhang "High-rise and high-density compact urban form: The development of Hong Kong", pp.245-254; and Mahtab-uz-Zaman, Lau and So "The compact city of Hong Kong: A sustainable model for Asia?" pp.255-268. Both in Jenks and Burgess (2000)(eds.) *Compact Cities: Sustainable Urban Forms for Developing Countries*. London: Spon Press.

⁵³ In mid-2004, population density was estimated 6,380 persons per square kilometre. Hong Kong SAR Government (2005) *Hong Kong 2004*. p.459.

⁵⁴ Density of Kwun Tong in 2004 was estimated at 50,910 persons per square kilometre. Ibid.

advantage of high-density development is that compaction has made the operation of high capacity, mass transit systems, like bus and railway, feasible and efficient.

Due to an influx of population from the mainland, as well as substandard living conditions in the congested urban areas, the government began the process of urban decentralization starting in the 1950s through a new town development programme.⁵⁵ In theory, new towns are supposed to be self-contained. Travelling between new towns and the urban core would be kept to a minimum. In reality, however, new town dwellers were keeping their jobs and social ties in the urban areas, and self-sufficiency therefore failed. New towns such as Shatin, Tai Po and Tuen Mun have instead become nodes of massive commuter traffic, putting enormous pressure on the transport system. In places not connected to the urban area by railway, in particular, like Tuen Mun prior to completion of the West Rail, residents had to suffer peak-hour road traffic congestion en route to work on a daily basis. The same problem recurred more recently in Tseung Kwan O. For over ten years since the first intake of population in Tseung Kwan O, residents had to rely on road transport for daily commuting, and Tseung Kwan O Tunnel was heavily congested during peak hours. Traffic situation on major roads vastly improved after the commissioning of the Tseung Kwan O Line in 2003.

The government has apparently never really stopped adding density within the core urban area. Most of Hong Kong's residential and commercial developments have been driven by market forces, which will in the long run determine city size and density. Unsurprisingly, developers are always attracted to the prime sites within the dense urban areas for better transport provisions and better access to amenities and services, regardless of the high land costs. In response to the great demand for urban land, the government is understandably happy to make sites available for development so as to maximize land sale revenue. Recent developments in places like Tai Kok Tsui, Mongkok and Kennedy Town, and other future plans, such as Central and Wanchai Reclamations, will largely intensify road traffic and exacerbate street level air and noise pollution in the already congested urban areas. Urban living space in Hong Kong is becoming alarmingly unsustainable.

In May 2005, the Council for Sustainable Development published Hong Kong government's first sustainable development strategy⁵⁶. A three-pronged strategy is set out for achieving a sustainable urban living environment⁵⁷. With respect to future urban development, the government will in essence further develop the New Territories with

⁵⁵ For a detailed account of new town development in Hong Kong up to the 1980s, see Bristow, R (1989) *Hong Kong's New Towns: A Selective Review*. Hong Kong: Oxford University Press.

⁵⁶ In 2004, the Council for Sustainable Development initiated a five-stage public engagement process with the aim of formulating Hong Kong's first sustainable development strategy. Three pilot areas were identified for public consultation and discussion, namely, solid waste management, renewable energy, and urban living space. For more details about the process and related publications, visit <http://www.susdev.org.hk/en/index.html>

⁵⁷ Council for Sustainable Development (2005) *A First Sustainable Development Strategy for Hong Kong*. p.13. <http://www.susdev.org.hk/en/pdf/1stSDStrategyE.pdf> The three strategic objectives are: (i) to speed up improvements to the environment of older urban areas through a "people-oriented" approach and the flexible deployment of the "4R" strategy – redevelopment, rehabilitation, preservation and revitalization; (ii) to plan and further develop the New Territories, taking account of stakeholder concerns on sustainability issues such as the need to protect the natural environment and cultural characteristics of rural areas, while having regard to Hong Kong's long-term socio-economic needs; and (iii) to promote sustainable urban planning and design practices that will ensure that Hong Kong will be an attractive and enjoyable place in which to live and work.

due social, economic and environmental considerations, as well as speed up the revitalization of old neighbourhoods through 'people-based' and sustainable planning approach. Based on past experience, transport will once again hold the key to the successful implementation of Hong Kong's future sustainable urban development strategies.

