Sustainable Transport in Hong Kong Directions and Opportunities

June 2002

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THE ASIA FOUNDATION
Civic Exchange and the Asia Foundation are grateful for the support of the MTR Corporation Limited for the publication of this report.

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**The Asia Foundation** is a non-profit, non-governmental grant-making organization committed to improving governance and civil society by promoting open discussions on public policy matters such as sustainable transport.
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The Hong Kong Special Administrative Region of China (HKSAR) has arguably been a "world city"1 ("Asia's World City") for at least the past several decades. Yet, as with any economy heavily dependent on trade, changing fortunes in an evolving world economy make the future status of the HKSAR far from assured. A further, and more specific issue is that Hong Kong, unlike other urban centers often cited as "world cities,"2 faces a continuing and rapid expansion of its population. Historically, the rate of increase has been about one million persons per decade and a similar or only moderately slower pace is expected for the next decade and a half.3

As the HKSAR grows from a city of about 7 million in 2002 to a city of about 9 million in 2020, it must cope with the need to increase the supply of housing, transport, and other infrastructure-intensive services by nearly 30%. The expansion of transport services in an already densely populated and highly developed landscape threatens to seriously undermine the quality of life in the HKSAR, even if the economy remains strong and personal freedoms remain sufficiently secure. Hence, the need to make Hong Kong's transport system more sustainable is vital for the entire community and not merely for planners and environmentalists.

It would be detrimental to the quality of life of Hong Kong people, as well as for the HKSAR's aspirations to remain a "World City" if current Transport Bureau and Transport Department policy were to be the sole basis of dialogue on this issue. To promote a more vigorous community dialogue, Civic Exchange, with a grant from the Asia Foundation, has developed a set of three alternative visions for a more sustainable transport system for the HKSAR. This report outlines one vision, which consists of an integrated set of planning- and technology-based strategies.4

An alternative vision for Hong Kong's transport system

A transport system should be considered sustainable only if it meets two basic conditions. First, it must meet current needs for mobility without imposing unacceptable costs, including external costs, on those who use it and are affected by it. Second, it must be able to meet projected future needs for mobility at acceptable costs. Does Hong Kong's current transport system meet these criteria?

In some respects, Hong Kong's transport system is among the best in the world. Almost everyone can rely on convenient, comfortable, and affordably priced public transport. Good transport is also central to Hong Kong's status as an international business center and logistics hub. The internal costs of transport for passengers, including transport fares, time spent waiting for transport service, and the quality of the journey, are low. In terms of internal costs, Hong Kong clearly does very well.

However, the external costs of Hong Kong's transport system - the costs experienced by the community as a whole - are much higher. Pollutant emissions from Hong Kong's road transport increase air pollution levels. Road traffic also exposes at least one million people to excessive traffic noise.

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2 While the cities on this list vary, cities like London, Paris, New York, and Tokyo are typically included.
3 Transport Department (1999), Third Comprehensive Transport Study, Hong Kong: HKSAR Government.
4 The two other reports, published in February 2002, are Sustainable Transport in Hong Kong, by Dick Rooks and Derckjan Smaling, and Electrifying Hong Kong: Making Transport Sustainable, by Richard Gilbert, both available at http://www.civic-exchange.org.
It is difficult to quantify the health effects of spending an hour or two of each working day commuting in polluted areas, whether by vehicle or on foot, but we do know that the air quality at street level is far worse than overall air quality in Hong Kong. At Hong Kong's three street level air monitoring stations, the average annual concentration of nitrogen dioxide (NO₂) and respirable suspended particulates (RSP) exceeds Hong Kong's already lax air quality objectives (AQOs) by a considerable margin.

Hong Kong's air pollution is responsible for several thousand premature deaths and 75,000 additional hospital "bed days" for pollution-related respiratory and cardiovascular problems each year. Established epidemiological methodologies suggest that a far larger number of people experience less severe health effects from air pollution. And while overall air pollution is a combination of pollutant emissions in Hong Kong and ambient air pollution from Guangdong, at street level, poor air quality is due largely to emissions from local transport.

When we consider these external costs - costs we all pay whether or not we are aware of it - the price we pay for transport in Hong Kong seems much less acceptable.

The key question, of course, is not just how well Hong Kong's transport system works today, but how well it is projected to work in the future. Government plans suggest there will be little improvement in the situation. According to current projections, air quality at street level will remain very unhealthy for at least the next 14 years. Exposure to harmful noise is projected to increase significantly, with far more people exposed to higher noise levels for more hours each day. At the same time, overall mobility will actually decrease due to increases in the number of vehicles on the road.

Current government plans assume that the high external costs of Hong Kong's transport system are unavoidable. Moreover, these plans reflect a pervasive "business as usual" mentality that is fundamentally at odds with movement towards a more sustainable transport system. The goal appears to be to continue doing the same things much as they have always been done. Later chapters of this report discuss the limitations of this mind-set and the need for more significant and substantive changes in transport policy and planning.

In summary, **Hong Kong's current transport system imposes external costs on the community that are unacceptably high.** In the face of expected changes, **service levels are projected to decline, while high external costs will persist and, in some cases, become far worse.**

We believe the people of Hong Kong need and deserve better options. In creating an alternative vision for Hong Kong, we have aimed to be more "visionary," while keeping practical considerations firmly in mind. Our vision stresses the need for basic changes in the way that the HKSAR government manages and finances transport. It does not call for more spending or more intervention, but rather for more effective spending and intervention.

In the near- and mid-term, the proposed changes in technology are modest and economically feasible. Nonetheless, integration of any new technology will require the active commitment and cooperation of government, something that has been lacking in previous attempts to assess and introduce new technologies in Hong Kong. Simply looking for cleaner ways to continue the same behaviors is an insufficient measure for making Hong Kong's transport system more sustainable. A sustainable transport strategy must integrate changes at both the planning and the technical level.

Implementation of the vision outlined in this report would involve some changes in the prices and types of transport available to travelers. But overall, costs to consumers should not rise and the level of transport
service within the HKSAR as a whole would improve. More importantly, the external benefits associated with these changes would improve the quality of life for everyone in Hong Kong. 5

Elements of a more sustainable transport system

Our vision of a more sustainable transport system for Hong Kong focuses on six major elements:

1. **Changes in government support for different modes of mass transport, specifically in terms of government financing for passenger rail systems.**

   The HKSAR is exceptional, and probably unique, in requiring its passenger rail systems to be largely self-financing. As a result, even though Hong Kong has the highest population density in the world, the coverage of rail network is fairly limited compared to that in other "world cities." The external benefits of replacing bus with rail service, including improvements in air quality, noise levels, and congestion, are significant. Although it is now government policy to give priority to rail development, there are no plans to change the current rail financing system or promote better bus-rail coordination.

2. **Re-assessment of the appropriate balance between competition and coordination among different transport modes.**

   While competition between transport modes and a greater variety of modal choices (bus, rail, tram, taxi etc.) benefit travelers, wasteful competition may actually impose higher external costs on the community as a whole by increasing congestion and the environmental impacts of transport. Better coordination of different transport modes would improve energy efficiency and lower the external and internal costs of transport.

3. **Re-examination of the feasibility of tethered electric transport (electric trolley buses and modern trams) for Hong Kong, especially in highly polluted and noisy urban areas.**

   Tethered electric transport systems should be integrated into plans for all new development areas and selectively introduced on the most polluted and noisy roads in older urban areas, with the goal of replacing most or all diesel buses. Reliance on diesel vehicles in dense urban areas is simply incompatible with attaining acceptable air quality at street level or reducing harmful levels of noise.

4. **Mandated use of cleaner engines and fuels in road transport vehicles.**

   (a) The Hong Kong government should encourage and assist Guangdong authorities in the development of the planned Liquefied Natural Gas (LNG) terminal. The transition to a natural gas economy throughout the Pearl River Delta is perhaps the most promising option for improving regional air quality.

   (b) We also recommend that government facilitate the use of Compressed Natural Gas (CNG) in single-decker buses and medium goods vehicles and test its application in double-decker buses and heavy goods vehicles.

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5 Given the resources available for this project, we are unable to quantify future costs for consumers, and the impact on government expenditures/revenues with adequate precision. Nonetheless, we are confident that the overall picture outlined here is accurate, although we would welcome a detailed study on these points from government.
(c) Government should track developments in more advanced technologies, including hybrids, fuel cells, and electric battery vehicles, but should not delay implementation of simpler options that are commercially viable and available today, such as oxygenated fuels, bio-diesel, and particulate traps.

5. **Planning for the pedestrian experience as an integral part of each public transport journey.**

Hong Kong's high reliance on public transport means that most people are pedestrians several times each day. Despite this fact, Hong Kong is a pedestrian hostile environment. Walking in Hong Kong's urban areas is typically unhealthy, unpleasant, and unsafe due to traffic congestion, noise, and poor street level air quality.

6. **Basic reform of the transport planning and policy-making processes.**

Effective implementation of these recommendations will require changes in the way that the Transport Department, Transport Bureau, and other government agencies make decisions about Hong Kong's transport system. At a fundamental level, there must be a change in the mind-set of senior government officials regarding the costs and benefits of the various options available for Hong Kong's future transport system and an improvement in the assessment process. While the new Principal Officials Accountability System (POAS) offers a framework for future change, the POAS is an insufficient measure for improving the quality of decision-making.

**Overview**

**Chapter 1** provides a general discussion of sustainable transport and suggests a paradigm for assessing different transport options. **Chapter 2** presents an assessment of Hong Kong's current transport system and outlines recent government initiatives in the direction of sustainability. **Chapter 3** takes a look at how urban passenger rail and bus systems are financed in Hong Kong and the larger implications of present financing arrangements. **Chapter 4** looks at planning strategies for reducing the impact of road transport in Hong Kong's highly dense urban setting. This chapter focuses primarily on pedestrianism. **Chapter 5** briefly reviews a range of technology-based options for more sustainable road transport, including the use of tethered electric transport systems, such as electric trolley buses and trams, as well as a number of alternative fuel/engine systems for free-wheeling road vehicles. **Chapter 6** discusses some of the transport issues associated with Hong Kong's potential role as a logistics hub for the greater Pearl River Delta region. **Chapter 7** looks at the institutional context in which transport decisions are made in Hong Kong. It also includes case studies of a number of policy and technology assessments carried out recently by the Transport Bureau and Transport Department. **Chapter 8** pulls together findings from the previous chapters to summarize the key points of our vision of a more sustainable transport system for the HKSAR. A list of references and information about the authors is included at the end of the report.
"The term sustainable development was introduced in 1980, popularized in the 1987 report of the World Commission on Environment and Development (the Brundtland Commission), and given the status of a global mission by the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992."6

The concept of sustainable development has now been widely adopted as a legitimate planning goal. In essence, sustainable development focuses on improving (and maintaining) the quality of life for all inhabitants of the Earth without increasing the use of natural resources beyond the capacity of the natural environment to supply them indefinitely. This concept takes into account the fact that innovative ways need to be found to change institutional structures and influence individual behavior. The practice of sustainable development requires taking action and changing policy and practice at all levels - at the individual and national, as well as the international, level.7

Although sustainable development initially emphasized resource conservation,8 the concept has gradually evolved to encompass a broader range of issues, including transport.9 Transport is key to prosperity as well as to sustainability and has attracted special attention in recent years. This chapter provides a brief overview of the international debate on sustainable transport and summarizes the essential elements of what constitutes a sustainable transport policy.

1.1 A sustainable transport policy

Transport is central to economic growth and social development. On the one hand, it facilitates the movement of raw materials and freight at the international, national, regional, and local levels. On the other hand, it facilitates the movement of people and the diffusion of ideas and knowledge. As transport is a prerequisite for growth, an enormous sum of money has been invested in major transport infrastructure projects all over the world during the last few decades.

Over roughly the same period, motorized transport has become an integral part of people's daily lives by providing the means to get to jobs, amenities, and leisure facilities. Public transport services, as well as personal modes of transport such as private cars and motorcycles, connect people with one another. Indeed, private vehicles have become the icon of a "modern" lifestyle that emphasizes personal mobility and individual freedom. In an urban context, prosperity, car ownership, highway construction, and dispersed land use patterns reinforce one another. Consequently, improved mobility serves and shapes urban sprawl.

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7 SD Gateway at <http://sdgateway.net/introsd/definitions.htm>, section on definitions of sustainable development.
8 According to Haq, the term sustainable development was first brought forward by the World Conservation Strategy (WCS) in 1980, which explained the contribution of resource conservation to human survival and to sustainable development. Haq, G. (1997), Towards Sustainable Transport Planning: A Comparison between Britain and the Netherlands, Aldershot: Ashgate, p.6.
9 In 1987, the World Commission on Environment and Development (WCED) report, Our Common Future (commonly known as the Brundtland Report), defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The Report weaves together social, economic, cultural, and environmental issues with global solutions and also highlights the notion of intra-generational and inter-generational equity. WCED (1987), Our Common Future, Oxford: Oxford University Press, p.8.
Given the economic, societal, and personal benefits associated with improvements in transport services and facilities, decisions about transport - whether bigger decisions about transport planning and investment or more personal choices about individual travel - are often made with little consideration of the negative external costs of transport, including congestion, urban blight, pollution, and fatalities. Even if these impacts are assessed, a decision in favor of more transport is almost always justified as long as total economic and social benefits exceed costs, especially in the short-term.

However, the conventional approach to transport development and economic growth is now being challenged worldwide. The rising environmental and social costs of transport are increasingly seen as major issues in public policy. Particularly in developed economies, people are reluctant to compromise the quality of life for marginal gains in mobility. The new challenge for policy makers is to assess the economic impact of new transport plans, and, more importantly, to strike a balance between different economic, social, and environmental objectives in reaching decisions.10

A transport system should be considered sustainable only if it meets two basic conditions. First, it must meet current needs for mobility without imposing unacceptable costs, including external costs, on those who use it and are affected by it. Second, it must be able to meet projected future needs for mobility at acceptable costs.

In many cities around the world, movement towards sustainable transport involves improving the local transport systems to better meet current and near-term needs. Often, this is largely a matter of improving and promoting public transport and discouraging use of private cars so as to improve traffic flow and lower environmental damage to an acceptable level. However, for cities experiencing rapid economic or population growth, the focus must also be on anticipating coming changes to prepare for future needs. Otherwise, any success in meeting near-term goals may be undermined by changing conditions.

In other words, when faced with expected substantial changes in underlying conditions, the focus of sustainable transport cannot merely be a matter of how well the system works today, but how well it will meet anticipated future needs. These changes might involve some or all of the following:

- Number of people or quantity of goods to be transported;
- Income levels;
- Expectations of quality for transport services;
- The ability of people and the natural environment to tolerate the external impacts of transport (e.g., air pollution, landscape modifications, noise); or
- The availability of particular energy resources or technologies to provide motive power (e.g., the end of cheap fossil fuels, a new natural gas supply line, a breakthrough in fuel cell technology).

Regarding future needs, the task is essentially to determine what modifications should be made to the existing transport system in order to satisfy projected future levels of demand (quantitatively and qualitatively), while keeping external impacts (economic, environmental, social) within acceptable limits. The relatively long lead times for transport infrastructure development mean that such decisions must be made in the context of anticipated rather than known future needs. A further unknown is the pace at which new transport technologies will become available on a commercial basis. Even if broader transport objectives remain relatively stable over time, changing demand or supply conditions (e.g., the types of technologies or fuels available) may mean that the optimal mix of transport modes and the incentives designed to attain that mix should change.

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Therefore, sustainable transport may be defined as an evolving set of strategies designed to provide good transport services, while keeping the internal and external costs of such services within acceptable limits.

1.2 Towards sustainable transport

For the last 15 years, the United Nations and a range of other international bodies have spearheaded the debate on sustainable development and sustainable transport. These international, high profile efforts have been instrumental in pushing national governments to explore new policies. A rich body of international literature, including policies developed by various national governments, is available on this subject and could be used as a reference by the Hong Kong government. Below are five general observations about the international experience in working towards sustainable transport.

The value of international consensus

The initiatives by international organizations and intergovernmental bodies, such as the United Nations, the Organization for Economic Cooperation and Development (OECD), and the World Bank, to prepare definitions and guidelines has ensured high-level international and national attention to the issue of sustainability, including widespread coverage by the media. International and locally based non-governmental organizations (NGOs) have been able to promote the concept of sustainability and lobby national authorities to make policy changes. Moreover, identifying sustainability as an international priority has given the issue global significance, making it harder for authorities to ignore.

The OECD Group on Pollution Prevention and Control (PPCG), for instance, proposed that environmentally sustainable transport (EST) be defined as:

"Transportation that does not endanger public health or ecosystems and meets mobility needs consistent with (a) use of renewable resources at below their rates of regeneration and (b) use of non-renewable resources at below the rates of development of renewable substitutes."\(^{11}\)

The OECD also developed a set of EST guidelines (see Appendix 1) as "a desirable and feasible approach for the transport sector"\(^{12}\) and "to establish [the] basis for a diverse range of policy-makers and economic actors to communicate and a framework for government to set goals, objectives, targets or standards and initiate actions."\(^{13}\)

The World Bank considers sustainability as the basis for a more rigorous transport policy and suggests that effective transport policy must satisfy three main requirements:

"First, it must ensure that a continuing capability exists to support an improved material standard of living. This corresponds to the concept of economic and financial sustainability. Second, it must generate the greatest possible improvement in the general quality of life, not merely an

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\(^{13}\) Cited from OECD at <http://www.oecd.org>, section on environmentally sustainable transport.
increase in traded goods. This relates to the concept of environmental and ecological sustainability. Third, the benefits that transport produces must be shared equitably by all sections of the community. This we term social sustainability.\textsuperscript{14}

The challenge for governments is to put this concept of sustainable transport into practice in ways "that are environmentally sound, socially equitable, and economically viable."\textsuperscript{15}

**A new approach for evaluating transport**

Since the Rio Summit in 1992, a series of international conventions and agreements have been created to build a framework to promote sustainable development internationally.\textsuperscript{16} The most significant of these agreements is *Agenda 21*, which outlines an action plan to help nations become more sustainable, thereby introducing the concept of sustainable development as part of the international political agenda.

*Agenda 21* identifies transport as a key aspect of sustainable development and offers a new approach to evaluating transport systems and policies. It reframes transport development by acknowledging that while transport promotes economic and social development, rapid motorization and poor transport/traffic planning and management cause a number of problems - including accidents and injury, poor air quality, noise, and congestion - that impact negatively on economic productivity and overall quality of life.\textsuperscript{17} Thus, all countries are encouraged to promote efficient and environmentally sound transport systems as well as develop cost-effective policies to control harmful environmental impacts.\textsuperscript{18}

**Continuation of unsustainable transport practices**

Despite various attempts to find better options, many current transport activities are still unsustainable. There is an urgent need for national and local governments to tackle the complex issues involved in transport planning.\textsuperscript{19} Key problem areas are:

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\textsuperscript{14} The World Bank sees a number of transport issues as inadequately addressed by current transport policies and practices - increasing access and affordability for the rural poor, providing adequate maintenance for transport infrastructure, increasing responsiveness to customer needs, adjusting to global trade patterns, and coping with rapid motorization. The World Bank (1996), *Sustainable Transport: Priorities for Policy Reform*, Washington, DC.

\textsuperscript{15} OECD (1997), *Towards Sustainable Transportation*.


\textsuperscript{17} *Agenda 21* outlines a number of principal activities for different program areas. UNCED (1992), *Agenda 21.* \(<http://www.un.org/esa/sustdev/agenda21text.htm>\). See Appendix 2 for details of proposed activities.

\textsuperscript{18} The experience of the United Kingdom is one example of the attempt by a national government to set a new framework for a sustainable national transport policy. The government altered policy in order to (i) strike the right balance between the ability of transport to serve economic development and the ability to protect the environment and sustain future quality of life; (ii) provide for the economic and social need for access with less reliance on travel; (iii) take measures to reduce the environmental impact of transport and influence the rate of traffic growth; and (iv) ensure that transport users pay for the full social and environmental costs associated with their transport decisions, so improving the overall efficiency of these decisions for the economy as a whole and ensuring key environmental benefits. Secretary of State for the Environment, et al. (1994), *Sustainable Development: The UK Strategy*. Cm2426, London: HMSO, p.169.

Chapter 1: A Sustainable Transport Policy

• Growth in road transport - road traffic, construction of new infrastructure, and associated costs;
• Growth in air transport - air traffic, aircraft noise, and emissions;
• Congestion and associated costs;
• Road casualties and associated costs;
• Dependence on finite fossil fuel sources;
• Vehicle emissions - air pollution and its global, regional, and local impacts and, to a lesser extent, water pollution;
• Noise, vibration, visual intrusion, and other disturbance due to transport; and
• Car-dependent planning and development (especially in developed economies) - inaccessibility to non-car users, high consumption of land, impact on community, social disruption, urban sprawl, decaying urban fabric.

Challenges of multidisciplinary policy-making

Progress towards sustainable transport depends on a wide variety of factors. It is often extremely difficult for policy-makers to understand the complexity of different policy options, such as how to set the optimal mix of incentives to change individual travel behavior or apply the right set of emissions control technologies. Developing and implementing an effective sustainable transport policy requires good data, continuous research, experimentation, and constant feedback from a diverse range of disciplines. The ability to develop a decision-making system that integrates knowledge and applies it on the ground is easier said than done.

The attempt by the United Kingdom's Royal Commission on Environmental Pollution (RCEP) to articulate a new transport policy illustrates the complexities involved in implementing the concept of sustainable development.20 The Eighteenth Report on Transport and the Environment stated that transport policies need to meet a set of wide-ranging objectives, including the integration of transport and land use policies, compliance with air quality standards, and mobility for all members of the community, and, at the same time, reduce environmental damage, use existing infrastructure efficiently, protect natural and cultural heritage areas, reduce the use of non-renewable resources, and reduce noise from transport.21 Most governments lack experience in this type of multidisciplinary policy-making.

However, when governments are able to put together an imaginative package of policy instruments with a realistic approach to long-term change this is far more effective than taking a piecemeal or ad hoc approach to sustainability. Thus, the best approach is to work backwards from the desired outcome of a policy and then develop long-term policy scenarios to explore how to achieve this outcome. This is often known as the scenario-building approach or the backcasting method.22 Such an approach provides a useful framework for decision-making, identifies constraints and opportunities, allows a variety of possible approaches, helps with assessment of alternative policies, and increases creativity and choice.23

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21 Ibid, xviii.
22 The OECD's environmentally sustainable transport approach started with a "portrayal of a sustainable transport future, the development of environmental and health quality objectives and criteria, and derived quantified targets with dates and milestones, and the specification and implementation of packages of measures required to achieve a sustainable transport future." The European Commission on Policy Scenarios for Sustainable Mobility also followed a similar methodology. OECD (2000), Environmentally Sustainable Transport Guidelines, p.7 and Banister, D., Stead, D., et al (2000), European Transport Policy and Sustainable Mobility.
Plan for people, not vehicles

The Rio Declaration on Environment and Development reminds us that:

"Human beings are the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."

Sustainable transport cannot be realized if policy-makers focus on facilitating vehicles rather than people. Lowe called for "...putting [the] automobile back into its useful place as a servant. With a shift in priorities, cars can be part of a broad, balanced system in which public transport, cycling and walking are all viable options." Lowe proposed that transport systems should facilitate *urban livability*. A livable city is human-centered, environmentally friendly, economically viable, socially sound and "connotes a desirable quality of life for its citizens - including social activities, attractive public places, provision of a certain level of privacy, as well as a sense of community."

1.3 A paradigm for assessing sustainable transport options

Figure 1.1 shows the paradigm developed as part of this study to assess the different options available for making Hong Kong's transport system more sustainable. **We have chosen to show mobility as the primary objective of sustainable transport**, rather than environmental or social goals. Environmental and social considerations are undoubtedly important, but are most appropriately considered as part of the larger context that shapes efforts to meet the primary objective of mobility. The primary aim of transport planning, especially from the perspective of most transport planners, is mobility and we feel that any vision of a more sustainable transport system for Hong Kong must acknowledge this explicitly. From the consumer's standpoint, prioritizing mobility means that travel times are reasonably predictable and that the preferred mode is reliable, convenient, comfortable, and safe, while still being priced within the means of most people.

A second important aspect of Figure 1.1 is the relationship between planning- and technology-based solutions. All too often, the focus in transport has been on technological fixes - either some new technology or better utilization of existing technologies (e.g., additional roads) - that will allow us to continue doing things very much as we do them today, but with somewhat less damage to the environment, or temporarily circumvent other problems, such as road congestion.

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26 Vuchic advocates that a transport system for a livable city must (i) provide service to all areas where there is a need for transportation; (ii) be available to all groups of people; (iii) provide local access to long-distance terminals; (iv) satisfy travel volume requirements; (v) have satisfactory performance (for example, speed, safety, reliability, comfort); (vi) involve reasonable costs and be properly priced; (vii) provide for efficient movement of goods and deliveries throughout urban areas; (viii) provide facilities and services that are efficiently incorporated with a human-oriented urban environment; (ix) stimulate creation of desirable urban development and forms; and (x) have low negative side effects. Vuchic, V. R. (1999), *Transportation for Livable Cities*, New Brunswick, NJ: Center for Urban Policy Research, The State University of New Jersey, Rutgers, pp.233, 234.

27 High expectations regarding electric battery vehicles since at least the 1970s are one example of the optimistic view that technological breakthroughs will provide a technical fix for transport problems. Hopefully, the optimism of the 1990s and early 21st century regarding fuel cells will be validated or expectations will at least be brought into line with actual (rather than hoped-for) breakthroughs.
Yet, as shown in Figure 1.1, while technical solutions are key for sustainable transport, planning solutions are also important. Planning solutions include not only long-term solutions such as better urban design and land use planning to minimize commuting and shopping distances, but also measures to make those particular transport modes that promote overall mobility, a clean, quiet environment, and other objectives more widely accessible and attractively-priced. Indeed, a major limitation of the technical fix approach is often not the pace of technological innovation, but the planning needed for its implementation.

**Figure 1.1 SUSTAINABLE TRANSPORT: A TAXONOMY**

**PRIMARY OBJECTIVE**

*Mobility: provide reliable, convenient, and affordable transport*

**CONTEXT/CONSTRAINTS**

*Evolving needs/expectations, environmental impacts, costs, manageability*

**ASSESSMENT OF OPTIONS**

<table>
<thead>
<tr>
<th>PRIMARY OBJECTIVE</th>
<th>TECHNOLOGY-BASED OPTIONS</th>
</tr>
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<tbody>
<tr>
<td>MINIMIZE NEED FOR MECHANIZED TRAVEL</td>
<td>ASSIST IN BUILDING INFRASTRUCTURE</td>
</tr>
<tr>
<td>* town planning * better telecommunications * pedestrianization</td>
<td>FOR TETHERED ELECTRIC TRANSPORT</td>
</tr>
<tr>
<td>ENCOURAGE HIGH OCCUPANCY TRANSPORT</td>
<td>* rail (underground/elevated) * light rail/trams (at grade) * electric trolley buses * people movers * rail-based goods transport</td>
</tr>
<tr>
<td>* inter/ intra modal coordination * relative pricing across modes * relative convenience across modes</td>
<td>ENCOURAGE/FACILITATE CLEAN</td>
</tr>
<tr>
<td>DISCOURAGE PEAK PERIOD TRANSPORT</td>
<td>FREE-WHEELING VEHICLES</td>
</tr>
<tr>
<td>* (as feasible) by pricing * by policed restrictions</td>
<td>(For passengers and goods)</td>
</tr>
<tr>
<td>ENCOURAGE CLEAN TRANSPORT</td>
<td>* clean petrol, diesel * more efficient engines * promote gaseous fuel (LPG, CNG) * tail pipe clean-up * electric hybrids * facilitate needed technology support</td>
</tr>
<tr>
<td>* through pricing incentives * (as needed) through mandates systems (e.g., for operation/maintenance)</td>
<td>ENCOURAGE ADVANCED CLEAN TRANSPORT</td>
</tr>
<tr>
<td></td>
<td>* fuel cells * electric hybrids * facilitate needed technology support</td>
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</tbody>
</table>

**OTHER**

**OTHER**
Public policy decisions determine the environmental impacts of transport as a result of their influence over individual choices. For example, the decision to travel by bus versus private car or by bus versus rail is greatly influenced by government's policy with regard to financial incentives for each mode and the impact of these decisions on the relative costs of each mode for consumers. Further, travelers may feel that the decision to ride a "clean bus" or use "clean fuel" is pointless when others remain free to choose "dirty" options.