New prescriptions for sustainable transport

Hong Kong's transport system to date is largely efficient, affordable to the public, profitable to the operators, and full of choice. However, it is run at extremely high external costs to society in terms of congestion, pollution, and associated health impacts⁵⁸. While the government has recently pledged to build a transport system that will satisfy Hong Kong's growing transport need in a sustainable manner⁵⁹, the current situation is suggesting otherwise. For example, the latest annual concentrations of major pollutants recorded at all roadside monitoring stations still failed to comply with the Hong Kong air quality objective (HKAQO)⁶⁰. With the assumption of a growing population and economy over the short and medium term⁶¹, and more of the same approach from the government's transport planners, the opportunity to put Hong Kong's transport system back on a sustainable development track looks very remote.

Hong Kong has clearly suffered from the government's over-indulgence in road building and a casual approach to transport demand management over the last few decades. Other than squeezing in more roads on reclaimed lands or along the shoreline, little progress has been made by the government to introduce proven traffic management schemes, such as road pricing, in congested city areas. Since 1973, almost 1,000 kilometres of roads have been added to the network. In terms of land consumption, approximately 38 square kilometres or 3.4 percent of Hong Kong's land area was taken up by roads (compared to 3.8 percent of land for residential use)⁶². Meanwhile, average travel speed has been falling⁶³, and road traffic is still contributing significantly to air pollution in Hong Kong. Road building is clearly not a sustainable long term option for Hong Kong's transport problems. Further expanding Hong Kong's road network in an

⁵⁸ It is well researched that major traffic pollutants such as nitrogen dioxide and respirable suspended particulates are strongly associated with cardio-respiratory diseases in Hong Kong. For a number of studies short-term health effect of ambient air pollution, visit http://www.epd.gov.hk/epd/english/environmentinhk/air/study/rpts/effect_ambient_ap.html.

A 2003 study on toxic air pollutant (TAP) in Hong Kong also shows that major TAPs that contribute to the highest cancer risk estimates are all related to road traffic. See Center for Coastal and Atmospheric Research (2003) *Assessment of Toxic Air Pollutant Measurements in Hong Kong: Final Report*, Hong Kong: HKUST.

http://www.epd.gov.hk/epd/english/environmentinhk/air/study/rpts/assessment_of_tap_measurements.html

⁵⁹ This is stated as the objective of Hong Kong's Third Comprehensive Transport Study (CTS-3), and repeatedly emphasized as Environment, Transport and Works Bureau's policy objective.

⁶⁰ In 2004, maximum daily and annual concentration of both nitrogen dioxide and respirable suspended particulates at all three roadside monitoring stations (in Central, Causeway Bay and Mongkok) did not comply with the Hong Kong air quality objectives. See Environmental Protection Department (2005) *Environment Hong Kong 2005*. Resource materials on air. Section 5.5 Air quality statistics. <http://www.epd.gov.hk/epd/misc/ehk05/english/air/05.html>

⁶¹ For CTS-3, three scenarios of low to high growth were developed. Annual GDP growth rate (1997 to 2016) was assumed within the range of 2.4 to 4.9 percent. Population in 2016 was projected from 8.2 million (low growth) to 10.1 million (high growth). Also see footnote 2.

⁶² Figures as at the end of 2004. Hong Kong SAR Government (2005), op.cit., p.532.

⁶³ For example, car journey speed on Hong Kong Island dropped from 26 kilometres per hour (kph) in 1997 to 21.7 kph in 2003.

extremely dense urban setting would probably destroy any remaining quality urban space.

Besides, the government has largely banked on technical measures like better engines and cleaner fuels to make transport less polluting, more energy efficient and environmentally friendly in Hong Kong.⁶⁴ It is understandable as technical measures tend to provide the fastest and least disruptive way to address environmental issues.⁶⁵ However, a technical fix could do little to change the way people use transport – indeed technological advancement allows people to stick to their travelling habits (such as driving their own car) but somehow produce less damage to the environment, at least over the short-term. The Environmental Protection Department's air pollution emission inventory suggests that while the emission level of major pollutants from road traffic has dropped significantly, the contribution of road traffic to emissions has remained high (Table 4). It shows that the environmental benefits achieved through technical measures have been easily offset by the relentless growth of road traffic and vehicle use over the long term.