Figure 1.2 lays out a number of points with respect to planning- and technology-based options for more sustainable transport. As the figure shows, planning and technical options are closely linked, particularly in terms of the support given to new technologies. For example, the use of a cleaner fuel system (e.g., compressed natural gas [CNG] or Liquefied Petroleum Gas [LPG]) requires a network of fuel distribution points. Yet, to the extent that some of the major benefits (e.g., a cleaner environment) do not provide a direct financial benefit to the vehicle owner or fuel supplier, some form of government support or assistance may be needed to ensure that vehicles owners use the cleaner fuel and that a distribution system evolves quickly enough to have the desired effect on vehicle emissions and air quality. Similarly, the effectiveness of some measures, such as the use of clean diesel, may be dependent on related initiatives, such as the creation of a system for engine maintenance and periodic emissions testing. Enforcement of regulatory systems is a matter of public, rather than private, decisions.

Figure 1.2 also highlights the need for a multidisciplinary approach to policy-making. Unfortunately, while in theory various departments in the Hong Kong government work in close cooperation, in practice they often seem work in parallel tracks, each department focusing on its own particular objectives. Any attempt to reconcile differences in vision and implementation occurs rather late in the process, a factor that has significantly affected the development of Hong Kong's current transport system. See Chapter 7 for more discussion on this point.

<table>
<thead>
<tr>
<th>Figure 1.2  Evaluating planning- and technology-based options for sustainable transport</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLANNING-BASED OPTIONS</strong></td>
</tr>
<tr>
<td>♦ Typically involve relatively long implementation lead times</td>
</tr>
<tr>
<td>♦ Tend to be horizontal in nature (inter-disciplinary, inter-departmental)</td>
</tr>
<tr>
<td>♦ Potentially pervasive but not always obvious (apparent to the public)</td>
</tr>
</tbody>
</table>

| **TECHNOLOGY-BASED OPTIONS**                                 |
| ♦ Tend to have medium to long implementation lead times       |
| ♦ Availability of new technology is influenced by unpredictable exogenous factors and this adds risk |
| ♦ There are often subtle but important planning aspects to adoption |
| ♦ Where new technologies are practical, they may provide the fastest and least disruptive way to address environmental (or mobility) concerns. |

| **INTEGRATED STRATEGIES FOR SUSTAINABLE TRANSPORT**           |
| ♦ Planning- and technology-based options are complementary and should be undertaken concurrently |
| ♦ In general, planning options should be investigated first because they tend to be more pervasive and over the long-term are often more cost-effective |
| ♦ It is risky to assume that implementation of a new technology will be the turnkey |
| - Planners must appreciate that local conditions necessitate special care to provide needed support for implementation of new technology |
| - Technology-based solutions may be preferred by planners as being administratively convenient, especially if they fail to fully appreciate the planning aspects of implementation |
Overall, Hong Kong manages to move people and freight around in a reasonably efficient manner. Arguably, Hong Kong's transport system is more sustainable than that of many developed economies since most rely much more heavily on private vehicle use. Yet evidence shows that Hong Kong is fast heading in an unsustainable direction. Urgent rethinking of the current transport system is essential since it will take time for new policies to show results.

### 2.1 Background

Hong Kong’s transport system is unequaled. With a mere 1,100 square km of land area (of which less than 200 square km has been developed), Hong Kong is home to 7 million people. It has one of the largest fleets of double-decker buses in the world, two railways that are among the best managed in the world, the world's busiest container port, and an international airport that is among the busiest in the world in terms of freight and passenger throughput.

Hong Kong people rely primarily on the public transport system to move around. The system is efficient, affordable, and diverse. At present, nearly 90% of all daily trips (about 10.9 million) occur by public transport. The 9 to 1 ratio of public to private transport makes Hong Kong unique among other major cities in the world. This is a very high ratio relative to economies with a comparable per capita income (about US$24,000 in 2000). Private car ownership in Hong Kong is low - less than 1 in 7 households owns a car. The low level of car ownership in this affluent society reflects the high cost of ownership (licensing, registration) and use (heavily taxed fuel, expensive residential parking, very little free parking in urban areas). Yet it should also be recognized that the advantages of car ownership in Hong Kong are less than elsewhere because for most people most of the time, reliable, comfortable, and reasonably priced public transport options exist.

Transport is also essential to the Hong Kong economy. Aside from local distribution needs, the export of light industry products from Hong Kong depends on the ability to move cargo in and out of the Pearl River Delta in Guangdong Province. Since the 1980s, Hong Kong manufacturers have effectively moved their production base to the other side of the border, which has enabled them to expand their capacity manifold. The relocation also resulted in a growth in the north-south movement of cross-border freight by river vessels and trucks. In 1997, about 709,000 goods vehicle trips were made every day within Hong Kong and another 30,000 trips were made across the border at Lok Ma Chau, Man Kam To, and Sha Tau Kok.

---

28 The Kowloon Motor Bus Company (KMB) Limited, the largest franchised bus operator in Hong Kong, had a fleet of 4,238 licensed vehicles at the end of 2000, 3,988 of which were double-decker buses. HKSAR Government (2001), *Hong Kong 2000*, Hong Kong.

29 The Hong Kong Mass Transit Railway (MTR) Corporation and the Kowloon Canton Railway Corporation (KCRC) are two of the very few mass transit railways in the world earning fare revenues sufficient to cover operating costs and depreciation and generate a satisfactory profit.

30 From 1992 to 2001, Hong Kong had the highest container throughput in the world, with the exception of 1998, when it came second to Singapore. See Chapter 6 for a more detailed discussion of Hong Kong's freight activities.

31 In 2000, the Hong Kong International Airport came second in the world in terms of freight throughput (2.27 million tons) and 22nd in terms of passenger throughput (32.7 million passengers). Information obtained from Airports Council International at <http://www.airports.org>.


33 US$1 is equal to HK$7.8. Per capita GDP at current market prices for the year 2000 was HK$187,105. HKSAR Government (2001), *Hong Kong 2000*.

34 This is the latest set of figures available on internal and cross-border goods vehicle trips. Transport Department (1999), *Third Comprehensive Transport Study*, Hong Kong: HKSAR Government, p.7, Table 2.3.
At the end of 2001, Hong Kong had 1,904 km of roads, with a density of about 275 licensed vehicles per kilometer of road, an unusually high figure. A substantial road construction program is underway and additional plans are on the drawing board as a solution to ease cross-border freight movements. There are also several rail projects under construction, but these are planned mainly for passengers. There is no concrete plan as yet to connect Hong Kong's container port with a freight rail service. A more detailed discussion of logistics and regional planning issues is contained in Chapter 6.

2.2 The external costs of Hong Kong's current transport system

How well does Hong Kong's current transport system meet the criteria for sustainability outlined in Chapter 1?

One indicator of an unsustainable system is that it exposes a significant number of people to demonstrably unhealthy levels of pollution and noise. While Hong Kong's current transport system provides adequate mobility most of the time, road transport exposes large numbers of people to unhealthy levels of street level air pollution every day. About one million people are also exposed to severe traffic noise (i.e., above 70 decibels [dB(A)]) on a routine basis.

Hong Kong's air pollution is responsible for several thousand premature deaths and 75,000 additional hospital "bed days" for pollution-related respiratory and cardiovascular problems each year. Established epidemiological methodologies suggest that a far larger number of people experience less severe health effects from air pollution, but it is impossible to know what percentage of Hong Kong's population is affected. What we do know is that nearly everyone in Hong Kong suffers some degree of impaired respiratory health due to the high level of air pollution.

Hence, in this important respect Hong Kong's current transport system fails the first test of sustainability given in Chapter 1, namely that the system should not impose unacceptable external costs on society.

According to current government transport plans and projections, up to 2016 there will only be marginal improvements in the air quality at street level, which is already very poor. Under some scenarios, air quality may actually become worse, while exposure to excessive road noise will increase substantially, meaning
that more people will experience even higher levels of noise for more hours of the day and night. Meanwhile, mobility will continue to deteriorate, with road speeds as low 14 km per hour by 2016. The underlying problem is the need to accommodate the transport demands of an additional one to two million people over the next one and a half decades.

Therefore, Hong Kong transport also fails the second test of sustainability given in Chapter 1. In the face of expected changes, service levels are projected to decline, while unacceptable external costs will persist and indeed, increase.

In other words, Hong Kong's current transport system is not sustainable and current government plans will fail to make it so.

2.3 Evolving transport objectives

Hong Kong's cityscape took shape in the mid-1960s when Hong Kong began to study its internal transport needs in a systematic manner in response to population and economic growth. A number of important studies, notably the *Hong Kong Mass Transport Study* (1967), the *Long Term Road Study* (1968), the three territory-wide comprehensive transport studies (1976, 1989, and 1999), and the two white papers on internal transport in Hong Kong (1979 and 1990) represent the foundation of Hong Kong's current transport system. The first White Paper on Internal Transport Policy, published in 1979, defined Hong Kong's first official transport objective:

"The Government's central transport objective is to maintain and improve the mobility of people and goods."42

Later publications essentially restate this original objective. In essence, the government aims to achieve an acceptable level of mobility for both passengers and freight in order to satisfy the transport demand generated by economic growth and urban development.

The 1979 White Paper also identified three main principles of transport policy in meeting this objective:

- Improvement of the road system;
- Expansion and improvement of public transport; and
- More economic use of the road system.

Planning for sustainability

Questions have long been raised as to the sustainability of Hong Kong's transport system. However, it was not until 1997 that transport officials acknowledged that they had the responsibility to achieve a sustainable transport system and modified Hong Kong's transport objectives by noting that transport policy should take environmental issues into account. Up to this point, the Transport Bureau did not consider sustainability factors when planning Hong Kong's transport system and regarded environmental protection simply as a matter of pollution control, which was the job of another government unit.

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In September 1997, in a delayed response to international attention to sustainable development, the HKSAR government commissioned the Study on Sustainable Development for the 21st Century (SUSDEV 21), which aimed "to develop a tool to assist decision makers incorporate the concept of sustainability into Hong Kong's future development."\(^{43}\) Hong Kong's working definition of sustainable development is as follows:

"Sustainable development in Hong Kong balances social, economic and environmental needs, both for present and future generations, simultaneously achieving a vibrant economy, social progress and better environmental quality, locally, nationally and internationally, through the efforts of the community and the Government."\(^{44}\)

Guiding principles and indicators were developed to link the definition to practical day-to-day working decisions. **Mobility** is identified as one of the eight guiding principles of SUSDEV 21 and refers to the provision of "safe, accessible and efficient transport systems and pedestrian facilities along with an efficient transport network for the movement of goods and facilitation of services for the community."\(^{45}\) Of the 39 sustainability indicators, three are associated with mobility.\(^{46}\) However, they serve mainly to enhance existing decision-making procedures. The study did not provide detailed policy objectives or action plans at the sectoral level.

**The Third Comprehensive Transport Study**

The *Third Comprehensive Transport Study* (CTS3), commissioned in 1997 and completed in 1999, provides key insight into the government's approach to future transport development. The objective of the study was:

"...To provide a framework on which Government can develop a balanced transport strategy to facilitate the mobility of people and goods of Hong Kong in an environmentally sustainable manner up to 2016."\(^{47}\)

CTS3 also identified a number of guiding principles for future transport policies, including the following:

- Integrating land-use, transport, and environmental planning;
- According priority to railways;
- Coordinating and enhancing public transport services;
- Providing transport infrastructure in a more timely fashion;
- Managing transport with new technologies;
- Giving more emphasis to pedestrian needs; and
- Alleviating the environmental impact of transport to an acceptable level.

CTS3 and the later *Second Rail Development Strategy 2000* (RDS2) propose a series of road building projects, as well as extensions to the passenger rail system. Yet faced with a relentlessly growing population, expected to increase from 7 million to at least 8 million by 2016,\(^{48}\) gains in mobility obtained

\(^{43}\) HKSAR Government (1999), *Sustainable Development in Hong Kong for the 21st Century: Second Stage Consultation* (Consultation Document), Hong Kong, p.2.

\(^{44}\) Ibid, p.3.


\(^{46}\) Average travel distances, average network speed, and the cost of freight transport.


\(^{48}\) CTS3 estimated that the HKSAR's population would reach between 8.2 and 10 million by 2016. More recently however, government planners have begun suggesting informally that the higher end of this range is unlikely, although the reasons behind this change in population projections remained unclear at the time of this writing.
by creating additional road space and potential improvements in air quality due to pollution reduction technologies are offset by the rising number of daily journeys and to some degree by the disproportionate increase (nearly three-fold) of trips by private cars.49

In short, government's current plans are inadequate to address the serious environmental side effects of road traffic or even halt the decline in mobility within the planning horizon of 2016. This is a striking failure for a government currently touting Hong Kong's as "Asia's World City." In the face of projected population increases and an already strained environmental carrying capacity, if Hong Kong is to avoid further reductions in mobility and improve air pollution and noise levels, which are already unacceptable, then steps well beyond those proposed in CTS3 will clearly be required.

Future planning

Hong Kong's current transport achievements could be built upon to create an innovative and sustainable system that would make it even more competitive with other communities. It could also provide a useful model for high-density urban development that successfully integrates energy, urban planning, transportation, and mobility considerations. However, as a group of local academics note:

"The development of a truly sustainable transport system in Hong Kong is still some way off. To achieve such an objective requires some fundamental changes in transport priorities and in the way that policy making in Hong Kong is conducted." 50

While the broad thrust behind CTS3 is in line with international thinking, the Transport Bureau and the government as a whole do not yet have a clear long-term vision of what a sustainable transport future means for Hong Kong. As discussed in greater detail in later chapters of this report, measures taken so far have been piecemeal and uncoordinated. Policy objectives remain muddled and Hong Kong still lacks time and sector-specific targets for moving towards greater sustainability. The government decision-making machinery for transport-related issues is poorly integrated, reflecting an insufficient understanding of the interconnectedness of strategic planning, land use, transport, economic development, and environmental protection (see Chapter 7). In the absence of a larger, integrated vision, critical issues and potential solutions are being discounted or simply overlooked.

3.1 Introduction

Any discussion of Hong Kong’s transport system must begin with the fact that the HKSAR relies overwhelmingly on public transport and that for most people public transport is attractive in terms of frequency, geographical coverage, comfort, and price. At the same time, the external costs associated with transport, especially road transport, are unacceptably high and will not be reduced under current government plans.

While road traffic arguably is a major factor in lowering the quality of life in urban settings worldwide, **Hong Kong has the highest urban population density in the world** (6,320 persons per square km)\(^{51}\) and experiences especially high impacts from road transport. The high densities in Hong Kong mean that normally accepted minimum standards for setbacks between roads and sensitive receivers (e.g., residences, schools, hospitals, recreational areas) are not always practical - for example, when a new road is built in an existing urban area or an existing road is upgraded to handle more traffic.

The health risks associated with air pollution are related to the concentration at which it is inhaled and the danger from noise depends on the intensity and duration (and the time of day) of exposure. Hence, the close proximity between traffic and large numbers of people in Hong Kong make the side effects of road traffic especially serious.\(^{52}\) Although air pollution poses a particularly high risk to certain vulnerable population groups, including children and the elderly, it impacts the health and quality of life of all Hong Kong residents.\(^{53}\)

Road transport in high-density core areas is especially problematic. Hong Kong’s closely packed, high-rise environment tends to trap motor vehicle exhaust and impede the circulation of air. Most of the vehicle kilometers traveled (vkt) in Hong Kong involve diesel vehicles, which have very high emission levels. According to Transport Department estimates for 2001, diesel vehicles account for 95% of respirable suspended particulates (RSP) and about 80% of nitrogen dioxide (NO\(_2\)) transport emissions in Hong Kong.\(^{54}\)

Hence, aside from the chronic effects of overall air pollution for everyone in Hong Kong, almost all of us face the additional risk of exposure to much higher pollutant concentrations at street level. This risk is due primarily to emissions from local road transport and amenable only to local policy initiatives.

3.2 Off-road transport options for Hong Kong

This chapter explores one area of transport policy that we feel offers significant potential to bring about

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\(^{51}\) HKSAR Government (2001), *Hong Kong 2001*, Hong Kong.

\(^{52}\) Strikingly, in a city where extremely high reliance on public transport means that virtually everyone is a pedestrian every day, walking on the street in the congested areas of Hong Kong is unpleasant, unhealthy, and unsafe (e.g., sidewalks too narrow for peak period foot traffic or walkway obstructions that force pedestrians to spill out into the road). See Chapter 4 for more discussion of this issue.


considerable improvements in local air quality, noise pollution, and congestion. In our view, the exceptionally high external effects of road traffic mean that an essential part of making Hong Kong's transport more sustainable is to get a greater proportion of travelers off the roads entirely.

A key factor in the choice of transport modes is, of course, the costs and benefits as seen by prospective users of each mode. In general, there is a significant difference between "private" costs and benefits and overall "social" costs and benefits. In other words, there is an important distinction between the internal costs and benefits from the perspective of individual travelers and the costs and benefits that are external to the individual but affect others.

For example, when using a private car on a congested road a driver experiences only the average "cost" of the slowdown in traffic and reduction in air quality associated with his/her choice of mode. Yet the decision to travel by car not only means s/he travels more slowly and breathes dirtier air, but also increases travel time and reduces air quality for many other people. Normally, drivers do not consider the impact of the decision to drive or take public transport for everyone else on the road. In other words, the impacts (costs) to others of private car use in terms of traffic congestion and pollution are likely to be external to the decision to use a car rather than take a bus or railway.

The same logic applies to the choice of electric-powered rail transport versus internal combustion engine (ICE) public road transport. While rail offers certain features for which passengers are willing to pay (e.g., speed, reliability), many of its benefits (e.g., no local air pollution, reduced noise, less congestion on the roads) are positive for others but do not accrue directly to passengers themselves. Hence, such benefits are likely to be external to a passenger's decision to travel by rail. The choice to travel by rail versus bus is likely to be determined primarily by the relative costs and benefits strictly as seen by prospective passengers, rather than by whatever external benefits railway provides to society as a whole.

Therefore, it can be argued that some form of public sector intervention is needed in order to bring these kinds of external considerations into decision-making. Bus and rail fares are greatly influenced by government transport financing policy. While the Hong Kong government claims that no mode of transport is subsidized directly, the reality is that government policy is a major factor in the level of private costs (fares paid, convenience of access) for transport users in Hong Kong. Such policy is far from neutral.

3.3 Transport financing in Hong Kong

In the fiscal year 1999-2000, total expenditure for roads in Hong Kong amounted to HK$3.8 billion, of which HK$3 billion was for construction. For the same period, total government revenue from vehicle licensing and registration, plus that from road fuel duty, was HK$8.8 billion. Just over 60% of this came from vehicle licensing/registration, and the remainder from road fuel duty. To the extent that these figures reflect relevant expenditures and revenues, as a group, road users in the HKSAR appear to more than fully pay the internal (financial) cost of construction and maintenance of the roads they use.
However, privately owned buses do not pay fuel duty or significant licensing/registration fees. Hence, buses do not contribute to the cost of building and maintaining the basic road infrastructure upon which they rely. In effect, *travelers on buses receive a substantial cross-subsidy from other road users.*

Although buses account for only about 5% of the vehicular traffic on HKSAR roads, they account for about 30% of all vehicle kilometers traveled (vkt). In addition, buses account for the overwhelming share of heavy vehicles on urban roads. Heavy vehicles impose disproportionately high road maintenance costs per vkt. Therefore, buses are responsible for a large percentage of the costs faced by all road users, including maintenance and congestion, but are not obligated to help finance these costs.

At the same time, the **government insists that railways largely pay their own way, including the cost of building and maintaining rail lines.** The Second Rail Development Strategy (RDS2) states, "Government acknowledges that any new railway project will have to provide a commercial return."60

None of Hong Kong’s transport providers pays for the residual - and legally allowable - external costs their operations impose on society, including air pollution, noise, accidents, and congestion. Yet the unpriced external costs per passenger journey in Hong Kong are much greater for buses and other road transport than for rail transport, even after considering the emissions from the power plants that provide energy for rail systems.61 Road traffic also necessitates the creation of roadways and setbacks, which occupy valuable land in space-constrained Hong Kong. Access to rail, on the other hand, tends to increase property values. Thus, although rail is expected to be largely self-financing, it imposes by far the lowest external costs on Hong Kong residents, while buses, which generate much higher external costs, receive a substantial cross-subsidy.

**Rail financing worldwide**

Hong Kong's rail financing policy was first formulated in the 1970s when the population was less than 5 million and incomes were far lower than they are today. Today, it is not only out of step with the mobility needs of a much wealthier Hong Kong, but as the population heads toward 8 million and beyond, it is at odds with rail financing practices worldwide. A survey of 15 major urban systems around the world examined how major intra-city urban passenger rail systems are financed.62 The survey showed Hong Kong is alone among the 15 survey participants in expecting its rail systems to be self-financing.63

The Mass Transit Railway (MTR) Corporation, Hong Kong’s major rail provider, which accounts for 25% of journeys on public transport and 22% of all journeys in the HKSAR, is almost entirely self-financing. About 80% of its revenue comes from passenger fares. Of the remainder, about half (10% of total revenue) comes from the right to exploit property development opportunities created by the existence of a rail station. The remaining 10% comes from a variety of sources, including advertising, shop rental, and

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61 Barron, W., and Steinbrecher, N., eds. (1999), *Heading Towards Sustainability? Practical Indicators of Environmental Sustainability for Hong Kong,* Hong Kong: Centre of Urban Planning & Environmental Management, University of Hong Kong.


63 The following cities participated in the survey: (Asia/Australia) Osaka, Taipei, Hong Kong, Singapore, Sydney; (Western Europe) London, Paris, Milan; (The Americas) Toronto, Boston, New York, Washington DC, San Francisco, Sao Paolo (Brazil), Santiago (Chile). Because some of the data requested in the survey are potentially sensitive, respondents were assured that individual answers would not be specifically attributed to them by name. In the following table a broad geographic categorization is used along with a letter identifier in place of the city name.
The self-financing policy applies not only to system operation and maintenance - as is common in some other places - but also to meeting the full cost of rail line construction and the purchase of capital equipment, making Hong Kong unique among all other participants in the urban rail systems study.

As shown in Table 3.1, the typical arrangement worldwide is for governments to provide direct grants to cover all or a major portion of railway construction costs. Of the 15 systems considered in the survey, in all but two cases, direct government grants cover 60% to 100% of construction costs, while in seven cases, government grants (rather than loans or equity capital on which a commercial return is expected) were used to meet the entire cost of construction.

### Table 3.1 Cost share of rail met by direct government grants (DG) and operator-generated funds (OF) (DG + OF = 100%)

<table>
<thead>
<tr>
<th>Construction costs</th>
<th>Eastern Asia &amp; Australia</th>
<th>Western Europe</th>
<th>The Americas</th>
</tr>
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<tr>
<td></td>
<td>DG</td>
<td>OF</td>
<td>DG</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>0</td>
<td>100%</td>
<td>System E*</td>
</tr>
<tr>
<td>System A</td>
<td>100%</td>
<td>0</td>
<td>System F</td>
</tr>
<tr>
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<td>0</td>
<td>System G</td>
</tr>
<tr>
<td>System C</td>
<td>60%</td>
<td>40%</td>
<td>System K</td>
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<tr>
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<td>0</td>
<td>System M</td>
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<table>
<thead>
<tr>
<th>New rolling stock</th>
<th>DG</th>
<th>OF</th>
<th>DG</th>
<th>OF</th>
<th>DG</th>
<th>OF</th>
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<td>System E</td>
<td>69%</td>
<td>31%</td>
<td>System H</td>
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<td>70%</td>
<td>System M</td>
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<td>System N</td>
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</table>

<table>
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<tr>
<th>Operation &amp; maintenance (O&amp;M)</th>
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<th>OF</th>
<th>DG</th>
<th>OF</th>
<th>DG</th>
<th>OF</th>
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<tbody>
<tr>
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<td>47%</td>
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<tr>
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<td>100%</td>
<td>System M</td>
<td>0</td>
<td>100%</td>
<td>System N</td>
</tr>
</tbody>
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*It should be noted that System E, which received the lowest level of construction funding after Hong Kong, meets two-thirds of the cost of new rolling stock through direct government grants.

Source: Barron, Ng, and Kwok, May 2001

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64 It is arguable that income associated with rail property development rights is a form of indirect government subsidy, since government itself could otherwise acquire such rights. Likewise, when government backing for loans enables the acquisition of capital for new rail line construction at a somewhat lower interest rate than available in the private market, this is also a form of subsidy. However, the fact remains that government support for passenger rail in Hong Kong is far more limited than in any other high-income city in the world.

65 Outside of Hong Kong, government financial support often takes the form of direct grants that do not have to be repaid. In Hong Kong, the government injects equity capital into the rail systems when the Transport Bureau wants a particular line to be built. However, rail providers must ultimately obtain enough revenue from that line (through fares and to some extent through property development) to pay the government a market rate of return on funds (i.e., the line must "provide a commercial return").
In one-third of the systems surveyed, government met the full cost of rolling stock. In eight of the 15, it met at least two-thirds of costs. Four systems (including the MTR Corporation) purchase new rolling stock entirely from operator-generated funds. However, it is in meeting ongoing O&M costs that operator-generated revenues are most significant worldwide. For eight of the 15 systems in the survey, operator-generated funds cover all O&M costs, while in an additional two systems operator funds meet 80% of costs.

Although national and provincial levels of government often provide support to intra-urban passenger railways, local (sub-provincial) government also plays a major role. In three of the systems surveyed, local funding accounted for 100% of government support for urban passenger railway construction and in two others it accounted for more than two-thirds of such support. Further, as one moves from construction costs to purchase of rolling stock and on to operation and maintenance costs, local government grants play an increasing role relative to national and provincial grants. This is highly relevant for the HKSAR, which does not have the normal overlays of local, provincial, and national financing for infrastructure projects.

Constraints on rail development in Hong Kong

Hong Kong's extremely high population densities and the resulting potential for very high load factors make the self-financing of rail transport through fares somewhat less difficult compared to other cities. However, the Hong Kong government has taken this potential to an inappropriate extreme, which ultimately raises the overall costs of transport in terms of air pollution, noise, and other external impacts associated with having more road travel than would otherwise be the case.

An important implication of the government's self-financing requirement for rail is that the MTR Corporation requires an expected daily ridership of 30,000 to 70,000 per day from a proposed rail station in order to justify construction. Among other systems in the urban rail systems survey, the minimum ridership range for construction of a new station was typically 5,000 to 10,000. In other words, compared to their counterparts elsewhere, Hong Kong people have relatively limited access to rail transport.

While avoiding direct support for railways might seem positive in "free market" Hong Kong, this policy means that Hong Kong's rail system is limited only to areas of extreme density. Route maps of other major underground systems around the world (including those in other commonly cited "world cities," such as London, Paris, New York, or Tokyo) show a complex set of lines with extensive coverage (see Figures 3.1-3.5). In contrast, the rail map for Hong Kong (including both the MTR Corporation and KCRC lines) is skeletal - despite the fact that it serves a metropolitan area far denser than that of other "world cities."

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67 Rail systems in cities such as London and New York suffer from under-investment and are poorly maintained when compared to Hong Kong's newer rail system, but this should not be confused with the issue of the extensiveness of their networks.
Chapter 3: Road versus Rail - Financing Mass Transit in Hong Kong

Figure 3.1  Hong Kong's urban rail system (HKSAR)

[Map of Hong Kong's urban rail system]

Source: <http://www.hyd.gov.hk/road/rail/rail_o.htm>

Figure 3.2  London urban rail system (United Kingdom)

[Map of London's urban rail system]

Source: <http://www.londontransport.co.uk/images/jpg_big.jpg>
Figure 3.3  Paris urban rail system (France)

Source: <http://www.ratp.fr/ParisVisite/Pla_q/Pla_r/Pla_r_rsx_g/metro.htm>

Figure 3.4  New York City urban rail system (United States)

Source: <http://www.mta.nyc.ny.us/nyct/maps.submap.htm>
Until recently, the government's policy was that rail infrastructure would be put in place only after population levels were sufficient to allow system extensions to be quickly self-financing. Tseung Kwan O, for example, had to wait a decade for rail service, even though it lies only 3 km from an existing rail line. Even today, financing policy is modified only occasionally and on an *ad hoc* basis, as with the creation of the West Rail System to accommodate anticipated major population increases in the Western New Territories. In the case of the Northwest New Territories, mobility and air quality problems necessitated the early provision of clean, rail-based mass transit. Had the traditional policy been applied and area residents forced to wait until population levels had increased massively, there would likely have been traffic chaos and very severe episodes of air pollution. Failure to prevent these kinds of outcomes could damage the HKSAR's image internationally, in addition to jeopardizing the quality of life available to Hong Kong people.

**Bus-rail coordination**

In contrast to the skeletal coverage of rail in Hong Kong, buses provide extensive coverage in less densely populated areas. Further, bus fleets often compete directly with passenger rail, tending to raise costs for both providers. The government's requirement that rail providers recover both capital and operating costs

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68 While economists generally mistrust terms like wasteful competition (seeing them as "code words" for a hidden agenda), under specific conditions competition can be inefficient because it tends to increase, rather than lower, the overall costs of service. For example, inefficient bus-rail competition results in two basic problems. Consider a long-haul passenger transport route where road transport alone cannot adequately meet demand, but rail service could meet demand alone or with supplemental bus service. Here, the addition of large-scale direct bus competition for an existing fixed rail route reduces rail load factors, while the rail option keeps bus load factors low. This raises the average cost of service to both transport providers beyond what it would be if service by one major provider was supplemented with service from another provider. When buses are subsidized (or cross-subsidized through particular government policies), they may be able to operate on these routes at a modest profit, even with low load factors. Meanwhile, the rail provider must continue to operate so long as it takes in any income above its operating expenses so as to be able to repay the high fixed cost of railway construction.
largely through fares, coupled with a major cross-subsidy to bus companies through free provision of road infrastructure, means that bus travel tends to be considerably less expensive and much more readily available to riders than travel by rail. As more journeys occur by road than rail, the external costs for everyone in Hong Kong are higher as the extra buses add to the already serious congestion, air pollution, and noise.

The Third Comprehensive Transport Study (CTS3) cites a 1990 White Paper on Transport Policy regarding the need to "minimize wasteful competition." Yet while the Transport Bureau (and its predecessor within the colonial government) have been aware of this problem for over a decade, little has actually been done by the HKSAR government to better coordinate bus and rail service.

While more than one out of every four passengers on the MTR arrives at the station by bus, this feed-in is almost entirely haphazard. There is very little coordinated bus service to rail stations. In contrast, in eight of the 13 systems in the urban rail systems survey, rail-bus coordination is strongly encouraged or facilitated by the government. While CTS3 noted the need for improved bus-rail coordination, specific measures to promote such coordination, whether in the form of regulations or incentives, were not even mentioned.71

One way to reduce the likelihood of wasteful competition in new development areas is to create a "hub and spoke" transport system in which rail stations serve as transport "hubs" and feeder buses serve as the "spokes" leading into rail "hubs." This would limit bus-rail competition for longer journeys. In a similar but less extensive manner, "hub and spoke" systems could also be introduced gradually in Hong Kong's older urban areas.73

CTS3 does mention the need for more park and ride facilities at rail stations. Yet in Hong Kong, land shortages mean that providing such facilities would be expensive, while the commercial returns to the rail provider would be modest at best. As with many of the benefits of rail, a shift away from private car use creates important external benefits to Hong Kong, but the rail provider is able to capture only a modest internal financial benefit. Furthermore, CTS3 lacks any recommendations for some form of government-provided incentive with regard to park and ride facilities.

Indeed, a number of recent Transport Department assessments and publications, including CTS3, contain serious flaws. This raises questions about the quality of the assessment process, an issue that is discussed further in Chapter 7. The basic problem is not the technical competence of the consultants, but rather the restricted scope of their work. Basically, it appears that the options reviewed by consultants and/or what

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72 This was a major recommendation of the report by D. Rooks and D. Smaling (2002), Sustainable Transport in Hong Kong, Hong Kong: Civic Exchange & the Asia Foundation.
73 As a "hub and spoke" system would reduce the number of transport modes offering service between two points, it would limit modal choice for some passengers. However, the benefits associated with a more streamlined and better-coordinated transport system, including reduced congestion, air pollution, and noise, indicate that greater modal choice comes at a high cost.
consultants are allowed to publish tends to be skewed in such a way as to largely pre-determine the conclusions. The results are then put out by the Transport Department as definitive, when in fact, important factors or alternatives have not even been considered.

**Although there are plans for a major expansion of the HKSAR's passenger rail system, it is noteworthy that the Transport Bureau proposes to do this without changing the manner in which railways in Hong Kong are financed.** Continuation of current transport financing policy seems likely, despite the fact that the rail self-financing policy causes high external costs (less mobility, more pollution and noise) for everyone in Hong Kong.

**Passenger journeys**

The adverse effects of the requirement that rail systems be largely self-financing are demonstrated by the absence of rail in a number of Hong Kong's major population centers. Urban areas housing hundreds of thousands of people and lying only a few kilometers from an existing rail line may remain unconnected to rail for many years. For example, in what other "world city" would communities like Ap Lei Chau/Wah Fu or Ma Tau Wai remain without rail service, despite serious congestion and air pollution? It seems unlikely that this situation would occur in the service areas of other urban systems covered in the rail study.

Due to differences in government support for different transport modes, more travelers use road transport than would otherwise be the case. Overall, somewhat more than two journeys on road occur for each journey by rail. This reliance on road transport is not good from the standpoint of mobility or the environment. The fact that one-third of all journeys occur by rail may appear impressive, but Hong Kong's high density and income levels make the potential for rail-based transit here the highest in the world. Yet among the 15 systems surveyed, Hong Kong barely made the upper third of those surveyed with respect to the role of rail transport relative to road transport. Logically, we should be number one.

Our point here is not that buses should lose their cross-subsidy but that current government policies do provide financial support for some transport modes, with the result that the overall external costs to the Hong Kong community are higher than they would be otherwise. Buses provide essential external benefits compared to other forms of road-based transport, such as taxis and private vehicles, and have a crucial role to play in a more sustainable transport system for Hong Kong. Nonetheless, buses are more energy-intensive and polluting than rail and should play a complementary role to rail transport. Moreover, government claims that current transport policies reflect a laissez faire and impartial financing system are simply untrue. Current policies do provide de facto subsides for certain modes of transport.

The way in which particular transport modes are financed has a profound effect on the quality of life for everyone. This occurs directly through the level of fares and accessibility to transport and indirectly through the external impacts of modal choice. And in dense urban areas, the external effects of modal choice intrude on our lives around the clock. We urge that the same logic that is applied in providing indirect financial support for bus transport should be applied to rail - i.e., support in covering the costs of basic infrastructure provision. This should be accompanied by a concerted effort to promote substantial bus-rail coordination.

The survey of urban rail systems mentioned here suggests alternative models for financing rail transport. For example, what would be the external economic, mobility, and environmental benefits for Hong Kong if:

- The government followed the model applied in other cities around the world and funded - through direct grants - a substantial portion (e.g., 60%-70%) of the cost of new passenger railway construction?
What would be the external benefits to the people of the HKSAR if the cross-subsidized buses were consciously routed so as to better coordinate with rail and avoid the wasteful duplication of services?

### 3.4 Environmental and mobility benefits of rail

Table 3.2 shows emissions of three important pollutants for each journey in Hong Kong under the mix of fuels used to generate electricity and power motor transport in the late 1990s. It also suggests the degree of change possible if the Hong Kong power sector moves, as expected, toward a greater reliance on natural gas in the coming 10-15 years. Even if natural gas plays a supplemental role in a power-generating system based on coal, rail transport is far cleaner than bus transport in terms of the two most dangerous pollutants, respirable suspended particulates (RSP) and nitrous oxides (NO\textsubscript{x}). In addition, the RSP and NO\textsubscript{x} emissions for rail occur at power plants located far away from population centers, while those from buses and other internal combustion engine vehicles occur in close proximity to large numbers of people. The health effects of both pollutants are closely related to the concentration at which they are inhaled.

**Table 3.2  Current and projected emissions per journey for bus and rail in Hong Kong (in grams)**

<table>
<thead>
<tr>
<th></th>
<th>RSP (g/passenger carried)</th>
<th>Nitrogen oxides (NO\textsubscript{x}) (g/passenger carried)</th>
<th>Carbon dioxide (CO\textsubscript{2}) (g/passenger carried)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bus</strong></td>
<td>0.4</td>
<td>3.1</td>
<td>380</td>
</tr>
<tr>
<td>**Bus future ***</td>
<td>0.2</td>
<td>1.7</td>
<td>380</td>
</tr>
<tr>
<td><strong>Rail</strong> (30% natural gas, 70% coal power generation mix)</td>
<td>&gt; 0.01</td>
<td>0.8</td>
<td>470</td>
</tr>
<tr>
<td><strong>Rail future</strong> (natural gas as primary fuel with supplementary coal)</td>
<td>NA</td>
<td>&gt;0.01</td>
<td>390</td>
</tr>
</tbody>
</table>

* Updated to reflect Transport Department data\textsuperscript{75}  

Source: Barron and Steinbrecher, 1999

The major negative aspect of electric-powered rail transport is that carbon dioxide (CO\textsubscript{2}) emissions for rail are currently about 25% higher per journey than for buses. However, if, as expected, future power generation is largely dependent on natural gas (supplied either by pipeline or from a Liquefied Natural Gas [LNG] facility in Guangdong), the CO\textsubscript{2} tradeoff for rail versus bus becomes quite small. In addition, emissions of RSP from power plants cease to be an issue and NO\textsubscript{x} become a smaller concern (as does acid rain caused by the burning of coal in Hong Kong's power plants).

With regard to mobility, peak period speeds on the MTR in dense urban areas are generally 25 to 35 km per hour (depending on the density of stations) while peak period road speeds in Hong Kong Island and Kowloon generally drop to between 14 and 20 km per hour.\textsuperscript{76} Peak period road speeds are, of course, far

\textsuperscript{76} Ibid.
less predictable. Further, buses moving in traffic have average speeds far lower than average because they must stop frequently to pick up and discharge passengers.

Off-road (underground/elevated) passenger rail in Hong Kong is typically heavy rail (about seven cars per train) though medium rail (four cars per train) might be more suitable for rail extensions to areas of less than the most extreme densities (e.g., a possible future South Island Line). Even a medium rail line could readily carry 15-25 thousand passengers per hour. Moving the same number of passengers by road would require hundreds of standing-room-only double-decker buses per hour, which would, of course, cause a significant increase in road congestion.

### 3.5 Future planning for rail

Stating that building more and more roads is simply not feasible, the Transport Bureau\(^\text{77}\) and Transport Department\(^\text{78}\) say that it is now government policy to give priority to rail, making rail, rather than road transport, "the backbone of Hong Kong's transport system." Yet a look at proposed expenditures, as well as the extent of proposed road and rail construction, suggests rather different priorities.

For the period up to about 2016, the government proposes to spend between HK$180 and 200 billion on railways,\(^\text{79}\) but HK$332 billion on roads,\(^\text{80}\) the overwhelming share of which are strategic highways that compete with railways. This means that some rail lines that would otherwise be approved may not be built if a major road is put in place to serve the same area. The Transport Department also proposes that about 250 km of strategic roads and more than 330 km of new roads overall be built compared to only about 80 km of additional rail line.

At least for now "rail as the priority" remains more of a politically correct slogan than an implemented principle. What is more, the plans put forward by the Transport Bureau and the Transport Department are expected to fail both in terms of maintaining the level of transport service and reducing environmental impacts. Predictions show that road speeds will continue to fall, exposure to excessive noise will increase substantially, and street level air quality will continue to be unhealthy. Indeed, it is only by assuming that Euro 3\(^\text{81}\) engines become standard and are well maintained that CTS3 is able to predict marginal improvements in air quality under some scenarios.\(^\text{82}\)

In essence, the Transport Department acknowledges that the benefits associated with an increase in rail

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\(^{78}\) Transport Department (1999), *Third Comprehensive Transport Study: Final Report*.


\(^{81}\) Hong Kong uses the European Vehicle Emission Limits, commonly referred to as Euro 1-5. These specify the carbon monoxide, hydrocarbon, nitrogen oxide, and particulate matter emission limits for petrol and diesel cars, light commercial vehicles, and heavy-duty vehicles. Since January 1, 2000, Hong Kong has required all imported cars to adhere to Euro 3 standards. However, a large number of pre-Euro vehicles are still on the road in Hong Kong today. There is a significant difference in emission levels between pre-Euro and Euro vehicles; for example, in Euro 3 vehicles, emissions of particulate matter and nitrogen oxide (the two pollutants of greatest concern in Hong Kong) are about 92% and 58% lower than in pre-Euro vehicles. Moreover, even in Euro vehicles, the actual emissions are far higher than projected without proper maintenance.

travel from the current 30% to about 40-45% of all journeys by 2016 will be more than offset by an increase in the number of transport journeys overall. Assumed gains in making each vehicle kilometer traveled (vkt) less polluting would be largely or entirely offset by increases in total vkt, as would the gains in speed obtained by building more highways.

3.5 Recommendations

As outlined above, current transport policy in Hong Kong favors bus travel over travel by rail. The Transport Bureau seems intent on maintaining existing financial arrangements for rail. This policy decision fails to account for the serious congestion, unhealthy street level air quality, and excessive noise caused by road traffic in what is the world’s most densely populated urban area.

A key priority in moving towards a more sustainable transport system for the HKSAR is to conduct a thorough policy review of the manner in which rail systems are financed. This should be done at the highest levels of government, involving agencies outside the Transport Bureau and including substantial input from the public. It is also crucial to review cases where direct competition between buses and rail appears to cause wasteful duplication of services. Further, a high-level policy review on the creation of effective feeder bus and light bus services to coordinate with rail service should be conducted.

Our specific recommendations on these points are:

1. That government cover two-thirds of the cost of new rail line construction, but that rail lines otherwise continue to be self-financing, as they are today;

2. That bus service be limited (but not eliminated) on certain long-haul bus routes competing directly with rail lines that have spare capacity; and

3. That the majority of rail stations be served by dedicated feeder buses.

The following chapter takes a closer look at various options for minimizing the number of vehicle trips in Hong Kong.

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83 The number of private cars is forecast to increase nearly three-fold, offsetting gains in mobility obtained by creating additional road space and potential improvements in air quality due to pollution reduction technologies. This increase is at least partly due to the "predict and provide" approach to transport planning, which is discussed further in Chapter 4. Transport Department (1999), Third Comprehensive Transport Study: Final Report.
4.1 Introduction

As discussed in Chapter 3, rethinking the way in which rail systems are financed in Hong Kong is a major step in moving towards a more sustainable transport system. The external costs of rail transport, including environmental impacts, energy use, and overall mobility, are far lower than the costs of road transport.

While the use of cleaner vehicles and fuels will facilitate improvements in road transport by reducing emission levels, simply seeking cleaner ways to continue the same activities is not the formula for a sustainable transport system. The relentless growth in traffic due to population growth, intensified economic activities, and land use policy could easily offset the benefits of technical fixes. Moreover, air pollution is only one way in which transport damages the environment and general quality of life. Traffic congestion, noise, accidents, landscape and habitat degradation, and other externalities associated with transport will be largely unaffected by the introduction of cleaner, more efficient vehicles. Further, the commercial viability of some technologies, such as fuel cells and electric battery vehicles, has yet to be proved and use of cleaner vehicles may not become widespread quickly enough to prevent a serious deterioration of the quality of life in Hong Kong.

One logical and effective way to lessen the negative impacts of transport is to reduce the number of vehicle trips. This chapter looks specifically at pedestrianism as one aspect of a coordinated policy package for influencing the total number of vehicle trips made each day in Hong Kong.

4.2 Influencing vehicle trips

"Predict and prevent"

Transport planners in Hong Kong still rely on the "predict and provide" approach, which involves forecasting transport demand and then providing adequate road space. This is a traditional approach to transport planning that assumes growth in road traffic will be continuous. Therefore, a continuous program of road building and road improvement is required in order to accommodate for this growth and address traffic congestion.

Although used until recently as the basis for transport planning in many countries, the "predict and provide" approach is increasingly regarded as outdated and non-sustainable. In the United Kingdom, for example, the "predict and provide" approach to transport planning came under severe criticism during the late 1980s and 1990s. Roads to Prosperity, a road-intensive transport strategy developed by the UK government...

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85 Owen, S. (1995), "From 'predict and provide' to 'predict and prevent'?: pricing and planning in transport policy."
86 By pedestrianism, we mean walking as a form of transportation and as a form of recreation or exercise. In contrast, pedestrianization refers to the act of physically separating walkers from motor vehicles, mostly at-grade.
in 1989, marked the beginning of the end of a transport policy geared towards "meeting-the-demand" in the UK. A new approach, known as "new realism," evolved in its place. This new approach questions the feasibility of building roads to keep pace with unrestricted traffic growth and acknowledges that traffic trends can be influenced as well as predicted.

Hong Kong's Third Comprehensive Transport Study (CTS3) acknowledged that Hong Kong's small size and difficult terrain limit the potential for road expansion. In the same document, however, the Transport Department committed to a HK$250 billion road-building program, demonstrating a continuation of the long-standing approach to near-term road construction. It is now evident that the "predict and provide" strategy is unsustainable and that new roads attract more traffic. If we accept that there is an ultimate limit to the supply of road space in Hong Kong, we should then try to influence or manage future traffic demand at an acceptable and desirable level. Otherwise, we are asking future generations to cope with all the associated and unwanted externalities of our transport system.

We are not saying that no new roads should be built. Yet if our long-term transport objective is sustainable mobility, we should adopt a "predict and prevent" strategy in place of the outdated "predict and provide" approach. The government should also take a proactive approach to reduce the number of vehicle journeys by making non-mechanized travel, including travel by foot and by bicycle, more feasible, safe, and pleasant.

Land use planning

The relationship between land use and transport is straightforward. Passenger and freight movements are closely related to land use activities and both the magnitude and characteristics of travel are governed by land development patterns. Furthermore, the provision of transport services influences future land use.

The need to integrate land use and transport planning in Hong Kong is not new. Indeed, the integration of land use and transport is being dealt with at a variety of levels in the planning process and the government has undertaken numerous land use/transport studies over the last 15 years.

CTS3, which accords priority to railway development, places specific emphasis on land use and rail transport. By integrating land use, transport, and environmental policy at both strategic and sub-regional planning levels, future high-density, mixed land use developments would be centered around railway stations and public transport interchanges, and supported by pedestrian links and feeder services. It is

89 The 1989 White Paper Roads for Prosperity envisaged the doubling of transport expenditure as part of a strategic trunk road plan that was considered the policy solution to forecasts of sharp increases in traffic. "The government's conclusion is that the main way in which to deal with growing and forecast inter-urban road congestion is by widening existing roads and building new roads in a greatly expanded road programme." Department of Transport (1989), Roads for Prosperity, London: HMSO, para.16.
92 The emergence of the "new realism" in the UK coincided with aspirations for a more sustainable transport future.
94 Ibid, p.21-27.
hoped that more integrated planning would actually reduce the need to travel, while rail services would be readily accessible for the majority of journeys.

However, land use planning alone is insufficient as a sustainable transport strategy. People will not travel less because of a certain land use policy, especially if it is convenient and relatively inexpensive to use private vehicles. Land use measures must be implemented with complementary policies, such as parking control, car restraint measures, and pedestrianism, in order to obtain effective results.

**Transport pricing**

Transport pricing is widely considered a key component of a sustainable transport policy. The argument is that transport users are seldom required to pay the full costs of transport. Beyond the internal costs of transport for users (fares, licensing etc.), transport also imposes external social and environmental costs on society at large. Advocates in other parts of the world are calling for the internalization of the external costs of transport so that transport users, especially car users, will be encouraged to make more informed decisions about private travel. If the true cost of transport is factored into decision-making, it is likely that the number of unnecessary vehicle trips will be reduced. At a minimum, making transport pricing more accurate would encourage travelers to use more sustainable modes of transport (see Chapter 3 for a discussion of rail versus road pricing). However, although the use of transport pricing to influence vehicle trips is theoretically sound, in practical terms, quantifying the "true cost" of transport is inherently difficult and tends to be politically unpopular.

The Hong Kong government tabled the idea of electronic road pricing (ERP) on two occasions, first in 1983 and more recently in 1997, as a means of regulating the number of vehicles on the road in congested urban areas. Members of the general public were skeptical and generally unreceptive to the proposal - many saw it as an additional tax imposed unfairly on drivers and transport users. The government abandoned the proposal in 1983 in response to public opposition, and shelved the idea for a second time in 2001 due to arguments that Hong Kong's roads would be able to accommodate the anticipated growth in the number of private cars (3% per annum) without reducing traffic speeds to significantly below the

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benchmark of 20 km per hour. Such arguments fail to acknowledge the existing external costs of road transport, including air and noise pollution, which will increase with any growth in the number of vehicles. See Chapter 7 for more information about the assessment of ERP in Hong Kong.

4.3 Promoting pedestrianism in Hong Kong

The need for frequent journeys by foot in Hong Kong’s urban areas is a direct consequence of high reliance on public transport. While private car owners are often able to park relatively close to their origin and destination, public transport users generally must walk from their origin to a public transport access point and from the departure point to their destination. In addition, public transport users often have to change modes, which may involve another trip on foot. While Hong Kong’s transport planners have done an effective job in making public transport attractive for the overwhelming majority of journeys, they have largely ignored the needs of public transport passengers in their consequential capacity as pedestrians. Pedestrians have been treated as if they were unimportant and, even worse, as an impediment to the flow of traffic. We believe it is time to ask why Hong Kong has been allowed to become such a hostile environment for the huge numbers of us who are pedestrians every day. In a city with such a high reliance on public transport, why is the pedestrian experience not treated as an integral part of transport planning?

Walking tends to be limited to short distances because it cannot match the speed, distance, coverage, and convenience of mechanized transport. In Hong Kong, walking in the city center is unpleasant, quite difficult, and generally hazardous as a result of the deteriorating pedestrian environment. However, walking itself is good exercise and beneficial in terms of fitness and health. Walking does not consume fossil fuel or contribute to environmental degradation. In short, it is a sustainable form of transport.

A world city hostile to pedestrians

Based on comparisons with urban areas of similar size, density, and income, Hong Kong is arguably one of the most pedestrian hostile cities in the world. Pedestrian facilities are often sub-standard and sometimes non-existent. It is not uncommon to see thousands of people squeezed onto relatively narrow sidewalks, while much greater space is allocated to vehicles carrying far fewer people. Traffic signals are timed to facilitate the movement of vehicles, not pedestrians, and as a result, bottlenecks at pedestrian crossing points are frequent. Pedestrian crossing points are infrequent, sometimes necessitating long detours. Sidewalk railings seem designed to prevent pedestrians from crossing the street illegally rather than to protect them from vehicles.

In some areas, sidewalks are extremely narrow and littered with obstacles such as traffic signs, lampposts, and parking meters, which make pushing a baby carriage or operating a wheelchair difficult. In other places, walkers may suddenly discover that the sidewalk has come to an abrupt end and find they have no choice but to walk on the road. In addition, features that might make pedestrian journeys more pleasant, such as street furniture (benches etc.) or shade, do not exist in Hong Kong. Even worse is the fact that pedestrians are exposed to toxic air pollution and harmful noise pollution. Traffic accidents involving

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Chapter 4: Strategies for Minimizing Vehicle Trips - Promoting Pedestrianism in Hong Kong

pedestrians are also common, sometimes as a result of careless driving and jay walking, but often related to the spillover of pedestrians onto the road because of overcrowding on narrow sidewalks.

Overall, the pedestrian environment in Hong Kong is unattractive to ordinary pedestrians and especially challenging for certain groups, such as children, the elderly, the physically impaired, and tourists, particularly those who are unfamiliar with Hong Kong's urban traffic patterns. In a city where relatively few people have private cars and the majority are pedestrians for some part of every day, this situation is unacceptable and unsustainable.

Recent government initiatives

Pedestrianization is not a new idea, but was largely overlooked by Hong Kong's transport planners in the past. Examples of early pedestrianization efforts include the special traffic arrangements for Chater Road on Sundays and the pilot scheme in Tsim Sha Tsui East. In his 1999 Policy Address, the Chief Executive announced government plans to expand pedestrian zones in crowded and particularly polluted areas in order to combat roadside air pollution. One of the guiding principles of CTS3 is that pedestrian needs should be prioritized. CTS3 recommends strengthening existing planning guidelines to develop the concept of planning for pedestrians in new areas and redevelopments. It also recommends improvement in the pedestrian environment in other areas through better pedestrian facilities and more pedestrian schemes.

Following the recommendations of CTS3, the Transport Department studied and successfully implemented various pedestrian schemes in older built-up areas such as Central, Tsim Sha Tsui, Mongkok, Wan Chai, Causeway Bay, and Sham Shui Po, as well as in tourist areas such as Stanley Market. To give due credit to the Transport Department, more has been done on pedestrianization over the last three years than in the preceding 30 years. Nonetheless, we feel that individual pedestrian schemes are only part of the solution. More broadly, the Transport and the Planning Departments must work together to make Hong Kong a safer and more attractive place to be a pedestrian. Walking is a form of transport and addressing the needs of people who must walk in urban areas should be seen as a necessary component of a sustainable transport system.