Table 4: Road Transport and Air Pollutant Emissions, 1990 and 2003

	1990 (in tonnes)			2003 (in tonnes)		
	Road Transport	%	Total	Road Transport	%	Total
Particulate matters	4,620	32.5	14,200	2,090	28.3	7,380
Sulphur dioxide	8,210	6.0	137,000	114	0.1	90,900
Nitrogen oxides	26,800	15.1	178,000	20,100	20.9	96,000
Non-methane volatile organic compounds	10,200	22.1	46,200	7,010	16.7	41,900
Carbon monoxide	107,000	85.6	125,000	56,500	87.7	64,400

Source: Environmental Protection Department, Air Pollutant and Greenhouse Gas Emission Inventory http://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html

To reverse the trend, the Government must look beyond technology-based measures to solve the traffic pollution problem. One alternative is to influence transport demand through the following planning based policy options:

- ◆ Minimize the need for travel by better land use and transport planning;
- ◆ Manage the demand for travel, especially during peak period, by pricing mechanisms (on fuel and road use);
- ◆ Encourage high occupancy transport by improving public transport services, improving modal co-ordination, implementing parking-related measures, and promoting park-and-ride;
- ◆ Encourage non-mechanized transport by improving the pedestrian environment, and promoting walking and cycling for short-distance trips; and

⁶⁴ A comprehensive programme was introduced by the Government in 2000, including initiatives such as adopting tighter fuel and vehicle emission standards, adopting cleaner alternatives to diesel, controlling emissions with pollutant trapping device, and strengthening emission inspection and enforcement.

⁶⁵ On the contrary, policy makers are less inclined to use planning-based measures to tackle traffic pollution, as they normally require longer time to implement and to get the desired effect.

- ◆ Encourage clean transport through pricing incentives, such as fuel tax concession or subsidy.

In principle, the best way to make Hong Kong's transport system sustainable (and to contribute to the city's overall sustainable development goals) is to reduce the level of road based travel.⁶⁶ This can be done by influencing a higher modal split in favour of non-road based modes, such as railway. To make this work, the key is not just to propose and build new railways, but more importantly to increase the role of railway in conjunction with better modal co-ordination between rail and bus. At present, bus and rail are fiercely competing for passengers along major transport corridors, resulting in low load factors, spare capacity (hence wastage, especially under-utilization of the expensive fixed rail assets) and high average costs (hence little room for fare reduction). On the contrary, enhanced bus-rail co-ordination, for example by promoting feeder bus services to rail stations, would allow both bus *and* rail operators to better utilize their system capacity, which in turn would lower average operating costs and in the long run provide better prospects for fare reduction. While bus operators may lose passengers to railway under a feeder system, they could still remain profitable through efficiency gain and an acceptable pre-determined share of the rail operator's additional revenue.

With a rail-based transport system well-co-ordinated with bus services, more passengers will be travelling off-road, and there will be fewer road vehicles running in some of the most congested urban areas. The spared road space should be given to pedestrians, and not taken up further by inefficient road users such as minibuses and taxis. Walking is a sustainable form of transport. However, the prospect of promoting walking in Hong Kong is greatly hampered by the city's extremely hostile street environment – polluted, excessively noisy, overly crowded, little shade, and lots of obstacles, including furniture. So far, the balance between pedestrians and vehicles is wrong, with priority to road space given to vehicles most of the time. Pedestrians are put either underground or above ground so as not to interfere with traffic flow⁶⁷. It is high time the government makes Hong Kong's streetscape a pleasant and safe place for walking so people can also enjoy their lives socially. In doing so, more people will be willing to walk instead of using motorized transport for journeys of short to moderate distances. It will go a long way in enhancing the quality of Hong Kong's urban living space.

The demographic challenge

Looking ahead, patterns of demographic change in the next few decades will present new challenges to Hong Kong's transport system. It will also test the government's resolve in achieving sustainable development in Hong Kong.

Albeit at a slower rate, Hong Kong's population will continue to grow, adding approximately 1.5 million people to the city in the next thirty years. At the current

⁶⁶ For a vision of sustainable transport in Hong Kong, see Barron, Ng, Loh and Gilbert (2002) *Sustainable Transport in Hong Kong: Directions and Opportunities*. Hong Kong: Civic Exchange. http://www.civic-exchange.org/publications/03publication/ST_HK_book.pdf

⁶⁷ Similar comments on the pedestrian environment have been raised by various panelists during the Business and Economic Policy Seminar Series 2005/06: Driven to the Brink – Crucial Road and Rail Choices for Planning Hong Kong's Future, co-organized by South China Morning Post, The University of Hong Kong and Citigroup, on December 5, 2005. Paul Zimmerman claimed that it is wrong to maximize the capacity out of Hong Kong's roads for vehicles. Bill Barron considered putting pedestrians underground as appalling second-best solution.

population level, Hong Kong is already facing a huge task to move closer towards the goal of sustainable mobility. It is therefore almost impossible to anticipate Hong Kong in year 2030 with 35 percent more people, and the associated traffic growth and pollution, without causing major havoc in the city. If population growth slows down, according to government's latest statistics, with a projected population of 8.38 million in mid-2033⁶⁸, it will still require very radical change to the way the government plans the city and manages transport demand today to maintain an acceptable quality of life for Hong Kong residents in the future. It has to be taken seriously though that a slower population growth will provide the policy makers with some breathing space to go back to the drawing board and be more innovative.