The Planning Department also plays a major role in looking after pedestrian needs in Hong Kong. As recommended in CTS3, those transport objectives that are related to land use planning have been incorporated into the relevant sections of the Hong Kong Planning Standards and Guidelines (HKPSG) to make sure that they receive due consideration during the planning process. The Planning Department also commissioned a Study on Planning for Pedestrians in late 2000 that aims to develop practical guidelines for achieving a better pedestrian environment through safer, more attractive streets, as well as improved connections between public transport services and other local activities. The study will also explore the effects of improvements in the pedestrian environment on urban regeneration, tourism, and heritage conservation. The first stage of the study was completed in February 2002 and the second stage of the study is scheduled to begin after the close of the stage one public consultation period in March 2002.

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108 For example, the Transport Department commenced the first phase of the Pedestrian Scheme Study in May 1999. The first phase covers busy streets in Causeway Bay, Mongkok, and Tsim Sha Tsui. The second phase, which commenced in May 2000, seeks to identify potential streets in Central, Wan Chai, Jordan, and Sham Shui Po for pedestrianization.
109 Planning Department (2002), Study on Planning for Pedestrians, Stage 1 Public Consultation, Hong Kong: HKSAR Government.
SUSTAINABLE TRANSPORT IN HONG KONG: DIRECTIONS AND OPPORTUNITIES

Limitations of current government plans

Hong Kong is now in a good position to promote pedestrianism. Local residents and the business community are increasingly aware of the environmental costs of transport and the negative effects on quality of life. Most importantly, the government has shown a certain commitment to making Hong Kong a less hostile place for pedestrians. The Transport and the Planning Departments have taken the lead in launching new projects and planning studies. Members of the planning profession have also begun to put ideas forward, such as the Des Voeux Road Central Scheme. Some private developers have even catered to the needs of pedestrians in new development plans. Yet while we applaud these positive steps, significant problems and concerns regarding pedestrian planning in Hong Kong still remain.

Government's recent pedestrian planning efforts have focused mainly on the introduction of isolated and small-scale pedestrian schemes in urban areas. They involve the part-time or full-time closure of an existing street (usually a block or two of a single street) for the primary or exclusive use of pedestrians. These pedestrian schemes offer a stopgap response to pollution and congestion problems rather than a comprehensive plan to improve and enhance pedestrian spaces. While pedestrian zones enable improvements in traffic and environmental conditions, they also offer valuable social, economic, and urban design benefits to the local community. There are plenty of opportunities in traffic-free areas for social and cultural exchange, local culture and general leisure activities, and new businesses.

Unfortunately, these long-term potential benefits are overlooked due to the short-term remedial objective of current pedestrian schemes. The Transport Department carries out studies in major urban districts to identify key problem areas with respect to pollution, congestion, and road safety. Recommendations for new schemes largely depend on consequential traffic impacts in the vicinity and the servicing of buildings, as well as local support and on-site implementation issues (such as coordination with traffic wardens or the police force). The main objective is reducing pollution, traffic, and vehicle-pedestrian conflict. Little attention has been given to design and landscaping treatments of pedestrian zones - in some areas, the specific needs of particular groups of pedestrians, such as wheelchair users or the elderly, are simply ignored.

The major deficiency of the short-term, piecemeal approach to pedestrianization is the failure to anticipate and plan for the gradual creation of a comprehensive, area-wide pedestrian network. At present, existing pedestrian zones are spatially fragmented. Enclosed pedestrian shopping malls developed by private groups (for example, Pacific Place and Festival Walk) are not connected to a more extensive pedestrian network.

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110 The Des Voeux Road Central (DVRC) Scheme was the effort of a Working Party formed by the Hong Kong Institute of Planners and the then Chartered Institute of Transport (now known as the Chartered Institute of Logistics and Transport) in 2000. It proposed a comprehensive pedestrianization scheme for Des Voeux Road Central between Western Market and Pedder Street as part of an overall revitalization strategy for Central. The scheme took into account future highway and railway developments in the area through 2012 and proposed a three-phase implementation plan over the next decade. In terms of innovation and the time frame for implementation, the scheme is first of its kind in Hong Kong. For details of the study, please see Hong Kong Institute of Planners (HKIP) (2001), Des Voeux Road Central Pedestrianization Focussed Study: Final Report, Hong Kong.

111 For example, the covered walkway system linking Discovery Park to Tsuen Wan MTR Station. The Mass Transit Railway (MTR) Corporation is developing a "Dream City" at the Area 86 Depot and Tseung Kwan O South Station sites to house some 58,000 people. Pedestrian needs will be emphasized and non-polluting vehicles will be used to transport residents in the "Dream City." For details, please visit the MTR Corporation website at <http://www.mtr-dreamcity.com/indexeng.htm>.


113 For example, there are complaints that the red tile pavement in some of the designated pedestrian zones discriminates against wheelchair users. Transport Department (2001), personal communication with Simon Ng.
Relatively little has been done to improve pedestrian walkways and other on-street pedestrian facilities, like plazas, to create a friendly pedestrian environment and to better connect pedestrian zones.

**Institutional obstacles**

Current institutional arrangements present yet another obstacle to long-term, comprehensive pedestrian planning in Hong Kong. Numerous government departments are involved in the planning and provision of pedestrian facilities.114 For example, the Transport Department is responsible for traffic management issues at the district level and hence responsible for the provision of pedestrian facilities in relation to pedestrian usage levels and vehicular traffic flow. The Highways Department (HyD), on the other hand, is responsible for the planning, design, construction, and maintenance of the public road system, including sidewalks.115 Regional Offices of the HyD also look after the maintenance of roads and street furniture. The Planning Department and the Town Planning Board prepare and approve layout plans and are concerned with the provision of basic pedestrian facilities, among other planning requirements. While it seems that the Transport Department has final responsibility for coordinating pedestrian planning, it does not adequately oversee the planning, design, implementation, and management of pedestrian facilities. The diffusion of planning and policy-making across government agencies impedes implementation of comprehensive pedestrian plans. See Chapter 7 for a more detailed discussion of this issue.

Similar coordination problems also exist between the government and various stakeholders, such as the local community (residents and local businesses), private developers, and professionals. For example, at the local level, District Councils are consulted on new pedestrian schemes only after plans have been proposed. Thus, although they are often most aware of local needs, District Councilors are involved in implementation of government plans, rather than concept development or discussion of specific design features. Nor does the public have a voice. While it can be argued that the District Councils provide a channel for local ideas to reach the government, this method of obtaining local input on government projects is far too passive. Equally, much work remains to be done in fostering a strong public-private partnership to promote pedestrianism in Hong Kong. The involvement of private developers is crucial because the design of private development sites affects pedestrian movements and the ways in which pedestrian networks can be connected. **At present, there are no regulations requiring developers to provide pedestrian facilities or walkways.** 116

### 4.4 Recommendations

In order to promote pedestrianism in Hong Kong, it is necessary to develop a mission statement to direct policy across different agencies. We recommend that the central objective for pedestrian planning in Hong Kong be to provide pedestrians with a quality environment for walking to meet mobility and other needs. This mission statement would allow pedestrian spaces to become an integral part of a livable and sustainable community. It would provide safe, convenient, and "green" corridors for pedestrian movement. It would also provide a street space that belongs to the people and is a focal point for social and cultural interaction.

In terms of transport, pedestrian planning should aim to promote walking as a transport mode, so as to encourage a shift from motorized trips to walking trips for short distances and to further promote the use of public transport, as this will make associated journeys by foot safer and more pleasant. In the long-term,

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115 Highways Department at <http://www.hyd.gov.hk/overview/index.htm>, section on departmental overview.

this may facilitate a change in people's travel behaviors, reducing the number of unnecessary motorized trips and increasing use of public transport.

The institutional framework must be better defined and structured to facilitate collective efforts and contributions to pedestrian planning. A cross-departmental, inter-disciplinary task force should be established to oversee planning, management, and implementation issues at a higher level. New channels should be opened to link the task force with District Councils and local communities and with the private sector and professionals for the exchange of ideas, particularly at the early stages of pedestrian planning. Institutional incentives for change ("carrots"),117 such as a plot ratio bonus, would encourage private developers to incorporate more and better pedestrian spaces on their sites.

We also recommend short- and medium-term pedestrian action plans in both the urban core areas and new development areas. In both cases, an integrated approach should be used to achieve the long-term vision of a comprehensive pedestrian network. Our strategy is to start building the city block at the local or district level - to (re)create "living streets." These living streets could be connected into a sustainable local pedestrian network. Gradually, local networks would be merged into a district pedestrian network and district networks into an area-wide pedestrian network. The process of revitalizing community space and developing a pedestrian network will be lengthy, but the long-term associated benefits will be enormous. At the local/district level, new pedestrian schemes should be encouraged. Further, additional efforts are needed to improve existing sub-standard pedestrian facilities (such as the widening of narrow sidewalks) and provide connections between isolated areas. Architectural design or landscaping treatments should be incorporated into pedestrian schemes at an early stage. Amenities such as street furniture and shade should be provided wherever possible. Most importantly, pedestrian spaces should be planned under the umbrella of a local or district pedestrian network. Local communities and District Councilors should play an active role in the planning process, as they are the people who are best informed about local needs and problems. District transport officers and local transport planners, as well as other relevant government agencies, should also act as facilitators to develop local pedestrian plans. In general, the local/district pedestrian network should allow smooth pedestrian movements throughout the district. Based on specific local objectives, the network might also serve to link tourist attractions and places of interest.

In new development areas and major redevelopment sites, pedestrian networks to link housing facilities with transport access points (such as railway stations or major bus terminals) should be included in the initial planning stages. These new developments provide the best opportunities to promote walking as a replacement for short motorized trips because the travel patterns and behaviors of local residents can still be influenced by planning measures. Therefore, the implementation of transport plans, such as provision of a railway connection, becomes crucial to the success of pedestrian schemes (see Chapter 3). In these areas, planners should also strive to make it possible for the majority of the local population to walk (or cycle) to the transport access points, or to shopping, amenities, or open spaces, without sharing common corridors with traffic and with minimal need to crossover onto busy roads.

In the long run, the government should be more bold and innovative in terms of the location and type of pedestrian facilities to be considered. To date, government pedestrian schemes have avoided major roads due to an obvious desire to prevent any obstacle to traffic flow in busy areas. Pedestrian schemes in these areas might require significant diversion of traffic, such as the re-routing of buses. Yet Hong Kong's busiest areas (for example, Causeway Bay, Central, and Mongkok) also have some of Hong Kong's highest pedestrian densities.

117 Ibid.
Major transport corridors on Hong Kong Island, such as Hennessy Road in Causeway Bay and Wanchai, Queensway in Admiralty, and Des Voeux Road in Central, make up the core of the city and it is in such areas that pedestrianization should be seriously considered. In cities like Munich, Vienna, Bologna, Florence, and Bristol, the core of the city has been converted into an auto-free "environmental oasis." In other cities, such as Paris, driving is banned in city center areas on days when air pollution levels are hazardous.

Hong Kong could follow the lead of municipal authorities elsewhere in preserving the city core for social, cultural, and tourist activities, rather than allowing it to be dominated by traffic. For example, we could develop a transit mall in Causeway Bay where local road transport needs would be met by clean and quiet tethered electric transport vehicles (see Chapter 5). In other areas, road space could be reclaimed and better utilized for street activities and greenery. Similar light rail malls are already in place in cities such as Bremen, Zurich, and Gothenburg. In Denver, a bus mall along 16th Street is becoming a major tourist attraction and has generated interest from city planners in other American cities.

4.5 Conclusion

The common goal of the various options discussed in this chapter, including pedestrianism, ERP, and more integrated planning, is a reduction in the number of unnecessary vehicle journeys. This is the only effective means of neutralizing the externalities of transport. One of the best options available in Hong Kong is shortening the distance of certain types of trips - for example, the distance between homes/offices and transport access points - and making the trip less dangerous and more pleasant so that people will prefer to walk short distances rather than relying on motorized transport.

Pedestrian planning should be seen as only one of many tools in a sustainable transport strategy. The policy options discussed in preceding chapters, including changes in financing for rail, are inter-related and could be integrated into a comprehensive transport policy package that would take us closer to the goal of sustainable mobility.

With reference to best practice in other parts of the world, Hong Kong needs to articulate a long-term vision for sustainability and develop a set of concrete targets, such as a ceiling for emissions or an optimum size for the private vehicle fleet, before moving on to tailor policy measures and packages. A sustainable transport policy for Hong Kong should aim to maximize accessibility and mobility within the preset environmental and traffic constraints.

118 The same can be said of Nathan Road on Kowloon side.


121 Ibid, p.60.
Once reliance on road transport has been minimized, the next step in moving towards more sustainable transport is to make road transport as clean and efficient as possible. In making this transition, there are two main priorities:

- **Facilitate use of road vehicles with high occupancy potential**, particularly for long-distance, high-demand routes. High capacity vehicles free up road space and reduce congestion. Compared to other high-income cities, Hong Kong ranks quite well in terms of high occupancy vehicle use.

- **Introduce clean power systems that lessen environmental damages (both local and distant) from energy production in vehicles of any capacity**. Although movement in this direction is long overdue, Hong Kong has begun to move towards cleaner vehicles by requiring cleaner fuel and engine systems. During the 1990s, the sulfur content of transport diesel fuel was reduced and since January 1, 2000, new vehicles have been required to meet Euro 3 standards. This trend toward cleaner fuels and vehicles is expected to continue with the introduction of ultra low sulfur diesel (ULSD) and more stringent Euro standards.

With regards to a clean vehicle strategy, the basic question is this: based on the commercial viability of technologies, cost constraints, energy delivery infrastructure requirements, vehicle performance standards, and emissions, which fuel and power systems are best for the specific situation at hand?

### 5.1 High occupancy road vehicles

High occupancy road vehicles fall into two major categories: free-wheeling vehicles with on-board fuel and engines and tethered electric road vehicles (electric trolley buses and modern trams) that run along fixed routes. Free-wheeling vehicles offer maximum flexibility, while tethered vehicles offer advantages with respect to efficiency, pollution, and noise. The major focus of this section is on how transport needs currently met by diesel buses might be met in more sustainable ways, primarily by replacing a significant proportion of the free-wheeling bus fleet with tethered electric vehicles.

**Buses**

Buses in Hong Kong account for about 39% of all public transport journeys by road and are utilized more than any other mode of passenger transport, including rail. Bus service in Hong Kong is both extensive in terms of area coverage and off-peak service and intensive, meaning that there is frequent service during peak periods. In much of Hong Kong, it is possible to rely on bus service most or all of the time. During

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123 Hong Kong uses the European Vehicle Emission Limits, commonly referred to as Euro 1-5. These specify the carbon monoxide, hydrocarbon, nitrogen oxide, and particulate matter emission limits for petrol and diesel cars, light commercial vehicles, and heavy-duty vehicles. However, a large number of pre-Euro vehicles are still on the road in Hong Kong today. There is a significant difference in emission levels between pre-Euro and Euro vehicles; for example, in Euro 3 vehicles, emissions of particulate matter and nitrogen oxide (the two pollutants of greatest concern in Hong Kong) are about 92% and 58% lower than in pre-Euro vehicles. Moreover, even in Euro vehicles, the actual emissions are far higher than projected without proper maintenance.

124 The word *modern* is used here to emphasize the fact that the present tram system on Hong Kong Island employs vehicles that are literally antiques. They are slow, cheap, uncomfortable, and quite narrow. In contrast, the modern trams found in some European cities are faster and more comfortable (although they use slightly more road space).

the 1990s, the overall quality of Hong Kong buses (e.g., introduction of air conditioning, lower pollutant emissions) improved substantially.

However, the real question is how many additional large, road-based passenger vehicles can be put on Hong Kong's increasingly congested roads at peak hours given the topological limitations imposed by mountains and the coastline. It is presumably in light of these limitations that the Third Comprehensive Transport Study (CTS3) projects that the proportion of all public transport journeys made by franchised buses will drop to about 33% by 2016, even with the Transport Department's proposed massive road building program and with a rise in population to beyond 8 million.\(^{126}\)

Although we feel that the government is still not taking the steps necessary for making rail the backbone of Hong Kong's transport system (see Chapter 3), it is clear that road vehicles must continue to play an important role in absolute terms even as their relative share of all public transport declines. While it may be possible to reduce the number of buses on some routes at some times, in absolute terms, the need to maintain a certain number of buses on Hong Kong's roads will remain constant as the population continues to grow. In keeping with this observation, CTS3 projects the absolute number of bus and other road-based public transport journeys will increase somewhat up to 2016.\(^{127}\)

Considering the unhealthy street level air quality and noise levels in Hong Kong, it is vital that large passenger vehicles in Hong Kong become far less detrimental to the quality of life in the neighborhoods through which they travel. One basic improvement would be better coordination with rail. Bus service in Hong Kong is provided by private companies but heavily regulated by the government. In light of government's role in awarding routes and given the many crossovers between road and rail lines in Hong Kong's high density urban environment, it is striking that Hong Kong has very little in the way of short-haul feeder buses to rail stations.\(^{128}\) While CTS3 notes the need for better bus-rail coordination, it makes no mention of the need for dedicated feeder bus services to rail stations, as is common elsewhere in the world. Nor is the concept of integrated fares explored in any detail.

Overall, the authors of CTS3 seem to recognize the benefits of better coordination of bus (and public light bus) services with rail, but are reluctant to suggest any specific steps that might be viewed as integration of services across modes. In our view, it is time for government transport planners to either mandate or provide meaningful incentives to promote much greater coordination between bus and rail service and to discourage inefficient duplication of road and rail service (see Chapter 3).

**Electric trolley buses and trams**

Although both electric trolley buses and trams have been in use throughout the 20th century, they fell into disfavor after World War II as urban areas expanded and their peripheries became less dense. This was also a period during which a plentiful supply of inexpensive petroleum existed. Interest in tethered electric road vehicles was rekindled in the 1980s when air pollution associated with internal combustion engines became a major concern. While some people may view trams and trolley buses as vehicles from another era, there has been considerable technological improvement in recent years with regard to comfort, speed, and safety.


\(^{127}\) Ibid.

\(^{128}\) As noted in Chapter 3, a related matter is that of bus lines competing with rail along the same routes. The closest CTS3 comes to addressing this point is to cite a 1990 White Paper issued by government that stressed the need to avoid wasteful duplication of transport services. Yet, more than a decade later, little has been done on this issue. Transport Department (1999), *Third Comprehensive Transport Study: Technical Report*, Section 13.4 and Barron, B., Ng, S., and Kwok, V. (2001), *Financing Urban Passenger Rail: An International Survey*, Hong Kong: Centre of Urban Planning & Environmental Management, The University of Hong Kong.
In contrast to internal combustion engine (ICE) vehicles such as buses, **electric trolley buses and trams emit no local air pollutants and tend to be more energy efficient and less noisy**.\(^{129}\) If local power generation is efficient and is at least moderately reliant on natural gas - and both prerequisites hold true in Hong Kong - replacing buses with trolley buses and trams along certain routes will not only improve street level air quality but also result in lower overall pollution and energy consumption in Hong Kong.\(^{130}\)

As noted in CTS3, franchised buses are capable of satisfying transport demands at lower capital costs than rail systems. They have the further advantage of flexibility in that they can adjust their service patterns to meet changes in demand in a relatively short time.\(^{131}\) However, in practice, there are likely to be a significant number of routes - particularly in the older, high density areas of Hong Kong - with stable transport needs where greater flexibility is not a significant advantage and unhealthy air quality and noise mean that the benefits of tethered electric vehicles are significant.

### Air pollution

Table 5.1 shows emissions of respirable suspended particulates (RSP), nitrogen oxides (NO\(_x\)), and carbon dioxide (CO\(_2\)) per passenger journey in Hong Kong for buses, non air-conditioned trams, and air-conditioned electric trolley buses. These emissions are based on the current system of power generation in Hong Kong, under which natural gas is used for approximately 30% of power needs and coal for the remaining 70% and are, of course, relevant to the extent that journeys are approximately the same length. If, as expected, Hong Kong becomes more reliant on natural gas with the construction of a Liquefied Natural Gas (LNG) facility in Guangdong, the emissions associated with electric trolley buses and trams would fall even further. Perhaps most importantly, CO\(_2\) emissions linked to electric-powered transport would be largely eliminated.\(^{132}\)

**Table 5.1 Energy and emissions per passenger carried**

(assuming 30% gas, 70% coal-fired power generation)

<table>
<thead>
<tr>
<th></th>
<th>Energy in mega joules (MJ)</th>
<th>RSP (grams)</th>
<th>Nitrogen oxides (NO(_x)) (grams)</th>
<th>Carbon dioxide (CO(_2)) (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double-decker electric trolley bus</td>
<td>2.9</td>
<td>0.02</td>
<td>0.8</td>
<td>400</td>
</tr>
<tr>
<td>Existing HK tram(^a)</td>
<td>0.4</td>
<td>0.01</td>
<td>0.3</td>
<td>95</td>
</tr>
<tr>
<td>Diesel bus</td>
<td>6.2  (^b)</td>
<td>0.18  (^c)</td>
<td>1.8  (^c)</td>
<td>290  (^b)</td>
</tr>
</tbody>
</table>

\(^a\) Energy use is low because unlike other transport modes in Hong Kong existing trams are not air-conditioned.

\(^b\) These figures would be somewhat lower if buses were to attain higher average passenger load factors.

\(^c\) Updated to reflect expected emission levels in 2016 using projections from Transport Department (1999), Third Comprehensive Transport Study: Strategic Environmental Impact Assessment.

Source: (except as noted) Barron and Steinbrecher, 1999.

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\(^{129}\) Barron W., and Steinbrecher, N., eds. (1999), *Heading Towards Sustainability? Practical Indicators of Environmental Sustainability for Hong Kong*, Hong Kong: Centre of Urban Planning & Environmental Management, The University of Hong Kong; Wong Hong Chung (1999), *Potential and Limitations for Trolley Bus Transport in Hong Kong*, Masters dissertation, Hong Kong: Department of Geography and Geology, The University of Hong Kong.

\(^{130}\) Barron W., and Steinbrecher, N., eds. (1999), *Heading Towards Sustainability? Practical Indicators of Environmental Sustainability for Hong Kong*.


\(^{132}\) Ibid.
Table 5.2 provides a more general picture and shows emissions for hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NOx), sulfur oxides (SOx), and particulates on a unit distance basis.

**Table 5.2 Pollutant emissions (grams/km)**

<table>
<thead>
<tr>
<th></th>
<th>Hydrocarbons</th>
<th>Carbon monoxide (CO)</th>
<th>Nitrogen oxides (NOx)</th>
<th>Sulfur oxides (SOx)</th>
<th>Particulates</th>
<th>Total pollutants&lt;br&gt; (tons/million km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean diesel bus</td>
<td>&gt;1</td>
<td>2</td>
<td>3</td>
<td>13</td>
<td>&gt;1</td>
<td>18.8</td>
</tr>
<tr>
<td>Electric trolley bus</td>
<td>&gt;1</td>
<td>&gt;1</td>
<td>5</td>
<td>7</td>
<td>1</td>
<td>Nil b</td>
</tr>
<tr>
<td>on coal fired power</td>
<td>Nil</td>
<td>Nil</td>
<td>3</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Electric trolleybus</td>
<td>Nil</td>
<td>Nil</td>
<td>3</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>on gas fired power</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Hydrocarbons, carbon monoxide, nitrogen oxides, sulfur oxides, and particulate matter.

\(^b\) The term "Nil" is used where pollutant emissions are so low as to be negligible.

Source: Citybus Ltd., personal communication from John Blay, March 20, 2001

**Noise pollution**

Another advantage of electric trolley buses and modern trams (though not necessarily of the "antique" trams in operation in Hong Kong) is lower noise. Noise is a growing problem in Hong Kong. In 2000, an estimated one million people were exposed to excessive road noise (above 70 db(A)).\(^{133}\) By 2016, the number of people exposed to excessive road noise is projected to increase by about 50%.\(^{134}\)

As noted in CTS3, in 1997, the hourly levels of daytime noise exceeded the relevant standards, but noise standards were only exceeded marginally during evening hours. However, by the year 2016, noise levels will increase substantially during all hours of the day. If Hong Kong does not tackle the heavy vehicles situation, there will be no improvement in road traffic noise.\(^{135}\) Table 5.3 shows estimated noise levels for trolley buses and diesel buses using a variety of different power systems.

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\(^{133}\) Environmental Protection Department (2001), *Environment Hong Kong 2001*, Hong Kong: HKSAR Government.

\(^{134}\) One must keep in mind that the decibel scale is logarithmic, i.e., the noise levels represented increase exponentially as the numbers rise arithmetically. Transport Department (1999), *Third Comprehensive Transport Study: Strategic Environmental Impact Assessment*.

Table 5.3 Estimates of comparative noise levels for buses with diesel, CNG, fuel cell, or electric motors

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Power source</th>
<th>Estimated noise level (in decibels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>Diesel engine</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>CNG</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Fuel cell</td>
<td>68</td>
</tr>
<tr>
<td>Trolley bus</td>
<td>Electric</td>
<td>60</td>
</tr>
<tr>
<td>City street background</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

Source: Citybus Ltd., personal communication from John Blay, March 20, 2001

A study cited by Wong rated diesel buses at 94 decibels and electric trolleybuses at 74 decibels, figures higher than those cited above. Yet while these noise levels are higher, electric trolley buses are still about 20 decibels quieter than diesel buses, a substantial advantage.

**Policy approach**

Trams and electric trolley buses seem well suited to help reduce serious air and noise pollution in Hong Kong. Yet CTS3 is, at best, ambivalent about tethered electric vehicles as part of any attempt to make Hong Kong's transport system more sustainable.

The few references to trams are limited to comments about the value of Hong Kong's existing trams (i.e., their usefulness for short distances when speed is not a concern, but where low cost is an important advantage). CTS3 does not even mention the possibility of modern trams for Hong Kong, such as those in use in a number of European cities. One possible explanation is that Hong Kong's "antique" trams are quite narrow and do not take up the amount of road space required by modern, more comfortable trams. Reluctance to concede some additional road space appears to have superseded the obvious benefits of wider, faster, and more comfortable modern trams.

Whatever the reasons for failing to mention modern trams in the CTS3 report, this was a serious omission. Modern trams could be an integral part of local transport in new town developments as well as in some older urban areas. The major limitations of trams are that they are restricted to flat or nearly flat areas and, being heavy, may require strengthening of roadbeds. However, trams are well suited to reclaimed areas, which tend to be flat, such as the northern shoreline of Hong Kong Island, the Kowloon peninsula, and parts of the New Territories. Trams can also be used imaginatively in conjunction with pedestrian schemes, such as those being proposed by the Hong Kong Institute of Planners. CTS3 does note that Hong Kong's existing trams (which currently account for nearly 3% of all road journeys) should continue to play a role in short trips and in providing feeder service to heavy rail.

Electric trolley buses do not suffer the same limitations as trams in terms of speed and restriction to flat

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136 Wong Hong Chung (1999), *Potential and Limitations for Trolley Bus Transport in Hong Kong*.
137 An ideal area would be the planned South East Kowloon reclamation.
138 Introduction of modern tram service would be very suitable in the new Tseung Kwan O development, despite the fact that government planners failed to consider options for eliminating transport-related local pollution during site design.
139 The *Des Voeux Road Central Pedestrianisation Focussed Study: Final Report*, produced by the Hong Kong Institute of Planners in April 2001, and other pedestrian schemes are discussed further in Chapter 4.
areas. In addition, they are somewhat less capital-intensive in that they do not use rails, do not require the strengthening of roadbeds, and have greater flexibility of movement (e.g., can overtake other vehicles, including other trolley buses). The newest electric trolley buses can move over a lane on either side of the overhead line. They have good acceleration and are quite good at climbing hills. In fact, under heavy loads, they significantly outperform diesel buses.\textsuperscript{140} Dual mode trolley buses with on-board diesel or electric motors for temporary off-power line operation are also an option.\textsuperscript{141} Citybus is now running trials of an air-conditioned, double-decker electric trolley bus with an auxiliary motor.\textsuperscript{142}

In May 2001, the Transport Department released the Executive Summary of \textit{A Feasibility Study of Introducing Electric Trolley Buses into Hong Kong},\textsuperscript{143} which discussed the negative features of trolley buses in more detail. The feasibility study claimed that both capital and operating costs are far higher for trolley buses than for diesel buses. It also noted that higher costs would necessitate substantial fare increases for passengers and thereby preclude the possibility of direct trolley bus and diesel bus competition along the same route. In our view, direct competition between diesel and electric trolley buses along the same route is probably not a good idea anyway. In order to realize significant air quality and noise improvements, it would be best if most (if not all) of the diesel buses on particularly polluted and noisy routes were replaced by electric trolley buses.

Moreover, the Transport Department's contention that electric trolley buses have substantially higher operating costs is questionable. Wong cites evidence that operating costs are actually lower,\textsuperscript{144} while Blay argues that vehicle operating costs are roughly comparable.\textsuperscript{145} It is also important to keep in mind the fact that diesel buses remain competitive in Hong Kong because they pay no fuel duty. Internal costs for passengers (bus fares) remain low because they do not have to pay for the external costs of diesel bus use, including the health damages caused by emissions and noise. The feasibility study does not address these points.

It is true that the capital costs of electric trolley buses are higher. However, this drawback is partially offset by the fact that trolley buses also have a much longer operating life and should be amortized over a much longer period.\textsuperscript{146} This fact is not even mentioned in the feasibility study. As with CTS3, the feasibility study on electric trolley buses provides only passing mention of their advantages. Yet curiously, at the end of a negative assessment of the appropriateness of electric trolley buses for Hong Kong, the feasibility study recommends (without any explanation) that electric trolley buses be considered for local transport in new development areas.

One might suspect that the purpose of the feasibility study was really to eliminate public interest in electric trolley buses for older urban areas (where admittedly, they would represent a somewhat greater initial challenge for traffic management). Yet in new development areas where such challenges could be dealt with at the planning stage, the door was left open for the introduction of trolley buses. If true, this approach is off-target since Hong Kong's older urban areas have the most pressing environmental health problems and tethered electric vehicles are the best road alternative commercially available today to help alleviate these problems. More general questions regarding the value of feasibility and planning studies are addressed in Chapter 7.

\textsuperscript{140} Ibid; John Blay (2002), Citybus Hong Kong Limited, personal communication, March 6, 2002.  
\textsuperscript{141} Transport Department (2001), \textit{The Annual Census of Traffic 2000}, Hong Kong: HKSAR Government.  
\textsuperscript{142} John Blay (2002).  
\textsuperscript{143} Transport Department (2001), \textit{The Annual Census of Traffic 2000}.  
\textsuperscript{144} Wong Hong Chung (1999), \textit{Potential and Limitations for Trolley Bus Transport in Hong Kong}.  
\textsuperscript{145} John Blay (2002).  
\textsuperscript{146} Ibid; Wong Hong Chung (1999), \textit{Potential and Limitations for Trolley Bus Transport in Hong Kong}. 
The higher capital costs and longer capital life of electric trolley bus systems suggest that these systems should not be managed in the same way as diesel buses. A longer franchise period than is common for diesel buses would be appropriate.\(^\text{147}\) In addition, higher capital costs mean that the route's financial viability is highly sensitive to the level of competition, since high fixed costs make load factors even more important. In our view, these considerations are not valid arguments for precluding electric trolley buses in areas where improvements in air quality and noise levels are badly needed.\(^\text{148}\) Nonetheless, an electric trolley bus system must be managed somewhat differently from a diesel bus system.

Another potential concern with regard to tethered electric vehicles is visual intrusion from overhead wires. While there are a variety of designs for poles and cables to fit into specific cityscapes,\(^\text{149}\) Hong Kong's narrow streets and overhanging signs present a unique challenge. Yet the very clutter of the Hong Kong street scene may make the overhead lines less visible than in less dense cities. There seems to be no public outcry about the overhead wires associated with Hong Kong's current tram system. Would a small increase in overhead clutter be an acceptable price to pay for cleaner air along Hong Kong's streets?

\^{\blacklozenge}\hspace{1em} \textbf{The future of trolley buses}

In the spring of 2001, Citybus Hong Kong Ltd. set up a trial in Hong Kong with a short off-street track to test power consumption on the world's first double-decker, air-conditioned electric trolley bus. Initial results are encouraging and side-by-side vehicle performance tests with a comparable diesel bus are also being carried out. Interestingly, the Transport Department's feasibility study casually dismisses the value of such a trial.\(^\text{150}\) Nonetheless, Citybus hopes to obtain approval from the Transport Department to conduct a commercial and technical demonstration.\(^\text{151}\)

Unlike other clean technologies, such as fuel cell, electric battery, or hybrid vehicles, electric trolley buses and modern trams are already available and commercially viable. While we look forward to the day when free-wheeling buses with zero local emissions are used on Hong Kong roads, the fact is that such vehicles are not commercial today and it is unclear when they will become available. Electric trolley buses and trams may offer the only realistic solution for attaining acceptable levels of air quality and noise in some of Hong Kong's pollution black spots any time soon.

\begin{itemize}
\item 5.2 Private vehicles and goods vehicles
\end{itemize}

\underline{Private vehicles}

While only about one in six Hong Kong families owns a car, the number of private cars continues to grow, contributing to congestion and local air pollution. Private vehicle ownership is expected to increase about 50\% by 2016, while peak period road speeds are projected to drop to as low as 14 km per hour.\(^\text{152}\) In a

\begin{footnotes}
147 John Blay (2002).
148 However, we do suspect that the need to change financing mechanisms may explain (at least in part) the negative attitude of the Transport Department with regard to Citybus interest in introducing trolley buses in Hong Kong.
149 Wong Hong Chung (1999), \textit{Potential and Limitations for Trolley Bus Transport in Hong Kong}.
152 CTS3 projects the number of private vehicles will increase faster than population, with about 1 in every 5.5 families owning a car in 2016, compared to 1 in 6 in 1997. Transport Department (1999), \textit{Third Comprehensive Transport Study: Final Report and Technical Report}.
\end{footnotes}
survey of car owners in Hong Kong, Cullinane notes that the longer individuals own a vehicle, the more they come to rely on it, even when public transport is available.\footnote{Cullinane, S. (2002), \textit{Car Dependence - Evidence from Hong Kong}, Hong Kong: Centre of Urban Planning and Environmental Management, The University of Hong Kong.}

Hong Kong seems unlikely to follow Singapore's lead and limit the number of private vehicles. Yet something must be done to discourage their use at certain times and places. Two basic options for discouraging private vehicle use are road pricing (tolls) and provision of ample and attractively priced park and ride facilities coupled with higher costs (or restricted availability) of day-long parking in congested areas during business hours.

In the spring of 2001, the Transport Department rejected electronic road pricing (ERP) as unnecessary at this point in time.\footnote{Transport Department (2001), \textit{The Feasibility Study on Electronic Road Pricing, Final Report}, Hong Kong: HKSAR Government.} However, as discussed in Chapter 7, a careful reading of the assessment report suggests that either critical parts of the analysis are being withheld from the public or that the four-year study was seriously flawed in its basic design.

On the subject of financial support for park and ride facilities, CTS3 is largely silent, noting only that in some cases such facilities might be commercially viable. While commercial viability is a worthy goal, the point of park and ride facilities is not to generate a direct profit but to provide wider economic, social, and environmental benefits by persuading people to switch from cars to trains. It seems that some of the more interesting possibilities available with this system (e.g. drivers able to show proof of having recently ridden the rail system are able to park at a lower rate) were not even considered in CTS3.

CTS3 did look at higher parking charges for heavily congested areas, but did not recommend this measure due to fears of increased illegal parking. However, concerns about illegal parking seem exaggerated considering the potential for effective enforcement through ticketing of illegal vehicles. Reluctance to raise the cost of parking in congested areas compounds the effect of the reluctance to consider significant subsidies for park and ride facilities at rail stations.

Given this narrow view of the situation, it is perhaps unsurprising that CTS3 found that park and ride facilities would not have a significant impact on car usage. As discussed further in Chapter 7, the assessments of ERP and park and ride seem to have been framed in such a way as to pre-determine the outcome.\footnote{The construction cost of such facilities might be treated as a road-related expenditure by the Highways Department and the operational costs of the facility covered by user fees.} Good transport planning and good government requires a more transparent and objective assessment of options.

\textbf{Goods vehicles}

Light and medium goods vehicles often contribute significantly to peak period traffic in congested urban areas. For example, a random sample of eight urban sites covered in the 2000 traffic census\footnote{This is admittedly a relatively small sample and the selection of congested areas a non-scientific sampling. Nonetheless, it does suggest that if it were possible to shift goods vehicle traffic to off-peak periods, this would significantly improve traffic flow and reduce vehicular emissions along those routes.} shows that goods vehicles account for about 15\%,\footnote{Goods vehicles accounted for 9\% to 35\% of all vehicles on the road in the eight urban areas.} of all vehicles on the road during the period between 8 a.m. and 10 a.m.\footnote{Transport Department (2001), \textit{The Annual Census of Traffic 2000}.} Since goods vehicles have a typical length of 1.5 to 2 passenger car units, their actual
contribution to congestion may be even higher than their numbers suggest. Furthermore, their contribution to congestion from 6 to 7 p.m. is even higher as goods vehicles account for about 17% \(^{159}\) of all vehicles on the road during this period. Removing goods vehicles from the road at crucial times of the day would not eliminate congestion, but could help improve the situation significantly.

Goods vehicles account for just over one-third of vehicle kilometers traveled (vkt) in Hong Kong, a level that is expected to fall only slightly by 2016. However, they produce nearly 60% of vehicular respirable suspended particulates (RSP) and nearly half of nitrogen oxide \(\text{NO}_x\) emissions. While much of this is from heavy goods vehicles, which tend to avoid congested urban areas, light goods vehicles do use urban streets and account for nearly one-quarter of RSP and about one-eighth of \(\text{NO}_x\) emissions.\(^{160}\)

Despite the contribution of good vehicles to congestion and pollution, CTS3 devotes only a few paragraphs to the question of possible restraints on commercial vehicles. The report concludes that given Hong Kong’s service economy, continuation of road-based goods transport is the only option. CTS3 also dismissed peak period restrictions on commercial vehicles in congested areas, stating that this would result in inconvenient delivery times and restrict commerce. However, there was no consideration of less stringent time-of-day restrictions (e.g., restricting goods vehicles from congested urban areas for a total of about three to four hours per day, split between morning and evening peak periods). By suggesting that the only option was a very broad time restriction, the Transport Department effectively pre-determined the finding that such long restrictions would be impossible.

5.3 Clean power systems

Natural gas vehicles (NGV)

Natural gas vehicles (NGV) are a commercially viable technology. Unlike the Liquid Petroleum Gas (LPG) currently used in taxis in Hong Kong, natural gas (\(\text{CH}_4\)) can be used to power light, medium, and heavy vehicles.\(^{161}\) There are about 35,000 NGV in the United States and a larger number in New Zealand, Australia, and Europe.\(^{162}\) The use of natural gas to power fleets of buses is common.

In NGVs, fuel is used in a spark ignition engine. Typically, \(\text{CH}_4\) is drawn from a pipeline in a gaseous state, compressed, and stored in a reinforced tank on the vehicle in the form of Compressed Natural Gas (CNG),\(^{163}\) much like the system already in use in Hong Kong for LPG. An alternative storage method is to cool the gas into a liquid state and keep the storage container chilled. This method, which involves on-board Liquefied Natural Gas (on-board LNG), is moderately more energy-intensive than CNG, but provides greater range and can be used for long-distance transport when natural gas re-fueling stations are available.

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\(^{159}\) Goods vehicles accounted for 4% to 32% of all vehicles on the road during the period from 6 to 7 p.m.

\(^{160}\) Transport Department (1999), *Third Comprehensive Transport Study: Strategic Environmental Impact Assessment*.


\(^{163}\) The gas tanks of CNG buses are typically located on the roof, but this would not be feasible for double-decker buses due to underpass clearance requirements. Hence, while use of CNG for double-decker buses may be technically feasible, carrying fuel tanks on such vehicles would likely require the removal of four to six seats inside the vehicle. Because double-decker buses are not common around the world, there has been no commercial application of CNG in these vehicles so far.
located far apart. For buses or other medium/heavy vehicles running along fixed routes, CNG is generally sufficient. On-board LNG might be useful for heavy trucks traveling long or varied distances (e.g., goods transport to the mainland).

As shown in Table 5.4, CNG use in medium and perhaps some heavy vehicles in Hong Kong could complement the Environmental Protection Department (EPD) LPG program for lighter vehicles. For lighter vehicles, LPG and CNG are about equal in terms of emissions and there would be no significant advantage to replacing LPG with CNG.164

The real advantage of CNG is for medium and heavy vehicles when LPG fuel systems are generally not practical. Considering that there are unlikely to be unlimited gas supplies available for transport in Hong Kong, initially restricting its use to medium vehicles (e.g., single-decker buses, medium goods vehicles) and later testing its practicality in heavy vehicles seems appropriate. As Table 5.4 makes clear, both LPG and CNG are far superior to diesel in terms of emissions of RSP and nitrogen dioxide (NO₂).165

Table 5.4 Pollutant emissions (grams/vehicle km) for LPG, CNG, and diesel

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>RSP</th>
<th>Nitrogen dioxide (NO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public light bus (PLB)</td>
<td>CNG 0.01</td>
<td>CNG 0.1</td>
</tr>
<tr>
<td></td>
<td>LPG &lt; 0.1</td>
<td>LPG 0.6</td>
</tr>
<tr>
<td></td>
<td>Diesel 0.6</td>
<td>Diesel 2.2</td>
</tr>
<tr>
<td>Taxi</td>
<td>CNG 0.01</td>
<td>CNG 0.1</td>
</tr>
<tr>
<td></td>
<td>LPG &lt; 0.1</td>
<td>LPG 0.01-0.04</td>
</tr>
<tr>
<td></td>
<td>Diesel 0.5</td>
<td>Diesel 1.5</td>
</tr>
<tr>
<td>Light goods vehicle</td>
<td>CNG 0.01</td>
<td>CNG 0.1</td>
</tr>
<tr>
<td></td>
<td>LPG &lt; 0.1</td>
<td>LPG 0.6</td>
</tr>
<tr>
<td></td>
<td>Diesel 0.5</td>
<td>Diesel 1.7</td>
</tr>
<tr>
<td>Single-decker bus</td>
<td>LNG &lt; 0.1</td>
<td>CNG 0.4</td>
</tr>
<tr>
<td></td>
<td>LPG NA</td>
<td>LPG NA</td>
</tr>
<tr>
<td></td>
<td>Diesel 1.4</td>
<td>Diesel 11.7</td>
</tr>
<tr>
<td>Medium/heavy goods vehicle</td>
<td>CNG 0.5</td>
<td>CNG 2.2</td>
</tr>
<tr>
<td></td>
<td>LPG NA</td>
<td>LPG NA</td>
</tr>
<tr>
<td></td>
<td>Diesel 1.4</td>
<td>Diesel 7.5</td>
</tr>
</tbody>
</table>

Source: Barron (2000)

Introducing NGV in Hong Kong

At present, Hong Kong receives natural gas through an offshore pipeline from Hainan to the CLP Power combined cycle generation plant at Black Point. Some of the gas is also sent to CLP’s retrofitted coal generators at Castle Peak. The natural gas consumed each year for power generation in Hong Kong has an energy value equal to about 160% of the energy value of the transport diesel fuel used in Hong Kong each year.166

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164 CNG comes out slightly ahead of LPG in terms of nitrogen dioxide (NO₂) for lighter vehicles, but slightly behind with respect to RSP.
165 Diesel buses operated by Sacramento Regional Transit exceed the stringent California Air Resources Board standards for particulates and nitrogen oxides (NOₓ), two very important pollutants that also affect the HKSAR. CNG buses, on the other hand, emit only 20% of the allowable level of particulates and only 40% of the allowable level of NOₓ. The goal is to completely replace diesel buses with CNG buses. Sacramento Regional Transit (1996), *Sacramento Regional Transit Makes the Transition to CNG*, Sacramento, California.
166 Barron, B. (2000), *Natural Gas for Transport and Industry: A Major Option for Reducing Hong Kong’s Air Pollution*. 
Diverting some gas from power generation (especially from the retrofitted coal boilers) to transport and replacing it with coal would result in a net reduction of emissions in Hong Kong, except for carbon dioxide (CO₂) and sulfur dioxide (SO₂). The advantages of this switch are even greater when one considers the location of the emissions from power stations and the fact that these emissions are highly diluted by the time they affect people. In contrast, the emissions from traffic on congested streets are inhaled directly and at extremely unhealthy concentrations.

Replacing transport diesel fuel with natural gas would also be commercially attractive because natural gas for power plants is priced to compete with coal. Hence, gas would be cheaper than transport diesel on an equivalent energy basis. In effect, diesel consumption would be cut, while coal consumption would increase. There should be no need for ongoing government financial support in making this transition.

As noted above, the only environmental drawback to diverting natural gas from power to transport is the modest increase in total CO₂ and SO₂ emissions resulting from the use of coal in place of gas in power generation. However, such increases should be viewed within the context of major cutbacks in CO₂ and SO₂ in Hong Kong following the introduction of natural gas for power generation in 1994. In other words, one could argue that increases are a small step backwards after a major step forward. Future emissions of carbon and sulfur will drop even further as soon as Hong Kong Electric begins using natural gas. In addition, measures to conserve electricity have great potential in Hong Kong and would help reduce both the demand for power and the emissions from power plants.

NGV do have moderately higher capital costs than their diesel and petrol equivalents. It is not clear how much of this difference is due to economies of scale (far fewer NGV produced than diesel or petrol vehicles) and how much is inherent in the technology. Considering the higher capital costs, there is a case for some form of government support to encourage potential customers to try using natural gas (e.g., reducing the first registration tax on NGV for several years). Such assistance from government would be in line with the support given for the conversion of taxis (and soon public light buses, as well) to LPG. Unfortunately, the Hong Kong government has historically taken a hands-off approach to cleaner vehicles - at least until faced with a crisis and then, as with LPG for taxis, it is forced to create incentives in order to secure user compliance and public acceptance.

If a limited CNG fueling system were set up (i.e., with pipeline gas available at fueling stations and localized compression to fill the pressurized fuel tanks of vehicles), it could potentially be used not only for buses but also for medium and possibly some heavy goods vehicles, depending on trial results.

Future possibilities for NGV

While there is some potential to divert gas from power generators at Castle Peak, the real potential for NGV depends on the status of the planned Liquefied Natural Gas (LNG) port facility in Guangdong. In Hong Kong, this gas supply would be used primarily to expand the generation capacity of Hong Kong Electric,

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167 Ibid.
168 This is not to suggest that pollution from power plants is unimportant. Some forms of pollution are damaging even when highly diluted. Sulfur emissions contribute to acid rain and carbon dioxide (CO₂) contributes to climate change.
169 Barron W., and Steinbrecher, N., eds. (1999), *Heading Towards Sustainability? Practical Indicators of Environmental Sustainability for Hong Kong.*
but LNG port facilities could also be scaled to meet a range of demands. Another major market for the LNG would be created by the likely conversion of the Town gas system\textsuperscript{171} to natural gas, which has a higher energy content. Replacing Town gas with natural gas would avoid the industrial emissions associated with producing Town gas in the HKSAR.

Another possible source of natural gas is the existing pipeline from Hainan to Hong Kong. The pipeline is capable of carrying far more gas than it does at present. Exploration for gas reserves in the Hainan area is ongoing. If more gas is found, Guangdong and the HKSAR could bid for additional supplies. On a cost basis, bulk natural gas supplies by pipeline are highly competitive with liquid fuels and are far cleaner. If natural gas becomes widely available in the Pearl River Delta, it could transform the energy and environmental situation throughout the region.

It is useful to remember that in the long run, Hong Kong's overall air quality depends in large part on what happens in Guangdong. Moving towards a regional energy based on natural gas is perhaps the most promising - and may be the only truly promising - long-term prospect for attaining safe air quality throughout the Pearl River Delta.

**Cleaner diesel and petrol**

While we feel that use of CNG and LNG should be encouraged, the introduction of both in Hong Kong will be restricted to particular types of vehicles for reasons of performance (e.g., LPG for lighter vehicles only) or re-fueling considerations (e.g., CNG). Hence, other alternatives must also be considered.\textsuperscript{172}

The major advantage of cleaner diesel and petrol is that both involve little or no change to existing fuel distribution systems. As such, they offer obvious advantages with regard to ease of implementation - indeed, except for somewhat higher prices, drivers would hardly notice the difference.\textsuperscript{173} Cleaner fuel options for Hong Kong include ultra low sulfur diesel (ULSD), oxygenated fuels, and bio-diesel.\textsuperscript{174} For more detail on the specific costs and benefits of each, the reader is referred to the *Cleaner Vehicles and Fuels* report jointly published by Civic Exchange and the Asia Foundation.\textsuperscript{175}

CTS3 notes the emissions reduction advantages of reformulated diesel, of which ULSD would be an advanced example. The study also stresses the advantages of diesel catalytic converters and particulate traps. Yet CTS3 says nothing about oxygenated petrol options and bio-diesel.\textsuperscript{176}

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\textsuperscript{171} Town gas has a chemical composition of carbon dioxide, carbon monoxide, methane, and hydrogen and is a product of the Hong Kong And China Gas Company Ltd (Towngas).

\textsuperscript{172} *Cleaner Vehicles and Fuels*, a report published by Civic Exchange and the Asia Foundation on May 18, 2001, offers an assessment of the options available for Hong Kong. Several of the free-wheeling road vehicle systems discussed here might provide cost-effective measures for mitigating Hong Kong's transport-related air quality problems. The report is available at <http://www.civic-exchange.org>.

\textsuperscript{173} The acceptability of any increase in prices for consumers (an internal cost) would be evaluated against the external benefits of better air quality.

\textsuperscript{174} ULSD has a sulfur content under 0.005%. Oxygenated fuels are created by mixing ethanol with petrol, reducing aromatics and carbon monoxide. Bio-diesel is fuel derived from vegetable oils or animal fats that is used in compression ignition engines (like petroleum-derived diesel fuel). This is an older technology and was used in many areas of the world during World War II in times of diesel fuel shortage. Bio-diesel can also be mixed with diesel to reduce tailpipe emissions of particulates by 5-15% and hydrocarbons by 15-20%. Civic Exchange & the Asia Foundation (2001), *Cleaner Vehicles and Fuels*, Hong Kong.

\textsuperscript{175} Civic Exchange & the Asia Foundation (2001), *Cleaner Vehicles and Fuels*.

\textsuperscript{176} Transport Department (1999), *Third Comprehensive Transport Study: Strategic Environmental Impact Assessment*. 
While the Hong Kong government has reduced the sulfur content of diesel fuel and mandated the use of unleaded petrol with catalytic converters for all new cars, we feel that the HKSAR’s continuing particulate problem and growing ozone levels are grounds for exploring a wider range of possible incentives or mandates for clean diesel and petrol options.177

Hybrid vehicles

While ULSD, oxygenated petrol, and bio-diesel are cleaner versions of the fuels we use today, hybrid engines and fuel cells offer more fundamental advances. Hybrid vehicles use a duel engine/fuel system and come in a variety of combinations, some of which have been under study and development for decades.

Currently, the most promising form of hybrids are parallel hybrids. A parallel configuration combines a downsized internal combustion engine (ICE) with a battery-powered electric motor. Either motor can be used to power the vehicle. The advantage is that driving can be entirely by electric power, making the parallel hybrid a part-time electric battery vehicle. In areas where higher performance is needed, where local air emissions are less of a concern, or simply when the energy stored in the battery runs low, the vehicle is powered by the ICE. In a series hybrid, a small ICE continually recharges the battery. The battery, in turn, powers an electric motor, which provides power to the vehicle. Series hybrids are heavier and larger than parallel hybrids.

Hybrid buses are reported to have substantially lower emissions than diesel buses, reducing nitrogen oxides (NOx) by one-third and particulates by about half.178 Of course, such advantages come at a price - although cheaper to run, operational savings do not fully offset the higher capital costs of hybrid buses. With currently available technology, hybrids have a lifetime cost that is one-quarter to one-third higher than conventional vehicles.179 Hence, hybrid vehicles would be introduced only where the government believes that the benefits in terms of reduced local air pollution would ensure public support.

Hybrid vehicles are on the road today in modest numbers. It would seem worthwhile for Hong Kong to consider acquiring and testing a few hybrid buses to see how they perform. If they prove reliable and have substantially lower emissions, the government should consider incentives for their introduction along the most polluted routes in older urban areas.

Fuel cell vehicles

Fuel cell vehicles can take on fuel in the form of a liquid (e.g., methanol, petrol) or a gas (e.g., CNG, hydrogen) and use it in an electrochemical device that produces electricity through the reaction of hydrogen and oxygen. The only local emission is water. In addition, the power and range of fuel cell vehicles can be quite good. Unlike an electric battery vehicle, which must be recharged at rest, the electric motor in a fuel cell vehicle is continuously supplied with fuel through an on-board liquid or gaseous source of hydrogen. This fuel supply can be replenished relatively quickly in contrast to the long recharge times needed for electric battery vehicles, which may take several hours.

While one day it might be common to pump hydrogen directly into a vehicle and compress and store it on-board, such a system would require an extensive and costly infrastructure. Hydrogen is a difficult fuel to handle (as hydrogen molecules are very small, hydrogen gas is more likely to leak than other gases). Hence, it is expected that during the initial stages of implementation, the source of the hydrogen fuel will not be hydrogen gas itself, but a liquid or gaseous fuel containing hydrogen.

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177 Environmental Protection Department (2001), Environment Hong Kong 2001.
178 Civic Exchange & the Asia Foundation (2001), Cleaner Vehicles and Fuels.
179 Ibid.
Candidate liquid fuels such as methanol and petrol are appealing because commercial supplies already exist. Yet both fuels result in local emissions and have other disadvantages. Using petrol as a source of hydrogen is inefficient and counteracts some of the emissions advantages of fuel cell vehicles. Methanol can be made from woody biomass, but is typically made by reformulating natural gas (at a considerable penalty in terms of wasted energy). It is also quite toxic and its widespread use would entail a new set of environmental problems. Using CNG as the hydrogen feedstock is another possibility, but would require a local fuel distribution system. Benefits of CNG use would need to be evaluated against the costs, energy efficiency, and emissions of burning CNG in a spark ignition engine. While all of these options are still under consideration, it appears that at least the first generation of fuel cell vehicles is likely to use methanol as a fuel source.