Past experience suggests that Hong Kong's changing population composition (see Table 5) will certainly make a mark on transport demand in the years to come. With other factors remaining unchanged, a shrinking working-age population (15 – 64 years) coupled with an ageing population (65 years and above) will reduce the amount of work-based travel, and to a lesser extent personal travel. This is based on the general assumptions that people will travel most in their adulthood⁶⁹ and will travel less after retirement age^{70,71}. However, such decrease in transport demand is likely to be offset by the transport impact of other population trends. Firstly, the number of households is projected to grow at a rate of 37,900 each year up to 2018⁷². More households will generate more travel, as a significant portion of transport demand is household-based, like food shopping and journeys with offspring. Secondly, the future inflow of immigrants and overseas workers, many of whom will be adults and economically active, will serve as an additional source of travel growth. Thirdly, the potential for senior citizens to travel more can be substantial. The government has been extremely negative about the issue of an ageing population in Hong Kong.⁷³ While the resultant surging health care and social service expenditure will put a huge financial burden on public finance,⁷⁴ Loh argues that people aged 65 and above can still play an important role in society, either continue to work beyond retirement age or to serve the community as volunteers, provided that they are blessed with good health⁷⁵. For some senior citizens, they may even have more discretionary money to spend on travel (especially for leisure journeys) as the burden in their early age to repay the mortgage and to raise children has diminished. The impact of an ageing population on transport will be determined by the interplay of various factors, such as health, employment and fare level.

⁶⁸ Census and Statistics Department (2004) *Hong Kong Population Projections 2004-2033*. http://www.info.gov.hk/censtatd/eng/interest/pop_proj/pop_proj_2033_index.html

⁶⁹ This is a period during which people are economically and socially most active, and are enjoying a higher income level. They will make more work-related, household-related journeys. There will also be more leisure journeys.

⁷⁰ Almost zero work travel, and fewer personal travel depending on health condition.

⁷¹ Transport Department (1993), *op.cit.*, p.6–9. A low trip rate of 0.9 was assigned to the age group 65+ during the Travel Characteristics Survey 1991-1993. The trip rates for age groups 16 to 24 and 25 to 34 were 2.51 and 2.41 respectively.

⁷² See Yip, Law, Cheung and Choi (2005) *A Critical Analysis of Population Dynamics and Their Implications on the Future Composition of Households in Hong Kong SAR*. pp.23-31. <http://www.civic-exchange.org/publications/2005/paul.pdf>

⁷³ See Hong Kong SAR Government (2003) *Report of the Taskforce on Population Policy*. Also see Christine Loh (2005) *What is the 'Problem' of an Ageing Population?* <http://www.civic-exchange.org/publications/2005/ageingpop.pdf>

⁷⁴ Yip, Lee and Law (2005), *op.cit.*, p.10.

⁷⁵ Christine Loh (2005), *op.cit.*, p.4.

Table 5: Major Demographic Changes in Hong Kong, 1961 – 2033

	1961	1971	1981	1991	2001	2003	2013	2018	2023	2033
Population (million)	3.17	4.05	5.18	5.75	6.72	6.80	7.39	7.69	7.97	8.38
0 – 14 (%)	40.5	35.9	24.6	20.8	16.4	15.7	12.2	11.8	11.6	10.7
15 – 64 (%)	56.3	59.6	68.7	70.4	72.4	72.6	74.6	72.3	69.0	62.6
65+ (%)	3.2	4.5	6.6	8.7	11.2	11.7	13.2	15.9	19.4	26.7
<i>Dependency ratio</i>	776	678	455	420	382	378	341	382	449	598
Households (million)	0.69	0.86	1.24	1.58	2.08	2.17	2.54	2.74	n.a.	n.a.
<i>Average household size</i>	4.5	4.5	3.9	3.4	3.2	3.1	n.a.	n.a.	n.a.	n.a.