Brent Yacobucci of the Congressional Research Service of the United States Congress sums up the current situation with respect to fuel cells when he notes that while fuel cell vehicles are not yet commercially available, they are being touted as the next great technological advance for vehicular transport. It will take significant technological breakthroughs to make them more commercially acceptable. Although nearly all of the major motor vehicle manufacturers are aggressively pursuing fuel cell technology, the widespread use of fuel cell vehicles probably remains at least a decade away.

It is also important to keep in mind that hydrogen is not a source of energy. Rather, it is a form of energy that must be produced from some source of energy. Today, free hydrogen is typically produced through the highly inefficient use of fossil fuel. Until the day comes when the primary sources of hydrogen fuel are renewable energy resources, such as solar or wind power, its widespread use as a transport fuel will involve considerable penalties in terms of the overall consumption of fossil fuels.

We recommend that Hong Kong keep abreast of applications for fuel cell vehicles (especially buses) elsewhere in the world, while also closely tracking any problems in introducing a methanol fuel distribution system. If developments elsewhere are encouraging, the Hong Kong government should consider incentives to introduce fuel cell vehicles in Hong Kong.

**Electric battery vehicles**

Electric battery vehicles are frequently cited as a long-term solution to transport-related air quality problems. Indeed, for decades it has been common to identify electric battery vehicles as an option in reviews of future transport technology. Hopefully, this optimism will be justified. However, although there are about 28,000 such vehicles on the road only a few thousand are privately owned.

In fact, this technology has been the subject of exaggerated optimism for more than 40 years. Breakthroughs in power density (acceleration potential), and energy density (range) have been "just around

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180 However, such systems do exist in various places around the world, including Washington, DC and Sacramento, California.
183 Civic Exchange & the Asia Foundation (2001), *Cleaner Vehicles and Fuels*.
the corner” since the 1960s. By the late 1970s, such promises were already beginning to wear thin.\textsuperscript{185} Even now, more than two decades later, there have been only modest advances.

The high optimism with respect to electric battery vehicles was based on presumed advances in batteries based on something other than lead-acid (e.g., nickel-cadmium, nickel-zinc, sodium-sulfur, lithium-chloride). Of these, only nickel-metal hydride and nickel-cadmium batteries have seen even very limited application. And while there have been some advances in battery storage over the last several decades, lead-acid batteries (basically much larger versions of standard car batteries) still power the overwhelming share of electric battery vehicles as they did in the 1970s.\textsuperscript{186} Even today, electric battery vehicles suffer from inconveniently long recharge times and limited range between recharges, regardless of the battery employed. Disposal of used batteries also presents a potential problem if the electric vehicle fleet becomes even moderately large.

For a place like Hong Kong, it would be best for the government to keep an eye on electric battery vehicle technology and, more importantly, its application elsewhere. When and if electric battery vehicles prove viable in other urban areas, the government should work with private vehicle fleet operators to offer incentives for local testing. Indeed, in 2001, the Hong Kong government ran a testing program for electric public light buses (PLBs). In this trial, electric battery vehicles with current battery technology were found to have some limitations, including a lengthy recharging period.

The exaggerated expectations for electric battery vehicles should serve as a cautionary note on fuel cell vehicles. In the late 1960s and 1970s, a considerable amount of work and large expenditures of research and development funds were devoted to electric battery vehicles. Indeed, the very extent of the literature on the research and development of such vehicles seemed to imply that the needed technological breakthroughs surely must come soon. Today, the literature on fuel cell vehicles may have created the same impression. However, simply applying more money and effort to develop fuel cell or electric battery vehicles is no guarantee that essential advances will be forthcoming.

Our motivation for stressing caution with respect to electric battery vehicles and fuel cell vehicles is a fear that waiting for advanced technology may become a means of avoiding more basic changes. By the time we realize that the presumed major technological breakthroughs may not be forthcoming, we will have lost precious years in implementing simpler alternatives that are known to work today.

5.4 Recommendations for making road transport in the HKSAR more sustainable

1. Far better coordination between buses (and PLBs) and rail is urgently needed, including the creation of feeder bus (and feeder PLB) routes between rail stations and high-density developments.

2. Although the HKSAR has high rates of bus ridership, there is much more that could be done to improve load factors, including an assessment of the extent to which electronic road pricing (ERP) could facilitate use of high occupancy public transport and discourage companies from putting empty buses on the road in highly congested areas.


\textsuperscript{186} Transport Department (1999), \textit{Third Comprehensive Transport Study: Strategic Environmental Impact Assessment}. 
3. The Transport Department should re-evaluate its negative assessment of electric trolley buses and modern trams. A feasibility study for trolley buses and trams should be re-done, but the terms of reference for consultants should be drawn up after review by experts outside government.

- This study should seek to identify those specific routes where flexibility in re-routing electric trolley buses or trams is not a priority, where load factors are likely to be high enough to warrant the added investment in infrastructure (e.g., power lines), and where the local air quality or noise situation is truly pressing. The study should also look at options for limiting the use of diesel buses along tram or trolley bus lines and consider the most appropriate financing arrangements for modern trams and trolley buses compared to that for diesel bus routes.

- Further, introduction of electric trolley buses or modern trams should be a major transport priority in new development areas.

4. As discussed in Chapter 7, it seems likely that ERP was evaluated in such a manner (with regard to the types of vehicles potentially affected by ERP) as to largely pre-determine the findings of the study, or at least those sections of the study that have been made public. ERP should be the subject of a new study in which the consultants’ brief has first been reviewed by independent experts outside government, as with the assessment of electric trolley buses and trams.

5. Until ERP is implemented inclusive of goods vehicles, goods vehicles should be banned from congested areas for three to four hours each working day, split between morning and evening peak (or near peak) hours.

6. The Transport Department should conduct a thorough evaluation of the benefits in terms of congestion reduction from the provision of low-cost park and ride facilities at rail stations outside the core urban areas. (It might even be worth assessing whether low-cost park and ride facilities might be introduced at a few bus stations in the far New Territories).

While the New Territories would likely be the primary area for low cost park and ride facilities, they should also be considered for Hong Kong Island and parts of Kowloon. The re-assessment of park and ride facilities should be coupled with another (and more credible) look at the impact of an increase in parking charges in core urban areas during normal business hours.

7. The government should evaluate and, if deemed appropriate, encourage the import of natural gas single-decker buses and medium goods vehicles. In partnership with CLP Power, the government should simultaneously explore the possibility of diverting some or all of the natural gas now being used in a relatively inefficient way at Castle Peak for use as a clean transport fuel. This experience would be valuable in determining how much of a role natural gas vehicles could play in the Pearl River Delta after the LNG facility in Guangdong is operational.

8. The government should continue to promote the use of clean diesel but expand this scheme to include trials of bio-diesel and hybrid vehicles, especially buses. It should also keep abreast of developments in fuel cell technology. With this noted, the environmental and energy drawbacks of fuel cell vehicles reliant on methanol or petrol should be carefully considered before any move to introduce these kinds of vehicles.

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187 Again, a re-assessment of park and ride should be done only after the scope of work for the consultants has been reviewed by a group of experts outside of government.
This review and discussion of Hong Kong's freight transport is in five parts. Section 6.1 briefly reviews data on the recent movement of freight within Hong Kong, with some focus on activity related to freight transport to and from Hong Kong. Section 6.2 presents and evaluates projections of freight transport activity in, to, and from Hong Kong. Section 6.3 discusses the Hong Kong government's plans to increase the amount of freight transport to and from Hong Kong, specifically through the promotion of Hong Kong as "the preferred international and regional logistics hub." Section 6.4 touches on the challenges of making freight transport in Hong Kong more sustainable. Section 6.5 summarizes the foregoing, sets out some conclusions about Hong Kong's freight transport, and makes one recommendation.

6.1 Recent freight movement within, to, and from Hong Kong

Recent trends in the movement of freight within Hong Kong may have been considerably more sustainable than trends in the movement of people, at least in terms of energy use. This is illustrated in Table 6.1, which shows energy consumption for transport within Hong Kong for 1989 and 1999. The data in Figure 6.1 are from Electrical and Mechanical Services Department (2000), Hong Kong Energy End-use Data, Hong Kong: HKSAR Government.

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1999</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road (lorries and vans)</td>
<td>28,193</td>
<td>36,837</td>
<td>+30.7%</td>
</tr>
<tr>
<td>Other (rail, marine, air)</td>
<td>15,689</td>
<td>8,447</td>
<td>-46.2%</td>
</tr>
<tr>
<td>Total energy use for moving freight</td>
<td>43,882</td>
<td>45,248</td>
<td>+3.1%</td>
</tr>
<tr>
<td>Per capita (gigajoules)</td>
<td>7.83</td>
<td>6.73</td>
<td>-14.1%</td>
</tr>
<tr>
<td>People:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road: bus and taxi</td>
<td>18,654</td>
<td>29,227</td>
<td>+56.7%</td>
</tr>
<tr>
<td>Road: car and motorcycle</td>
<td>10,052</td>
<td>18,057</td>
<td>+79.6%</td>
</tr>
<tr>
<td>Other (rail, marine, air)</td>
<td>6,033</td>
<td>7,133</td>
<td>+18.2%</td>
</tr>
<tr>
<td>Total energy use for moving people</td>
<td>34,739</td>
<td>54,417</td>
<td>+56.6%</td>
</tr>
<tr>
<td>Per capita (gigajoules)</td>
<td>6.20</td>
<td>8.10</td>
<td>+30.6%</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total energy use for internal transport</td>
<td>78,621</td>
<td>99,665</td>
<td>+26.8%</td>
</tr>
<tr>
<td>Per capita (gigajoules)</td>
<td>14.03</td>
<td>14.83</td>
<td>+5.7%</td>
</tr>
</tbody>
</table>

188 Energy consumption is used here as an indicator of sustainability for four reasons: (i) all energy used for transport in Hong Kong is in some form of non-renewable fossil fuel, use of which is unsustainable; (ii) energy use is closely correlated with several adverse impacts of transport, notably emissions of greenhouse gases and of locally acting pollutants such as nitrogen oxides (NOx) and particulates; (iii) energy use can be readily compared across transport modes; and (iv) last but not least, relevant data are available.

189 The data in Figure 6.1 are from Electrical and Mechanical Services Department (2000), Hong Kong Energy End-use Data, Hong Kong: HKSAR Government.
Table 6.1 shows that the better performance of freight was achieved in part because energy use for road transport increased less for the movement of freight than for the movement of people. As well, "other" transport of freight showed a decline, perhaps reflecting decreased marine freight with the opening of cross-harbour tunnels in late 1989 and in 1997. Available data are not specific on this point. Nevertheless, energy use for the main freight mode - vans and lorries - increased by more than 30% overall from 1989 to 1999 (by about 9% per capita). The actual amount of freight transported probably increased even more. Again, specific data are not available, but it is known that the composition of the goods vehicle fleet changed over this period.

The overall number of goods vehicles on the road remained about the same between 1989 and 1999, but the number of light goods vehicles declined by 17% from 88,716 to 73,527, while the number of medium goods vehicles increased from 22,884 to 37,526 (64%) and the number of heavy goods vehicles increased from 609 to 2,717 (346%). These trends are illustrated in Figure 6.1, which shows the continuation of these patterns into 2001, particularly the growth in the heavy goods vehicle fleet.

The composition of the goods vehicle fleet is important because in energy terms larger vehicles are generally much more efficient carriers of freight than smaller vehicles, other things being equal. Thus, as the composition of the fleet has changed since 1989, it is likely that more tonne-kilometers have been performed for the same amount of energy.

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190 The information in Table 6.1 probably overestimates the share of road transport and underestimates the share of marine transport in the following way. The table likely represents all road transport, including the Hong Kong portion of trips to the mainland. However, it may represent only marine journeys that start and end in Hong Kong. Thus, some of the energy used to move a full shipping container by lorry from a mainland factory to Hong Kong's port would be represented in Table 6.1, but none of the energy that would be used to move the same container by river barge would be represented. It would be reasonable to represent the portion of the energy used to move the river barge that is expended within Hong Kong's border, but this appears not to have been done. This matter could be of particular importance because of the huge growth in freight movement by river, as noted in this chapter. However, water transport is usually much less energy intensive than road transport and so the amount of energy involved may not be large.

191 The data in this paragraph and those represented in Figure 6.1 are based on several Hong Kong government sources, notably Table 8.10 of the Hong Kong Annual Digest of Statistics (2000). They refer to vehicles registered in Hong Kong. Light goods vehicles have a gross vehicle weight up to 5.5 tonnes, medium goods vehicles up to 24 tonnes, and large goods vehicles above 24 tonnes. Between 1990 and 2001, the total number of goods vehicles licensed in Hong Kong actually declined, from 117,533 to 112,585. Census and Statistics Department (CSD) (2000), Hong Kong: HKSAR Government.

192 Heavy goods vehicles travelling on inter-city roads use about one megajoule of energy per tonne-kilometer, i.e., for moving one tonne one kilometer. Light goods vehicles use about ten times as much energy to do the same work under the same conditions. See Box 5 of Hong Kong Monthly Digest of Statistics (June 2001) and associated sources. (These data reflect European conditions, but are probably relevant to Hong Kong.) The energy content of a liter of diesel fuel is about 38.7 megajoules. Performance is extremely sensitive to how fully a vehicle is loaded. A half-loaded lorry uses 90% of the fuel used per kilometer by a fully loaded lorry. Load factors often tend to be higher for larger vehicles, thus adding to the efficiency with which they use energy. At the same time, this gain in efficiency could be offset by the greater amounts of noise made by heavy vehicles. CSD (June 2001), Hong Kong: HKSAR Government.
The increase in the use of heavy goods vehicles may be associated with the increase in cross-border trade with mainland China, particularly the movement of shipping containers by lorry. The decline in the use of light goods vehicles may reflect the decline in manufacturing in Hong Kong. These trends are illustrated in Figure 6.2, which shows by value the overall increase in the re-export of goods from and to mainland China - by far the largest portion of the trade - and the decline in domestic exports, i.e., goods made in Hong Kong.193

Figure 6.3 shows how these economic trends are reflected in the number of vehicles crossing the border. The number of goods vehicles other than container lorries has remained relatively steady at about 4.5 million crossings per year. However, the number of container lorry crossings increased almost fourfold between 1991 and 2001.194

The 4.4 million border crossings by container vehicles and the 4.7 million crossings by other goods vehicles in 2001 illustrated in Figure 6.3 indicate an average of about 12,100 and 13,000 crossings respectively per day. More than 60% of the crossings by goods vehicles and almost 80% of the crossings by container lorries are made at Lok Ma Chau crossing point. Of the three road crossing points into mainland China, Lok Ma Chau is the nearest to the Hong Kong port. It is also open for the most hours per day, from 6:30 a.m. to midnight.

In relation to the total volume of Hong Kong traffic, the amount of road activity contributed by cross-border traffic is small, perhaps one million vehicle-kilometers per day of the six million vehicle-kilometers involving goods vehicles and 32 million vehicles-kilometers traveled overall.195 However, cross-border traffic is likely to account for a large proportion of vehicles on the roads between the port and the border.196 The exact proportion may not be known until results from a 2003 Transport

193 The data in Figure 6.2 are chiefly from CSD (2000), Hong Kong Annual Digest of Statistics.

194 The data in Figure 6.3 are chiefly from the Transport Department (Dec 2001), Monthly Traffic and Transport Digest, Hong Kong: HKSAR Government; and Port and Maritime Board (PMB) (2002), Summary Statistics on Port Traffic in Hong Kong (as of December 2001), Hong Kong: HKSAR Government.

195 The estimate of 32 million vehicle-kilometers (vkm) is in Transport Department (2000), Annual Traffic Census 2000, Hong Kong: HKSAR Government. Other vkm estimates in this paragraph were made by Richard Gilbert.

196 For example, heavy goods vehicles comprised 0.6% of road vehicles licensed in Hong Kong in 2001 but amounted to 8.8% of vehicles using the Tai Lam tunnel, which lies between the port and the border. Transport Department (Dec 2001), Monthly Traffic and Transport Digest, Hong Kong: HKSAR Government.
Department survey entitled "Trip characteristics of goods vehicles" are made available. 197

Available data on the amount of container traffic leaving the port by road are shown in Figure 6.3; these figures are for 1995-1999 only.198 Here the trend is in the opposite direction from that of the container lorry crossings. To the extent that these data reflect long-term trends, they suggest that a growing percentage of the cross-border traffic may comprise goods that have been loaded or re-loaded into containers in Hong Kong. Much better data are needed on this matter before firm conclusions can be drawn.

Although the amount of container traffic entering or leaving the port by road may have been declining, the growth in the movement of shipping containers by river between mainland China and Hong Kong has been extraordinary. This traffic almost tripled over the period 1995-2001 - from about 1.6 to about 4.7 million TEUs a year199 - and has comprised the largest part of the growth in container traffic handled by Hong Kong's port. Seaborne traffic, including trans-shipments, increased by only 20%, from 11.0 to 13.2 million TEUs. Indeed, the growth in river traffic seems to have sustained Hong Kong's position as the world's busiest container port (Singapore being the main rival).

At the end of the 1990s, well over a third of total container movement between mainland China and Hong Kong was by river. As well, river trade involves substantial amounts of non-containerized freight (bulk and other cargo), roughly equal in weight to the amount of containerized freight. Overall, a higher tonnage of freight moving across the border is moved by river than by road (48 million vs. 38 million tonnes per year in 2001 - see Figure 6.4).

Figure 6.4 shows trends in the handling of all freight at Hong Kong's port, not just container traffic.200 The

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197 In common with many other major urban regions across the world, Hong Kong has relatively poor data on how freight moves within the urban region, and a weak record of forecasting freight-related changes. The last Transport Department Freight Transport Study (1994) was based largely on 1991 data. It projected a 25% increase in the size of Hong Kong's goods vehicle fleet between 1991 and 2001, a 43% increase in overall goods vehicle traffic, and a 137% increase in the number of border crossings by goods vehicles. As noted earlier, there was no increase in the size of the goods vehicle fleet (although there was a change in its composition; see Figure 6.1), and border crossings increased by "only" 65% rather than by 135%, from about 15,000 to about 25,000 per day (see Figure 6.3). A tendency to project large amounts of cross-border goods traffic was also evident in the last Planning Department study, where border crossings by goods vehicles were forecast to average about 39,000 a day in 2001; the actual average, as noted, was 25,000. Compared with other urban regions, Hong Kong has good data on freight movement in and out of the region. However, this advantage could be nullified by poor use of these data and consistently inflated projections. Planning Department (2000), Feasibility Study for Additional Cross-border Links, Stage 1: Investigations on Traffic Demand, Hong Kong: HKSAR Government.

198 The data in Figure 6.3 on container movement leaving and entering the port by road was derived from Table ES1 of the 2002 Port and Maritime Board study by subtracting the amount moved by river from total direct shipments, i.e., shipments to and from Hong Kong and mainland China. The term "TEU" means "twenty foot equivalent units" and is a standard measure of containers. Containers now tend to be 40 feet (12.2 metres) in length and the term "FEU" (forty foot equivalent unit) is more commonly used. PMB (2002), Summary Statistics on Port Traffic in Hong Kong (as of December 2001).

199 Ibid. See Footnote 198 for the meaning of "TEU."

200 Figure 6.4 is based on data in PMB (2002), Summary Statistics on Port Traffic in Hong Kong (as of December 2001).
pattern of growth in seaborne (ocean) traffic changed dramatically around 1995; it almost doubled between 1989 and 1995 and then increased by less than 3% between 1995 and 2001. The change in the amount of cargo entering and leaving the port by road was also dramatic: between 1989 and 1995, cargo increased more than four-fold, but between 1995 and 2001, it increased by only 10%. Since 1995, the only significant increases in the movement of cargo to and from the port have been by river, a trend consistent with the observation above concerning river traffic.

Figure 6.4 also shows the dramatic decline in the amount of freight moved from the port by rail. Now, almost no freight is moved by rail in Hong Kong.201

An important driver of freight activity within Hong Kong is the airport. Figure 6.5 shows that there has been an almost continuous high rate of growth in freight handled at Hong Kong's airports since 1989, with no evidence of the kind of slowdown that has occurred in seaborne freight.202 For the last few years, the Hong Kong airport has been the second or third busiest cargo airport in the world, vying with the Los Angeles Municipal Airport, although the Memphis Shelby County Airport is the clear leader in this field.

The total tonnage of freight moved by air is relatively small, but the value of what is moved is high. Worldwide, airfreight has 25 times more value per tonne than other freight.203 In Hong Kong, airfreight has a value of about HK$300,000 per tonne, while other freight averages about HK$12,000 per tonne.204 Thus, although aircraft move only about 1% of Hong Kong's trade in terms of weight, they move about 20% in terms of value.

The actual amount of traffic generated by the airport's freight activity cannot be ascertained until the findings of the Transport Department survey mentioned earlier are released. The previous survey, completed in 1994, noted that cargo activities at the then Kai Tak Airport generated a large number of vehicle trips relative to the amount of freight handled.205 The 802,000 tonnes of airfreight handled in 1990 (see Figure 6.5) generated 1.2 million road trips. On this basis, the 2.1 million tonnes handled in 2001 would be expected to have generated about 3.1 million trips.206

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201 Use of MTR Corporation trains has been proposed as a way of moving freight to and from Hong Kong Island. D. Rooks and D. Smaling (2002), Sustainable Transport in Hong Kong, Hong Kong: Civic Exchange & the Asia Foundation.
202 The data in Figure 6.5 are from PMB (2002), Summary Statistics on Port Traffic in Hong Kong (as of December 2001). The appropriate comparison is with seaborne freight rather than with all freight handled by the seaport because little of the airfreight originates in or is destined for mainland China. According to the Hong Kong Annual Digest of Statistics (2000), airfreight to and from mainland China averaged about 4% of total airfreight handled during 1990-1999.
203 Organization for Economic Cooperation and Development (OECD) (1999), Background Document for a Workshop on Regulatory Reform in International Air Cargo Transportation (held in Paris, July 5-6, 1999), Paris.
204 The per-tonne value of all trade was estimated by noting that Hong Kong's visible trade in 2000 had a value of HK$3.2 trillion and weighed 217 million tonnes. CSD (June 2001), Hong Kong Monthly Digest of Statistics.
206 In 2001, goods vehicles of all classes made 3.9 million trips on the Lantau Link, which mostly serves the airport but also a few other destinations. Transport Department (Dec 2001), Monthly Traffic and Transport Digest.
6.2 Projections of freight activity

Projections are available for cargo movements associated with the port and the airport, for growth in the number of goods vehicles, and for cross-border trips by all road vehicles (but mostly goods vehicles). These are presented here and discussed in turn.

Figure 6.6 River and seaborne cargo handled by Hong Kong's port, 1999 and 2000, and projections to 2020

Cargo movements through the port have been forecast by the Port and Maritime Board and are presented in Figure 6.6. Perhaps the most interesting aspect of this forecast is the projected 126% increase in seaborne freight movement - ocean cargo - between 1999 and 2020, equivalent to a 4% increase per year. Ocean cargo is the key factor in trade. As the Board noted in its forecast document, river transport is inland transport, and should be set aside when considering growth in international trade activity.

A key feature of recent port activity is the essential lack of increase in seaborne freight movement since 1995, after almost doubling in the period from 1989 to 1995 (see Figure 6.4). Thus, the context for this projection is near-zero growth for several years, which is to be followed by 4% annual growth sustained over two decades. The only new factor offered as explanation for this forecast is China's accession to the World Trade Organization (WTO) in December 2001, impending at the time the Board's report was prepared. It was anticipated that this would increase the volume of trade through Hong Kong by 10% over a four-year period. No explanation is given for the remainder of the proposed 126% increase in seaborne freight.

The Board's forecast document focuses specifically on container traffic. The ocean cargo portion of this traffic is expected to increase between 1999 and 2020 at an even higher rate than all ocean cargo, by a total of 144%. The projections for the period 2005-2020 are shown in Figure 6.7, together with actual data for 1995-2001 and corresponding information for Shenzhen's container ports.

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207 Figure 6.5 is Figure ES1 in PMB (2000), Hong Kong Port Cargo Forecasts 2000/2001: Executive Summary, Hong Kong.
208 Data for Hong Kong in Figure 6.6 are from PMB (2002), Summary Statistics on Port Traffic in Hong Kong (as of December 2001) and projections are from PMB (2000), Hong Kong Port Cargo Forecasts 2000/2001: Executive Summary. Information concerning Shenzhen ports is from a Hong Kong government source: Ng A. (2001), Moving People and Products to World Market - The Case of Hong Kong, Presentation at the Asia-Pacific Cities Summit, Seattle, Washington.
Figure 6.7 indicates that between 1995 and 2000, seaborne container traffic increased from 11.0 to 13.3 million TEUs, an increase of 3.9% per year. Review of the relevant data suggests that this was largely the result of increased containerization of cargo, particularly goods from mainland China being sent abroad through Hong Kong. The containerization rate of these goods increased progressively from 78% in 1995 to 93% in 2000. The scope for further containerization seems limited. Nevertheless, a high rate of growth in container traffic is projected to 2020.

Figure 6.7 shows even higher projected rates of increase and accelerated growth in traffic through Shenzhen's container ports, which are set to pass Hong Kong in terms of container traffic during the next two decades. For 2001, Shenzhen's container traffic met its projected trajectory, putting it among the world's ten busiest container ports for the first time. In the same year, Hong Kong's container traffic fell below projections; however, the port remained the world's busiest.

The projected increases in Hong Kong's port traffic seem unfounded, based on wishful thinking rather than realistic appraisals of trends and opportunities. The total amount of seaborne freight handled is a critical indicator of port traffic and has essentially remained constant in Hong Kong since 1995. Yet the Port and Maritime Board report suggests it will suddenly show large (4%) annual increases and sustain these increases for two decades. The amount of seaborne container freight, possibly a more important indicator, has been almost as flat. The increase in container freight is largely due to increased containerization rather than increased throughput. And yet this measure is expected to show even larger increases.

Moreover, the Port and Maritime Board's forecast document itself notes that profound challenges are ahead for Hong Kong's port. Most of the port activity involves goods originating in or destined for Guangdong Province. Hong Kong has higher handling charges than the Shenzhen ports and the cost of moving goods between Guangdong and Hong Kong is high. Rationalization of customs procedures and tariffs following WTO accession will encourage use of Shenzhen ports. At the same time, the progressive liberalization of trade between mainland China and Taiwan, possibly imminent, will favor use of northern ports.

The hope for Hong Kong, according to the document, lies in provision of services, chiefly logistics and banking, that may be less available in Shenzhen. This matter will be discussed in section 6.3.

Projections of the volume of airfreight handled at Chek Lap Kok Airport (Hong Kong International Airport) speak to increases of 6% a year in regular cargo and 12% a year in express cargo. Using the 2000 total of 2.24 million tonnes as a base, and assuming that express cargo is presently 5% of total air cargo, the projected total volume in 2020 is close to 7.9 million tonnes. This would represent an overall increase over the 2000 level of 250%, or about 6.5% annually.

This increase is even higher than that projected for ocean cargo. It is, however, more in accordance with recent trends. Airfreight volume handled at Hong Kong airports increased by just under 9% annually over the period from 1995 to 2000 (see Figure 6.4). Moreover, the airport was designed to incorporate additional facilities that would ultimately permit the handling of nine million tonnes of cargo annually.