Note: n.a. – not available

Sources: Census and Statistics Department (1969) *Hong Kong Statistics 1947-1967*;
 Census and Statistics Department (2004) *Hong Kong Population Projections 2004-2033*;
 Census and Statistics Department (various years) *Hong Kong Annual Digest of Statistics*; and
 Census and Statistics Department <http://www.info.gov.hk/censtatd/>

Urban renewal and new developments in the New Territories will give fresh impetus to population redistribution. In old urban districts, many buildings constructed during the first major period of population growth in Hong Kong some forty years ago are now becoming too old and dilapidated to keep. As these old building blocks are the only opportunities to increase space utility in a compact urban area, some people are in favour of urban intensification by re-developing the old blocks into new high-density, high-rise developments. Others are more concerned with the poor living conditions that characterize many old urban areas, and prefer lowering urban density by developing more new towns away from the urban core. As stated in the government's sustainable development strategy, a combination of the two alternatives seem to be the way forward⁷⁶. Either way, there will be significant implications on travel demand characteristics and commuting patterns. To achieve greater sustainability, the government should go for high speed commuter rail instead of long-haul road transport to complement New Territories-based development. For urban regeneration and revitalization, the best way to make high-density development more sustainable is to integrate it with a non-road based transport system, such as the underground railway.

V. Conclusions

At a crossroads

Hong Kong's transport system is now at a crossroads. It is an excellent system in many respects according to international standards, but it is also largely unsustainable. While the government has expressed its will to satisfy Hong Kong's transport needs in a

⁷⁶ Council for Sustainable Development (2005), op. cit., pp.12-13.

sustainable manner, many of its transport strategies and policies have either misfired or are inconsistent with the sustainability goals.

What Hong Kong needs to develop now is a truly comprehensive integrated vision of a more sustainable transport system (which is also part of a broader vision for Hong Kong as a sustainable city). In this envisioning process, it is crucial that policy makers and transport planners are put in the right frame of mind – it is more about ‘build to sustain’ rather than ‘build to expand’. In this paper, it is argued that Hong Kong’s future transport policy should be geared towards encouraging bus-rail co-ordination (as the long term basis for fare reduction, higher operating efficiency and less road congestion), enhancing pedestrian movement in a dense urban setting (as a means to reduce short distance mechanized travel and to promote walking), and managing vehicle use.

In this respect, one logical first step the government should take is to press ahead with the merger of the MTR Corporation Limited and the Kowloon-Canton Railway Corporation. This is beneficial to Hong Kong, not so much for short term gains (like fare reduction), but rather because of the long term positive impact it will bring to rail transport as a whole. The merger will make rail in Hong Kong more efficient and more competitive in terms of fare and services. In the long run, it will attract more passengers off the road, and contribute significantly towards a more sustainable transport system in Hong Kong.⁷⁷

A golden opportunity

A stabilized or a slow growing population may not significantly reduce transport demand *tomorrow*, as demographic dynamics tend to slowly, but continuously, influence transport need. However, as there will be less pressure on the government to build more flats and to add more roads in the immediate future, this is an excellent opportunity for Hong Kong to re-position its urban development plans and transport policies, as well as to re-consider its public expenditure strategy *over the longer term*. With a smaller population projection, resource allocation may become more flexible, and policy recommendations should be directed towards quality rather than quantity.

The pressing need to re-develop some of Hong Kong’s old urban districts also presents the government with another golden opportunity to re-configure land use and city growth as a means to achieving long term sustainability. Population density should be lowered in extremely crowded areas in order to reduce traffic, to re-claim local open space and to improve pedestrian environment. Local density will be allowed to rise only if there is spare road capacity and pedestrian walkway space to accommodate additional traffic or if the area is readily served by a high capacity railway. To add density and then to support it by building more roads in a congested urban context, or vice versa, is irresponsible and short-sighted.

A decision on Hong Kong’s future development path is imminent. Such decision will bear considerable impact on Hong Kong’s urban and natural landscape, as well as on people’s quality of life for the next fifty years and beyond. Opportunities to make lasting changes for the better of the city only come along once every few decades. If Hong Kong is to become a *truly sustainable* world city, this is the moment of truth.

⁷⁷ See Civic Exchange (2004) *Merging Hong Kong’s Railways: The Public Interest Perspective*. <http://www.civic-exchange.org/publications/2004/railmerger%20-%20E.pdf>