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209 Airport Authority Hong Kong (2001), *Hong Kong International Airport Master Plan 2020*, Hong Kong.
More than half of airfreight is carried in the holds of passenger aircraft. Thus, without massive and expensive expansion of dedicated cargo fleets, projections of passenger and cargo volumes are interlinked. There were declines in the volume of both passengers and freight in 2001 (especially cargo), in part because of economic conditions and in part because of the events in the United States on September 11, 2001. Both passenger and cargo volumes increased during the first quarter of 2002 over the first quarter of 2001 - passengers by 0.4% and cargo by 15.6% - perhaps putting the volume of cargo handled annually back on its previous trajectory.210

Fuel prices may be of greater importance for longer-term projections of airfreight volumes than security factors or economic considerations. There is considerable debate among geologists, economists, and others as to when production of conventional oil will peak,211 and the possibility that oil prices will rise dramatically during the next few decades should not be discounted.

Because aircraft are fuel intensive and there are no taxes on the fuel used for international flights, airlines costs are extremely sensitive to crude oil prices. Historically, fuel costs comprise 15-30% of aviation's total expenses, a much higher proportion of total costs than for other modes of transport. It is hard to predict how much real crude oil prices will rise after the production peak, but a factor of five over current prices by 2015 may be plausible. Such an increase would make the movement of people and freight as we know it impracticable.

The projections for air cargo make no reference to their potentially acute sensitivity to oil prices. This would seem unwise given the uncertainties about oil production and the large amounts of investment involved. It could be argued that airfreight may be so insensitive to price that a fivefold or greater increase in fuel prices may be of little consequence, but the little available evidence suggests that airfreight is quite sensitive to economic conditions, and perhaps more so than air travel (for example, the experience during 2001 noted above).

Projections of growth in the goods vehicle fleet and in cross-border traffic are set out in Table 6.2, which presents scenarios that have been adopted by the Hong Kong government.212 The preferred scenario seems to be the one listed here as "2016 high (1)." Under this scenario, the number of goods vehicles on the road will more than double between 1997 and 2016 and cross-border traffic will increase four-fold.

The projection of the number of goods vehicles on the road is extraordinary in view of recent trends. The number of goods vehicles on the road in Hong Kong has hardly changed during the last decade, although there have been changes in fleet composition, as illustrated in Figure 6.1. Thus, for reasons that are not mentioned in the projection report, the Hong Kong government expects that a decade during which there was essentially no change in the number of goods vehicles will be followed by

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Licensed goods vehicles (growth)</th>
<th>Daily cross-boundary traffic (growth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997 baseline</td>
<td>117,000</td>
<td>30,000</td>
</tr>
<tr>
<td>2016 low</td>
<td>14,100 (21%)</td>
<td>85,000 (183%)</td>
</tr>
<tr>
<td>2016 medium</td>
<td>185,000 (58%)</td>
<td>120,000 (300%)</td>
</tr>
<tr>
<td>2016 high (1)</td>
<td>262,000 (124%)</td>
<td>120,000 (300%)</td>
</tr>
<tr>
<td>2016 high (2)</td>
<td>262,000 (124%)</td>
<td>164,000 (447%)</td>
</tr>
</tbody>
</table>

210 Information about the first quarter of 2002 is from Hong Kong iMail, April 12, 2002.
Gilbert, R. (2002), Electrifying Hong Kong: Making Transport Sustainable, Hong Kong: Civic Exchange & the Asia Foundation, Section 5.1; and other sources referenced there.
212 The projections in Table 6.2 are those in Transport Department (1999), Third Comprehensive Transport Study, Hong Kong: HKSAR Government.
the doubling of the fleet in less than two decades.\textsuperscript{213}

The projection regarding cross-border goods traffic by road may be even more extraordinary in view of recent trends. The composition of the cross-border traffic is not addressed in the report, except by a suggestion that it will reflect historical trends. If this were to be the case, the preferred projection would imply a total of close to 93,600 daily goods vehicle crossings in 2016, nearly a fourfold increase over the actual number of crossings in 2001. The actual increase since 1995 seems to have been about 14\% (see Figure 6.3). Thus - again for reasons that are not explained - a period of modest growth in cross-border goods traffic (2.2\% a year) is to be followed by 15 years of astonishing growth (9.2\% a year).\textsuperscript{214}

The factors underlying government projections of the goods vehicle fleet and of cross-border trips by goods vehicles may be the same as those mentioned earlier as responsible for the equally extraordinary projections in seaborne freight, namely wishful thinking and lack of realistic appraisal of trends and opportunities. It could be argued that economic circumstances made the late 1990s and even all of the 1990s unusual, and this period is thus a poor basis for forecasting the next two decades. While this may be so, this argument was not presented in the forecast documents. Moreover, the almost uninterrupted growth in airfreight handled at Hong Kong’s airports suggests that the effects of economic circumstances on freight movement were not pervasive.

Finally, the absence of current projections regarding rail freight should be noted. Presently, almost no freight is moved by rail in Hong Kong. The last review of freight transport\textsuperscript{215} recommended construction of a Port Rail Line (PRL) by 2003, estimating that it would increase the total tonnage of cross-border freight by 10\% and also reduce the amount carried by road by about 15\%. The line would link the Kwai Chung container terminal with the rail network in mainland China.

A PRL was proposed again in 2000 without predictions as to its effect, but with the puzzling note that its implementation "hinges on growth of the rail-borne freight to the Kwai Chung ports." The document also noted that "the PRL would support the growth of the port cargo by tapping freight from the deep hinterland of the Mainland and could benefit the SAR's economy."\textsuperscript{216} The current status of the project appears to be that the government is committed to construction of the PRL but that detailed design work has yet to begin.\textsuperscript{217}

6.3 Hong Kong as a logistics hub for south China

Uncertainties about Hong Kong’s future as an entrepot for mainland China prompted the Port and Maritime Board to establish a Committee on Logistics Services Development in 2000 and to commission what became known as the McClier Report.\textsuperscript{218} This HK$40 million report was produced in 2001 by a consulting team headed by the McClier Corporation, a Chicago-based firm of architects and engineers. It proposed a "Competitive Strategy and Master Plan for Hong Kong as the Preferred International Regional

\textsuperscript{213} This ambitious projection echoes the projection of growth in the goods vehicle fleet made in the early 1990s. Then, a 25\% increase was projected between 1991 and 2001, but no growth occurred (see Footnote 197).

\textsuperscript{214} This truly extraordinary projection echoes similar projections about cross-border goods vehicle crossings made in the early 1990s. Then, a 135\% increase in border crossings was projected between 1991 and 2001, more than twice the increase that actually occurred (see Footnote 197).

\textsuperscript{215} Transport Department (1994), \textit{Freight Transport Study}.

\textsuperscript{216} Transport Bureau (2000), Second Rail Development Strategy, Hong Kong: HKSAR Government.

\textsuperscript{217} This was indicated in a response by the Secretary for Transport to a question posed in the Legislative Council (January 9, 2002). The PRL was also promoted in the McClier Report as part of a proposal for an "Inland Logistics Rail Pipeline" (see section 6.3).

\textsuperscript{218} PMB (2001), \textit{Study to Strengthen Hong Kong's Role as the Preferred International and Regional Transport and Logistics Hub}, Hong Kong.
Transportation and Logistics Hub.

The Master Plan proposed three principal elements:

- Creation of an efficient and integrated logistics platform with sea, air, and land modes of transportation and the capability for the integral processing of goods.
- Creation of logistics pipelines extending beyond the confines of the HKSAR as part of the PIDN (Port Inland Distribution Network), which would facilitate the movement of goods to and from Hong Kong with a focus on both the Pearl River Delta and inland China (Wuhan and Chengdu).
- Provision of the capability for small- to medium-sized business enterprises (SME/MBE), including trading companies, to participate in the Global Supply Chain and the Virtual Market.

It also proposed six target projects for completion within three years:

- The development of an Integrated Operational Plan, which would define the framework for the creation of a multimodal logistics platform in Hong Kong and the associated external logistics pipelines.
- The establishment of an Intra-Asian Integrator Hub in Hong Kong with intercontinental capability by defining the operational and physical (facility and infrastructure) needs and characteristics of such a project.
- The creation of Value Added Logistics Parks, which would enable the efficient processing of goods as an integral part of a multimodal logistics system. These are to be located on a phased basis at the airport, Tsing Yi, and Tuen Mun.
- The establishment of a PRD Road - Fast Track Pipeline to facilitate the movement of freight from select gateways, freight villages, or inland ports within mainland China, with a focus on the Eastern Pearl River Delta.
- The establishment of a PRD High Speed Boat - Fast Track Pipeline to facilitate the movement of time-critical freight from the catchment area within the Western Pearl River Delta.
- The establishment of an Inland Logistics Rail Pipeline capitalizing on the Rail Feeder being developed by the KCRC to the mainland, together with the development of a freight village in Pinghu and the potential for the operation of inland block trains.

What this means in summary is that Hong Kong should work harder to ensure that substantial amounts of mainland China's trade pass through Hong Kong. The one wholly new idea introduced in the Master Plan may be the proposal to establish "logistics parks," which could be places where goods are trans-shipped, with or without storage, repackaging, and other processes, or the location for external management of logistics processes elsewhere. Groundbreaking for a logistics center at the airport occurred late in 2001. It will be a three-storey, 31,400 square meter facility to open in 2003 at a cost of over HK$500 million.

"Logistics," according to one definition, "is the science - and art - of ensuring that the right products reach the right place in the right quantity at the right time to satisfy customer demand."  

The Hong Kong government has embraced the idea of "Promoting Hong Kong as a Logistics Centre." This was the title of a section of the 2001 Policy Address by the Chief Executive, Tung Chee Hwa. The section included the following statement:

"With Hong Kong's excellent transportation facilities and the PRD's high productivity, together we can develop into a logistics hub to link the Mainland with the world. We can promote the development of an inter-modal system and consider other supporting facilities to speed up the flow of goods and information. The provision of integrated services will also strengthen Hong Kong's competitive advantage as a supply-chain base."

A Steering Committee on Logistics Development has been established with Hong Kong's Financial Secretary as chair and is responsible for accelerating measures to take forward "Logistics Hong Kong." A Hong Kong Logistics Development Board is also being created. Within the administration, the Port and Maritime Board division has been restructured as the Port, Maritime, and Logistics Development Unit.220

At the airport facility's groundbreaking ceremony, Sandra Lee, the Government's Secretary for Economic Services, said,221

"The logistics industry encompasses sea, land and air services. Taken together, trade, transport and logistics industries make up 21.6% of our GDP, employ 20% of the total workforce. To develop this industry, we need to enhance connectivity between the various sectors in the supply chain, such as those between different modes of transport and those between Hong Kong and our cargo sources. We also need to facilitate collaboration amongst the players in the chain so as to strengthen the four pillars of 'Logistics Hong Kong' - physical, electronic, human resources and marketing logistics (the 4 'Ls'). The 2 'Cs', that is, Connectivity and Collaboration and the 4 'Ls' form the base on which the development of our logistics industry can be built."

Meanwhile, there is questioning as to whether much freight needs to be moved through Hong Kong at all. There is good reason to examine the economic value of being a trans-shipment hub. Assessment of the economic benefits and environmental costs of moving increasing amounts of freight through Hong Kong's territory could well point to the need for other options to secure the HKSAR's economic future.

In March 2002, the Port and Maritime Board commissioned Maunsell Consultants Asia (a participant in the production of the McClier Report) to examine, among other things, whether Hong Kong could be an international maritime centre without its port.222 Maunsell will determine the contribution of each of the maritime sectors to the economy and employment, benchmarking them against sectors in other maritime centres. The consultants will examine information technology and human resource needs and prepare a master plan - possibly for the emergence of a "virtual maritime center."

Such a development would resemble the transformation of Hong Kong in the 1980s and early 1990s from a leading exporter of light manufactured goods to a major service economy. Hong Kong has been described as the leading example of the "virtual economy," defined as "an entity with research development, design, marketing, financing, legal, and other headquarter functions, but few or no manufacturing facilities." By 1997, Hong Kong companies employed 3-4 million workers in China, and Hong Kong was the world's fourth largest source of outward direct investment. Hong Kong achieved this by "successfully hollowing out itself, shifting production elsewhere, and moving up the value-added chain into the services sector."223

There is evident tension between the recent thrust to move freight more expeditiously through Hong Kong and the even newer thrust to move less freight through Hong Kong but control more of its movements elsewhere. How this plays out over the next few years will be of great interest.

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221 This quote is taken from the report on the groundbreaking ceremony on the website of the Hong Kong Trade Development Council at <http://www.tdctrade.com/shippers/18/02logistics/logistics01.htm>.

222 As reported in Hong Kong iMail, March 25, 2002.

223 This paragraph is based on a 1997 speech by Andrew Sheng, Deputy Chief Executive of the Hong Kong Monetary Authority, to a seminar organized by Nikko Research. The speech can be found at <http://www.info.gov.hk/hkma/eng/speeches/speeches/Andrew/speech_110497b.htm>.
In the meantime, notwithstanding the somewhat frenetic activity of the government and several private-sector interests, the prospects for moving more freight through Hong Kong do not seem good. Several adverse factors were noted in the previous section in connection with discussion of what seem to be fanciful projections for increased port activity and, by extension, increased activity across the land border.

An additional factor that has received little attention in Hong Kong is the renewed interest in improved rail links between Asia and Europe. The last major review of freight transport in Hong Kong provided extensive discussion of rail developments in mainland China and noted the possible development of a "Euro-Asia Land Bridge."224 There was little interest in this concept during the late 1990s, but in 2001, the Paris-based Union Internationale des Chemins de fer (International Union of Railways, usually known by the acronym UIC), began discussing the idea.

UIC has undertaken several studies and projects on the establishment of an intercontinental rail freight corridor linking Europe and Asia, with trans-Atlantic sea links to eastern North America. The overall concept is illustrated in Figure 6.8. Specifics of what is presently the most favoured routing are in Figure 6.9.225 This would run from Lianyungang, a port in Jiangsu province, north west of Shanghai, to Narvik, a port in Norway.

The UIC research suggests that moving freight by rail could provide a lower-cost, more reliable service than moving it by sea. In a different context, Korean authorities have estimated that shipping containers by rail from South Korea to Europe - through North Korea, if that becomes possible - would be twice as fast and one-quarter the cost of shipping by boat.227 The availability of onward passage from Narvik to Halifax and Boston could result in less expensive access to North American markets for all parts of Asia connected to the land bridge.

At present, the UIC land bridge concept does not include Hong Kong (see Figure 6.8). Nor does an alternative concept linking Southeast Asia to Europe via New Delhi and Istanbul.228 Even if a proposed route did include Hong Kong, we would in any case be at the far end of the line, with little to export. However, in an interconnected world, Hong Kong interests could provide significant investment in a Euro-Asian land bridge and play a significant part in its management.

Yet another factor to be taken into account is the aftermath of the events in the United States on September 11, 2001. Initial observations suggest that these terrorist attacks have produced a paradigm shift in business attitudes and practices, particularly as they concern freight transport. One analysis is presented in Table 6.3.229 The essential transition is from the "just-in-time" processes prevalent in the 1990s, which substituted tightly managed transport for inventory, to the less transport-intensive "just-in-case" processes that are now emerging. The more

### Table 6.3 The post-'9/11' paradigm shift

<table>
<thead>
<tr>
<th>The open economy of the 1990s was characterized by:</th>
<th>The post-'9/11' siege economy is characterized by:</th>
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<tbody>
<tr>
<td>Facilitation</td>
<td>Surveillance</td>
</tr>
<tr>
<td>Trade liberalization</td>
<td>Controls/closed borders</td>
</tr>
<tr>
<td>Asset concentration</td>
<td>Decentralization</td>
</tr>
<tr>
<td>Interdependence</td>
<td>Redundancy/loose coupling</td>
</tr>
</tbody>
</table>

224 Transport Department (1994), *Freight Transport Study*.

225 Figures 6.8 and 6.9 were presented by UIC at a press conference held in Paris on April 18, 2002.


229 Table 6.3 is from a presentation by Bahar Barami (2002), *Productivity gains from pull logistics: tradeoffs of internal and external costs*, presentation at a conference on "Transportation and Economic Development" organized by the Transportation Research Board of the US National Academies of Science, Portland, Oregon, May 5-7, 2002.
relaxed supply chains of the "just-in-case" practices rely less on logistics, and could thus favor routes where logistics skills are less well developed than in Hong Kong. On the other hand, enhanced security will add to logistics requirements and the result could be a greater need for logistics overall. At the moment, it is difficult to say how this will play out.

In terms of value, about half of the goods from China trans-shipped through Hong Kong are destined for the US, where the focus of security planning has shifted from airports and aircraft to seaports and freight containers. Measures under consideration would involve tagging, tracking, and tamper-proofing every container as it moves across the world. The logistical challenges would be huge. In 2001, the world's total movement in containers was between 72 million and 244 million TEUs (available data are alarmingly imprecise). The movement of each container can involve up to 25 different parties and require at least 30-40 separate documents - more if a container carries freight for several customers.

The US has proposed installing its own security checks at numerous foreign ports and using these ports as exclusive gateways to the US. A more far-reaching proposal under discussion would enable the US to extend its border controls to the point of origin, i.e., the factory or warehouse where the container is filled and sealed. Such requirements could alter globalization patterns in profound ways but the impact on Hong Kong is unclear - new patterns could result in more or less freight movement through Hong Kong.230

What is not at all clear is how long this new paradigm will apply. Is it a change for a generation, essentially a fundamental reversal in centuries-long trends in transport and the economy? Will it be swept aside in a year or two by unrelenting economic imperatives and remain only as a bad memory? Or, as some have proposed, will it be a transition to an era of energy constraints and consequent reductions in mobility?

6.4 Towards sustainable freight transport

Although it is relatively easy to prescribe a path towards the sustainable movement of people,231 it is difficult to prescribe the steps needed for more sustainable movement of freight for a number of key reasons:

- Data on freight movement are poor.
- There are many unknowns about trade with mainland China.
- Hong Kong's plans for rail freight for the next decade or so are much less clear than plans for passenger rail. However, even through there is potential for moving some freight by rail, it is likely that a large amount would still need to be moved by road, and there are major questions about whether this could be achieved in a more sustainable manner.

However these and other uncertainties are resolved, the challenge of moving Hong Kong's transport towards sustainability would likely be easier if Hong Kong were no longer a physical entrepot for south China. The freight transport system would be less extensive and less economically important. There would be a smaller system to make sustainable, and less economic imperative to resist sustainability.

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230 The comments on the US approach to security are taken from "The Trojan box," *The Economist*, February 7, 2002; "When trade and security clash," *The Economist*, April 4, 2002; and from interviews with US officials during the television program 60 Minutes on March 24, 2002.

231 What is meant by a sustainable transport system is set out in Chapter 1 and also discussed in Gilbert, R. (2002), *Electrifying Hong Kong: Making Transport Sustainable*. In brief, it is transport that meets current needs without reducing opportunities for future generations to meet their needs.
Figure 6.8  Examples of intercontinental freight corridors

Figure 6.9  The Northern East-West Freight Corridor
However, the need to make transport more sustainable should not be a factor in determining whether Hong Kong should continue to be a logistics hub through which goods are moved. An essential feature of a sustainable transport system is that it does the job of moving people and goods around. There is no sustainable transport if there is no transport. It is always possible to make transport more environmentally sustainable by having less transport activity, but the overall system must do the job required of it by society. Thus, the appropriate strategy is to figure out what freight transport system Hong Kong needs, and then work out whether and how it can be made environmentally sustainable. If what appears to be the needed system cannot be made sustainable, the need should be reviewed, but only then.

More sustainable transport systems generally use less energy overall and rely on a larger share of renewable energy. Moving towards sustainability is thus desirable not only to maintain opportunities for future generations but also to reduce vulnerability to energy constraints should they affect present generations. As noted in 6.2 above in connection with projections concerning airfreight, there is some reason to expect that oil prices will rise during the next few decades. Should such price increases occur, Hong Kong's freight transport system will continue to function with fewer financial challenges if it has become more energy-efficient and depends more on renewable energy.

Rail is potentially the most sustainable mode of transport in terms of its low energy intensity and ability to use a wide variety of primary energy sources, including renewable sources. Thus, whether or not Hong Kong continues to serve as a major trans-shipment centre for goods produced in China, development of a rail freight capacity linked to the mainland system would seem desirable.

6.5 Summary, conclusions, and recommendation

Hong Kong's freight transport in the last decade has been characterized by:

- A decline in the overall number of goods vehicles on the road, but large increases in the proportion of heavy goods vehicles;
- A large increase in energy use by road freight vehicles, perhaps offset by a decline in energy use for other freight purposes;
- A large increase in road border crossings by container vehicles, but almost no increase in crossings by other goods vehicles (which in 2001 still accounted for the majority of crossings by goods vehicles);
- A very large increase in cross-border freight movement by river, which sustained the Hong Kong port's position as the world's busiest;
- Little increase since 1995 in the amount of freight leaving Hong Kong's port by road;
- Almost no increase since 1995 in the amount of seaborne traffic handled by Hong Kong's port; and
- Large increases throughout the 1990s in the amount of airfreight handled at Chek Lap Kok Airport.

Notwithstanding the recent near-zero growth in the handling of seaborne cargo and zero growth in the numbers of goods vehicles on the road, government projections indicate large increases in these key aspects of freight transport for the next decade or two. The amount of seaborne cargo is to double by 2020; the number of goods vehicles on the road is to double by 2016. Cross-border road goods traffic has increased only modestly since 1995, and yet it is projected to increase by a factor of almost four by 2016. The documents in which these projections are presented offer little in the way of rationale for the extraordinary changes in trajectory.

These projections seem to reflect wishful thinking and a lack of realistic appraisal of trends and opportunities. Moreover, the projections regarding goods vehicles follow earlier inflated projections (see Footnotes 10, 26, and 27).
Hong Kong's standing as a major trans-shipment center faces enormous challenges, chiefly from rival facilities in Guangdong province. Contradictory strategies are emerging to meet these challenges. The government's present position appears to be to boost the flow of cargo through Hong Kong by improving transport facilities and associated services. An emerging alternative view speaks to improving the ability with which transport and logistics elsewhere can be managed from Hong Kong with few goods passing through Hong Kong.

There may also be challenges from the improvement of Euro-Asian rail freight services. These could perhaps offer better service at lower cost from China to Europe and even on to North America. Such a development would leave Hong Kong literally at the end of a limb, but could offer opportunities for investment and management from Hong Kong.

A "wild card" that provides both challenges and opportunities for Hong Kong is the heightened attention given to security issues since the events in the United States on September 11, 2001.

Charting how Hong Kong's freight transport could progress towards sustainability is a major challenge on account of poor data availability, implausible projections, and an unusual number of uncertainties, including uncertainties about developments in mainland China and about technological progress. Whatever path to sustainability may be appropriate, it is likely to include development of rail freight capacity because of rail's low energy intensity and ability to exploit a wide range of energy sources, including renewable sources.

The one recommendation made here is that more attention be given to the availability of data about Hong Kong's freight, to the quality of the projections about freight activity, to the need for progress towards sustainable freight transport in Hong Kong, and to thoughtful planning of Hong Kong's future freight facilities.

To an outsider, the overall impression of the recent and present state of these matters is that except as they apply to airfreight, they are not approached with the high degree of professionalism that characterizes comparable work in Hong Kong on the transport of people. This is a paradox because Hong Kong's economy has come to depend on efficient freight transport and on effective planning of associated facilities, perhaps more than any other economy.

The only plausible explanation of this paradox may be that geographical, economic, and political circumstances have so favoured Hong Kong's freight transport sector in recent years that slackness in data quality, projections, and analysis concerning freight transport has been of little consequence. These circumstances appear to be changing.
7.1 Introduction

Decision-makers in the HKSAR government have bought into the rhetoric of sustainable development, but have yet to put it into practice. Furthermore, they do not appear to recognize Hong Kong's potential to be a leader in sustainability experimentation, which would give Hong Kong a strategic advantage in economic growth. On a basic level, decision-makers have failed to identify sustainable development as a policy objective or to align organizational structures and practices in meeting this goal. Therefore, as a whole, the decisions and behaviors of government officials do not reflect an attempt to find the most sustainable solutions.

Hong Kong's current system of decision-making is complex and has its roots in a 19th century colonial model of administration where civil servants were trained first and foremost as bureaucratic administrators. However, implementation of the Chief Executive's new Principal Officials Accountability System (POAS) on July 1, 2002, will involve fundamental changes in the way that the HKSAR government operates. This move is key in the sense that it is an attempt to reform the executive branch of government. At the same time, the restructuring of the policy bureaus and the designation of political appointees as effective ministers are insufficient measures for improving the quality of decisions. While the POAS does provide a platform for further changes, an overhaul of the decision-making process is also necessary.

The current decision-making process is insufficiently rigorous in assessing alternatives, while the allocation of resources is often sub-optimal. Indeed, the entire system shows sign of obsolescence. With rapid changes in expectations and technology, yesterday's strategies are unlikely to prove effective in solving tomorrow's problems. In developing a sustainable transport system, Hong Kong needs integrated planning, cross-departmental coordination, and a more effective resource allocation structure so that related issues can be assessed concurrently before decisions are taken.

Section 7.2 provides some general observations about the current system of decision-making in the HKSAR government. Section 7.3 discusses those government bodies that play a role in devising and implementing policies, including elected bodies, and discusses the possible impact of the POAS. Section 7.4 provides several case studies to illustrate observations made in earlier chapters. Section 7.5 provides recommendations regarding the institutional changes necessary for Hong Kong to move towards greater sustainability.

7.2 General observations

There are several facts to bear in mind in understanding how the HKSAR government currently makes decisions with regard to transport and sustainability:

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Chapter 7: The Dynamics of Decision-making in Hong Kong

1. The political system gives overwhelming authority to the executive branch, which has resulted in an "executive-led" system of government in Hong Kong. This will not change with the implementation of the POAS.\textsuperscript{234}

2. Key decision-makers are the elite "Administrative Officers" (AOs), who are generalist bureaucrats effectively doubling up as ministers. Civil servants dominate all major policy processes, including policy initiation, formulation, and implementation. The POAS will create a new political elite. However, since it is anticipated that many of the initial appointees will come from the senior ranks of the civil service, existing organizational structures and decision-making practices are unlikely to change in the short-term.

3. The administrative culture of the Hong Kong civil service and the training of civil servants impact the way that decisions are made. The top-down and compartmentalized structure of the bureaus and departments does not encourage a multidisciplinary approach. This problem is further exacerbated by an internal culture where different bureaus and departments avoid "interfering" with each other's decisions. While officers from different units of the administration may coordinate with each other, there is little effective joint decision-making at the important stages of policy formulation.\textsuperscript{235} In implementing the POAS, the Chief Executive has pushed for closer coordination of policy portfolios. Although the ministers will all serve on the Executive Council - a step in the right direction - effective coordination will occur only if policy objectives, goal setting, and organizational structures and practices are properly aligned.

4. The bureaucratic-administrative system sometimes results in a lack of competency at the highest levels of government. AOs change jobs every few years and, more often than not, are transferred into areas where they have no previous experience. Over the course of a five-year period, it is possible that all of the key officers within a bureau will change. This means that it can be hard to retain experience and institutional memory, as each new officer has to learn on the job. The POAS will create a non-political civil service in which permanent secretaries serve as administrative bureau heads and provide support to political appointees. It is unclear at this stage whether there will be complementary changes in the administrative system to develop the policy expertise required for a new governance system.

5. The argument in favor of the existing system is that while AOs are generalists, they are supported by departmental officers who are specialists. At the departmental level, the training has been to implement policies rather than initiate them. In theory, generalists and specialists should make a strong team but in practice, they often do not, and the differences in approach can be a cause of internal conflict and contention. The POAS is unlikely to change this situation in the short-term.

6. There is an urgent need to review Hong Kong's transport planning process and locate it within overall planning for sustainable development. The executive branch also needs to ensure that there is a meaningful connection between the planning and implementation of transport decisions, including the funding and pricing of transport. Opportunities to be more creative in developing and funding transport for the benefit of the community at large are being missed.

\textsuperscript{234} This system is derived from a colonial system in which the government was not elected to office and where there were no real politicians. As such, the civil service was in fact the ruling party and played a political as well as administrative role.

\textsuperscript{235} For example, for years the Transport Department (TD) and the Environmental Protection Department (EPD) used different standards to test vehicular smoke emissions. It was only after intense criticism in the legislature that they adopted a common standard in July 2000.
7. The POAS provides an opportunity to align policy and implementation in order to move towards a more sustainable transport system for Hong Kong, although early signs indicated that sustainable development was not a goal of the architects of the new system. However, subsequent changes in the configuration of several portfolios, particularly the amalgamation of the Environment portfolio with Transport and Works, are more positive.236

7.3 Current decision-making structure

Several policy bureaus and departments have responsibilities relating to transport planning and the execution of transport decisions in Hong Kong. The decision-making system is vertically organized with relatively weak horizontal links, resulting in a disjointed process of policy formulation that gives exceptional authority to transport officials over their peers in other bureaus.237 The system does not appear to be sufficiently integrated so that there is a continuous and conscious learning and feedback loop that is rigorous and informative. Those at the highest level of the administrative system have not shown an inclination to question the basis for specific policies, enabling certain biases to continue to dominate decisions. Elected bodies play an important role in stopping decisions at the final stages of implementation when they are blatantly problematic, but in a more effective system, these issues would be picked up much earlier.

Transport Bureau, Transport Department, and Highways Department

At the core of the decision-making structure is the Transport Bureau (TB), which is charged with the responsibility to "provide a safe, efficient, reliable, and environmentally friendly transport system, which meets the economic, social and recreational needs of the community, and is capable of supporting sustainability and the future development of Hong Kong."238 The TB's main responsibilities are to formulate policies on:

- Development of Hong Kong's transport infrastructure;
- Provision of transport services;
- Management of traffic; and
- Introduction of environmental improvement measures in transport-related areas.239

The Transport Department (TD) and Highways Department (HyD) provide support for the work of the TB. The various areas for which the TD and HyD are responsible are listed below.

<table>
<thead>
<tr>
<th>Transport Department (TD)</th>
<th>Highways Department (HyD)</th>
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<tbody>
<tr>
<td>Implement policies on public transport development;</td>
<td>Expand and improve road network;</td>
</tr>
<tr>
<td>Franchising and regulation;</td>
<td>Provide technical support for the planning,</td>
</tr>
<tr>
<td>Assist in the formulation of infrastructure development programs;</td>
<td>design and construction, and maintenance of</td>
</tr>
<tr>
<td>Plan and implement traffic management, road improvement, and pedestrian schemes; and</td>
<td>roads; and</td>
</tr>
<tr>
<td>Manage tunnels, bridges, parking meters, and government car parks.</td>
<td>Implement rail development decisions</td>
</tr>
</tbody>
</table>


236 The HKSAR government moved a motion debate in the Legislative Council on May 29, 2001 to seek legislative support for the POAS and at the same time announced a different configuration of several portfolios in response to legislators' demands.
237 Although this issue is beyond the scope of this chapter, it would be useful to trace the reasons why transport planning has become so dominant within Hong Kong's civil service.
The TB and the TD are therefore the primary transport planners. They put out policy documents and commission studies to assess long-term needs. In terms of current transport policy, the two most important studies are the Third Comprehensive Transport Study 1999 (CTS3) and the Second Railway Development Study 2000 (RDS2). The objective of CTS3 was to provide a framework for the development of an environmentally sustainable transport strategy up to 2016. The objective of RDS2 was to provide the framework for further expansion of Hong Kong's rail network up to 2016. The HyD has the responsibility for updating and implementing RDS2 and houses the Railway Development Office (RDO).

The TB and TD also have a direct role within the organizations of the major public transport service providers. Representatives from the bureau and department are nominated to sit on the boards of the two rail companies and the franchise bus companies. Furthermore, it is the responsibility of the Secretary for Transport to provide a secretariat for the Transport Advisory Committee (TAC), which is the key advisory body to the HKSAR government on transport matters. As such, the secretariat has the ability to exert considerable influence on the committee.

Works Bureau

While the TB plans for Hong Kong's transport needs, it is the Works Bureau (WB) that plans, manages, and implements public works programs, which include all major infrastructure projects, to meet the requirements of client bureaus and departments.240

The administration initially proposed that the POAS would combine the TB and the WB under a new Transport and Works Bureau, while the Environment portfolio would be combined with Health and Welfare. This decision indicated that decision-makers did not see sustainable development as a priority and regarded transport simply as the creation of hardware infrastructure: "Transport and Works both concern the development of physical infrastructure, for example, in respect of highways and railway systems. Placing the two portfolios together will facilitate closer planning and coordination."241

However, as a result of pressure from local NGOs and legislators, the administration announced on May 29, 2002 that the Environment portfolio would instead be amalgamated with Transport and Works.242 The Secretary of the new bureau will serve as a member of the Executive Council and will be supported by a non-political Permanent Secretary.

Planning and Lands Bureau, Planning Department, and Territorial Development Department

The Planning and Lands Bureau (PLB) also plays a role in transport planning and has the responsibility to "design and develop Hong Kong into an advanced international city through effective land use planning; adequate land supply; quality building and maintenance standards; and timely urban renewal."243 The Planning Department (PD) provides support for the work of the PLB and has the mission to:

- Formulate sustainable development strategies and plans;
- Guide land use and development;
- Facilitate sustainable development and re-development; and
- Encourage community involvement and support in the planning process.

242 See Footnote 236.
The PD’s current high-profile study is *Hong Kong 2030: Planning Vision and Strategy*, which aims to investigate a number of strategic planning issues. The Territorial Development Department (TDD) is responsible for smaller studies that are generally sub-regional and district-based.

The Secretary for Planning and Lands is chairperson of the internal Committee on Planning and Land Development (CPLD), which monitors the overall progress of all development projects in Hong Kong. The Secretary is also the leader of the HKSAR representatives on the Hong Kong/Mainland Cross-boundary Major Infrastructure Coordination Committee (ICC), established in October 1997 to coordinate major cross-border projects between Hong Kong and Guangdong Province. In addition, the Secretary chairs the Town Planning Board (TPB), a statutory body that has responsibility for town planning matters. Thus, the PLB and the PD are responsible for both strategic planning and district level local planning.

**Nevertheless, the Secretary for Transport is the effective lead transport planner in Hong Kong.** The extent of TB and TD control over transport planning is evident from the limited role of the CPLD and TPB. Despite the wide remit of the CPLD, the TB and TD are not bound by the CPLD’s decisions. And although the TPB produces statutory plans for Hong Kong, it has no authority over planning for roads and railways. The relationship between the Town Planning Ordinance, Roads Ordinance, and Railway Ordinance requires the TPB to take as given any road or rail project approved by the TB and TD under the Road and Railway Ordinances.

Within the HKSAR government, the PLB and the PD are among the most progressive in developing public consultation processes. The PD has built public and focused stakeholder meetings into its planning process to get feedback at the early and later stages of planning. The open, participatory style of the PLB and PD is in distinct contrast to that of the TB and TD.

The POAS will combine the Planning and Lands Bureau and the Housing Bureau into a new Housing, Planning, and Lands Bureau, to be headed by the Secretary for Housing, Planning, and Lands.

**Environment and Food Bureau and Environmental Protection Department**

The Environment and Food Bureau (EFB) and its Environmental Protection Department (EPD) have no direct authority over transport issues except in areas relating to vehicular pollution. Neither the EFB nor the EPD has any real role to play in transport planning. The key advisory body on the environment, the Advisory Council for the Environment (ACE), has no remit in the area of energy policy or review of transport plans. However, it does have a subcommittee that vets environmental impact assessments (EIAs) of major development projects, including transport infrastructure development.

The POAS will combine the environmental responsibilities of the existing EFB with Transport and Works, a move that offers the potential to integrate environmental considerations into transport planning. However,

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245 In discussions of the new Town Planning Bill during the 1998-2000 legislative term, four non-official members of the Town Planning Board appeared before the legislature and requested it to consider giving the TPB the power to participate in the decision-making process for roads. The legislature ran out of time to consider the Bill and the government has yet to present the Bill to the 2000-2004 legislature.
the planning conflicts mentioned earlier still need to be addressed in order to improve the quality of decision-making on transport-related issues.246

**Finance Bureau and the Financial Secretary's Office**

The Finance Bureau (FB) is responsible for overall resource planning and manages and coordinates annual resource allocation. The head of the FB is the Secretary for the Treasury, who is charged with various responsibilities, including:

- Laying down and implementing policies and procedures to ensure effective control and management of public revenues and expenditure, including assets and investments;
- Encouraging and promoting value for money in public investments and expenditure; and
- Assisting policy bureaus to formulate policies, specifically in terms of the financial implications of policy proposals.247

It appears that the FB has not played much of a role in the formulation of transport policies, even though it is charged with promoting value for money in public investments and expenditure, as well as ensuring that the financial implications of policy proposals are taken into account.

Under the POAS restructuring, a Bureau for Financial Services and the Treasury will be created. The new bureau will be responsible for Hong Kong's public finances and monetary affairs.

The Financial Secretary (FS) is responsible for fiscal, monetary, and economic policies. While the FS does not oversee transport policy, his role within the FB potentially gives him the power to question the financial efficiency and implications of transport policy, although it is unclear whether such questions have ever been raised or discussed. The implementation of the POAS alone is unlikely to change behavior unless its reforms lead to changes in the decision-making process as well.248

**Chief Secretary's Committee**

The Chief Secretary for Administration (CS) is primarily accountable to the Chief Executive and oversees the formulation and implementation of government policies. As the head of the civil service, he is the highest-ranking official in Hong Kong. The CS determines the overall direction of the administration as head of the policy-making Government Secretariat and also has a role to play in coordination, mediation, and arbitration when inter-bureau disputes arise.249

The CS chairs the Chief Secretary's Committee, which has seven policy groups with different policy secretaries serving as members. The CS meets each group at least once a month, and every two to three months, the full Committee (with all groups) meets. The FS joins these meetings whenever the need arises. Otherwise he chairs his own weekly meetings with the secretaries under his responsibility. The areas

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246 The original proposal was to combine the EFB with the Health and Welfare Bureau, a move that would have been less than optimal since environmental considerations would have sidelined as a health issue, rather than as a factor in the planning process. According to the most recent announcement, the portfolio for Food and Environmental Hygiene (FEHD) will be merged with the Health and Welfare Bureau.
covered by the seven policy groups on the Chief Secretary’s Committee are planning/lands, works, transport, housing, environmental protection, and economic services. The policy secretaries responsible for these areas attend as standing members.

The newly set up Sustainable Development Unit (SDU) resides within the CS’s office and is responsible for coordinating sustainable development initiatives. The creation of a new Council for Sustainable Development is anticipated once the new ministerial system is in place, although it is unclear how this body will function or approach sustainable development.²⁵⁰ It remains to be seen whether the SDU and the new Council will link energy and transport in their definition of what sustainability means for Hong Kong.

Currently, the portfolio for energy policy rests with the Economic Services Bureau (ESB), which sees its role as solely to administer supply contracts with the utilities, rather than investigate renewable power sources or reduce the use of carbon-intensive fossil fuels.²⁵¹ The Energy Advisory Committee, the key body on energy planning, operates under the purview of the ESB and has not spent much time examining sustainable transport either.

The POAS provides for a new Secretary for Economic Development, who will take on the responsibility for regulating the utilities.²⁵²

"The Chief Executive will continue to rely on the Chief Secretary and Financial Secretary to oversee and coordinate the work of the respective policy bureaux and to coordinate work which straddles different policy bureaux. The two … will also coordinate the work in respect of important policy agendas and priorities determined by the Chief Executive and Executive Council … Furthermore, the role of the Executive Council will be enhanced. The Chief Secretary … will chair various Executive Council Sub-committees. These Executive Council Sub-committees will replace the policy groups under the Chief Secretary’s Committee. Likewise, the Financial Secretary will chair relevant Executive Council Sub-committees.”

Chief Executive Address to LegCo
April 17, 2002

Chief Executive’s Office and the Executive Council

The Chief Executive (CE) is the political head of the HKSAR and is assisted by the Executive Council in policy-making. The Executive Council, a part-time and non-professional body, normally meets weekly with the Chief Executive presiding.²⁵³ After July 1, 2002, the Executive Council will operate more like a full-time cabinet. The CS and FS are both members of the Executive Council and will retain these roles under the POAS.

The overall direction of administrative policies is outlined in the CE’s annual policy address in October.

²⁵⁰ The decision to set up the SDU and the Council for Sustainable Development within the Chief Secretary’s office was announced in the Chief Executive’s 1999 Policy Address. The SDU was established in April 2001 and the Council was originally to be set up by early 2000. The delays in implementation have never been explained.

²⁵¹ Although it is beyond the scope of this chapter to discuss the issue of energy overall, suffice to say that policymakers and the public do not yet appear to see the link between transport and energy.

²⁵² The new bureau will combine economic services and information technology.

²⁵³ The current Executive Council’s non-official members are part-time members, many of whom have other full-time jobs in the private sector. Some have little or no previous political experience. Under the new ministerial system, the Executive Council may become a full-time professional cabinet.
In his 2001 address, the CE noted that the HKSAR government was committed to investing over HK$400 billion in hard infrastructure projects within the next nine years, with a sizable portion to be spent on transport infrastructure (mainly roads). An additional HK$200 billion will be spent on rail expansion. Despite estimated budget deficits for the next few years, the government has shown no signs that belt tightening measures will include cutbacks in capital-intensive infrastructure projects.254

The CE is the chairman of the Commission on Strategic Development (CSD), with secretarial support from the Central Policy Unit (CPU), an internal think tank that serves the CE as well as the CS and FS, who are both members of the CSD. The CSD advises the CE on long-term development needs and goals for Hong Kong and supposedly sets the direction for development. For example, the PD study mentioned earlier, Hong Kong 2030: Planning Vision and Strategy, reflects the CSD goal of developing Hong Kong as "Asia's World City" and a major Chinese city.

Legislative Council and District Councils

The political appointees within the POAS "will be accountable to the Chief Executive for the success or failure of their policy initiatives. Under the leadership of the Chief Executive, they will be accountable to the community … According to the Basic Law, the powers of the officials of the HKSAR Government originate from the Chief Executive. It is for the Chief Executive to determine how he should delegate his authority according to his policy agenda … To complement the introduction of the Accountability System, and to facilitate strengthening of the coordination role of the Executive Council in the decision-making process, the Executive Council Secretariat will be transferred to the Chief Executive's Office … the Central Policy Unit will strengthen its capabilities in respect of conducting surveys of public opinions and long-term policy researches."

Chief Executive Address to LegCo
April 17, 2002

Hong Kong has an unusual political system in the sense that the most representative government bodies - the District Councils (DCs) - have the least power. 75% of all District Councilors are elected by universal suffrage on a geographical basis every four years, with the remaining 25% appointed by the CE. However, under the Basic Law, Hong Kong's post-1997 constitution, the DCs merely play an advisory role within the political system. TD officers frequently attend DC meetings in order to brief councilors on district transport issues, such as the creation of bus routes and bus stops and planning for pedestrian schemes, while HyD officers inform councilors about road construction plans. The DCs may influence the outcome of these plans but they have no power in setting them.

The Legislative Council (LegCo) is an entirely elected body with an extremely complex electoral system.255 Of the 60 LegCo representatives, one represents the transport industry and is referred to as the Transport Functional Constituency Representative.256 A number of panels within LegCo deal with transport-related issues:

254 The Financial Secretary's 2002-2003 Budget, which was delivered on March 6, 2002, targeted cuts in civil service pay but not infrastructure spending.
255 It is beyond the scope of this chapter to describe the electoral system in detail. A brief account can be found in Hong Kong 2000, a government publication.
256 The Transport Functional Constituency has less than 200 voting organizations, with a heavy emphasis on taxi and minibus associations.
The Transport Panel meets regularly to consider transport-related issues with the TB and TD officers in attendance. A subcommittee of the Transport Panel looks specifically at rail development projects.\(^{257}\)

The Environmental Affairs Panel holds frequent meetings with the Transport Panel on joint issues, such as the regulation of vehicular emissions.

The Finance Committee and its Public Works Sub-Committee vet transport infrastructure projects, such as roads, bridges, and rail lines, and have the power to withhold funding for projects.

The Economic Services Panel is responsible for energy policy, but so far has shown little interest in approaching sustainable transport from an energy usage perspective, an attitude that appears to be shared by other LegCo panels.

An issue on which both the DCs and LegCo are extremely vocal is public transport fares, with the goal being maintenance of current fares without the raising or lowering of prices. However, neither body has spent much time on assessing planning- and technology-based options to ensure that TB proposals provide the best solutions for a cost-effective and sustainable transport system. Nevertheless, these venues, especially LegCo, have become useful channels for community groups to highlight concerns regarding the TB’s proposals. LegCo pressure was also critical in forcing the executive to combine the Environment portfolio with Transport and Works, rather than Health and Welfare.\(^{258}\)

Under the POAS, the Chief Secretary has the responsibility to create a closer and more effective working relationship with LegCo. Legislators may be appointed as non-portfolio members of the Executive Council in order to help the executive branch win legislative support for government initiatives. As the current LegCo panel system was designed to reflect the responsibilities of the various government bureaus, implementation of the POAS is likely to involve some internal restructuring of LegCo as well.

### 7.4 Flawed policy assessment process

The extent to which the Hong Kong administration conducts assessments of planning- and technology-based options in order to find the best solutions for meeting its declared transport objectives is unclear. However, the following case studies indicate that the assessment process in transport decision-making suffers from a number of key flaws:

- **Existence of a policy bias** - the assessment process tends to favor the outcome that appears to be preferred by government;
- **Lack of critical analysis, review, and debate of planning- and technology-based options**;
- **The existence of a policy bias and the lack of rigorous analysis raise questions about competency and systemic structural problems within the administration**; and
- **Lack of transparency** - it can be extremely difficult for interested parties and members of the public to locate detailed information about how options were assessed.\(^{259}\)

**Implementation of the POAS will not address these issues unless the executive acknowledges that there is a problem in the decision-making process and takes steps to improve the situation.**

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\(^{257}\) The subcommittee on matters relating to the implementation of railway development projects is a relatively new unit formed to follow up on various issues arising from the planning and implementation of rail projects.

\(^{258}\) LegCo debate on the POAS, May 29-30, 2002.

\(^{259}\) What questions are asked and how they are asked affect the objectivity of the assessment exercise. If detailed information about the assessment exercise is not released, and it seldom is in Hong Kong, it becomes very difficult for the public to assess the integrity and rigorousness of the exercise.
The structure of the POAS reflects an attempt to facilitate "better deployment of resources and closer coordination of portfolios" rather than achieve more sustainable development for Hong Kong. Indeed, the best evidence of current government priorities is the fact that in the most senior ranks of the government, the driving goal is bureaucratic expediency rather than an understanding of policy.

**Case Study 1: Rail versus Road Financing**

The issue of rail versus road financing is covered in detail in Chapter 3. Rethinking the way in which government provides support to different transport modes, whether directly or indirectly, is critical in moving towards a more sustainable transport system for Hong Kong.

Hong Kong's railways operate on prudent financial principles and are largely self-financing. The rail-financing mechanism is seen as a triumph by policy-makers, who have therefore shown little inclination to examine whether Hong Kong could be better served by an alternative policy. For example, they have not adequately considered the fact that although Hong Kong has the highest population density in the world and relies on public transport for 90% of all journeys, its rail system is skeletal in comparison with the systems in cities such as London, Paris, New York, and Tokyo (see the rail maps in Chapter 3). In other words, it is arguable that Hong Kong residents have inferior rail service compared to their counterparts in cities with similarly developed economies.

Moreover, since 1999, the stated transport policy has been "to rely on railways as the backbone of Hong Kong's transport system" and to give "priority [to rail development] in government's plan for infrastructure development." The question that the TB has so far been unwilling to consider is whether substantially expanding the railway network is possible if new railway projects must continue to provide a commercial return.

The TB would argue that it has already committed to several heavy rail expansion plans that will cost billions of dollars to implement (see Table 7.1 below). The issue is not that government has no plans to expand rail service but whether changing the financing mechanism would allow dramatic increases in rail service provision to major residential areas - areas that would already be served by rail in other wealthy cities. Hong Kong's rail financing policy is actually holding back the extension of medium and light rail to areas with relatively high densities. The failure to go ahead with plans for a South Island Line (SIL) despite the existence of large population centers on Hong Kong Island South is a good example of this fact.

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261 The first page of RDS2 states that the "government acknowledges that any new railway project will have to provide a commercial return." Transport Department (2000), p.1.

262 RDS2 outlined six new rail projects: the Shatin to Central Link, the Island Line Extension, the Kowloon Southern Link, the Northern Link, the Regional Express Line, and the Port Rail Line. However, the report also highlights various rail lines that would be desirable but have not been given high priority, such as a South Island Line (SIL).
Table 7.2 Committed and planned rail projects in Hong Kong

<table>
<thead>
<tr>
<th>Committed Projects</th>
<th>Length (km)</th>
<th>Scheduled completion date</th>
<th>Project cost (HK$ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Rail Phase I</td>
<td>30.5</td>
<td>End-2004</td>
<td>51.7</td>
</tr>
<tr>
<td>Tseung Kwan O Extension</td>
<td>12.5</td>
<td>Mid-2002</td>
<td>24</td>
</tr>
<tr>
<td>Ma On Shan Rail</td>
<td>11.4</td>
<td>2004</td>
<td>16.3</td>
</tr>
<tr>
<td>Tsim Sha Tsui Extension</td>
<td>1</td>
<td>2004</td>
<td>2</td>
</tr>
<tr>
<td>Sheung Shui to Lok Ma Chau Line</td>
<td>7.4</td>
<td>2004</td>
<td>8.5</td>
</tr>
<tr>
<td>Penny’s Bay Link</td>
<td>3.5</td>
<td>2005</td>
<td>2.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planned Projects</th>
<th>Indicated completion</th>
<th>Estimated cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shatin to Central Link</td>
<td>2008-2011</td>
<td>27-37</td>
</tr>
<tr>
<td>Island Line Extension to Western</td>
<td>2008-2012</td>
<td>19-20</td>
</tr>
<tr>
<td>Kowloon Southern Link</td>
<td>2008-2013</td>
<td>7-8</td>
</tr>
<tr>
<td>Northern Link</td>
<td>2008-2016</td>
<td>9</td>
</tr>
<tr>
<td>Regional Express Line</td>
<td>*</td>
<td>13-17</td>
</tr>
<tr>
<td>Port Rail Line</td>
<td>*</td>
<td>5-9</td>
</tr>
</tbody>
</table>

* Dependent on cross-border traffic growth.

Current rail financing mechanism

The major rail operator, the Mass Transit Railway (MTR) Corporation is financed 80% by fares, 10% by property development rights around its stations, and 10% by miscellaneous sources, such as shop rentals in stations and advertising. The passenger rail systems in Hong Kong do not receive any direct government grants to help meet expenses. Therefore, the MTR Corporation can only build a new rail line when population densities are sufficient to ensure the commercial viability of the line from day one.

In contrast, in other cities around the world, direct government grants play a major role in meeting the construction cost of new rail lines and, to a lesser degree, in meeting capital equipment and operating costs. Such support is provided in recognition of the positive external (un-priced) benefits provided by off-road mass transit (less road congestion; faster, more predictable travel times; reduced air pollution and noise; and less loss of land for roads and their setbacks). Hong Kong appears to be a rare, and probably unique, case in the sense that its two passenger rail service providers are nearly self-financing.

However, at all layers of government, policy-makers see the existence of rail subsidies in other parts of the world as evidence of the failure of those systems. This belief seems to have clouded clear thinking on the issue of rail financing and prevented an examination of how Hong Kong could expand rail to serve the greatest possible number of people in a cost-effective manner (see Case Study 2 below).

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264 Rail systems in cities such as London and New York suffer from under-investment and are poorly maintained when compared to Hong Kong’s newer rail system, but this should not be confused with the issue of the extensiveness of their networks.
Case Study 2: Route 7 and Route 10

A look at the planning process for two of Hong Kong's proposed highways, Route 7 and Route 10, illustrates a number of key problems:

- The failure of existing policy to promote sustainability and the maximization of resources;
- Conflict between transport planning and overall planning; and
- Bureaucratic reluctance to abandon outdated plans when the original rationale has changed or better alternatives have become available.

Route 7 (Western Hong Kong Island) and Route 10 (Northwest New Territories) were designed in the 1980s to serve needs associated with the anticipated expansion of the container terminals at the southeastern end of Lantau Island. Route 7 was intended to provide a direct link between Kennedy Town and Lantau while Route 10 would link Lantau with the northwestern part of the New Territories.

The port plan was dropped in 1999 after the decision was made to locate the new Disney theme park in Penny's Bay on Lantau Island, effectively eliminating the possibility of locating container terminals in this area, but the TB did not alter plans for Routes 7 and 10. Instead, the TB announced that the purpose of Route 7 was to provide more convenient access to Lantau Island for motorists, while Route 10 was to serve as an alternative to Route 3, which was expected to become saturated by 2010-2011, although seriously underutilized in 1999.

It was many months before the TB was willing to concede in public that the enormously expensive section of Route 7 linking Kennedy Town to Lantau Island via Victoria Harbor was no longer needed. Controversy then arose as to whether Route 10 also needed to be re-designed since its original purpose - to serve a new set of container terminals - was no longer valid. The TB initially maintained that no change in design was warranted.

Route 10

It was only after a year of intense lobbying from public interest groups that transport officials agreed that construction of the southern section of Route 10 could not be justified, that construction of a HK$5 billion section on Lantau Island (the Chok Ko Wan Link) could be abandoned, and that access roads linking the southern section of Route 10 (the Tsing Lung Bridge) to Lantau Island could be greatly simplified. Neither the CS nor the FS appear to have ever spotted the potential resource wastage the original plan would have entailed, nor does the Executive Council appear to have asked any critical questions regarding the proposal.

The TB then began pushing for construction of the northern section of Route 10. Separately, the Secretary for Economic Services, who is responsible for port development, stated that "Route 10 could serve the needs of future development" in the northwestern New Territories and play a supporting role in expansion of the seaport. However, this statement failed to acknowledge that new port plans are still far from being finalized. It is unclear that new facilities will be sited in the northwestern New Territories. Thus, the

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265 The Disney theme park is under construction and is scheduled to open in 2005.
266 The Route 10 debate raged for most of 2001. Two community groups that took an active interest in the discussion, SOS-Save Our Shoreline and the Society for Protection of the Harbour, were most vocal about abolition of the Chok Ko Wan Link and the need to redesign the connection between the Tsing Lung Bridge and Lantau Island. The bridge was accepted as a useful alternative route to the airport at Chek Lap Kok.
government was apparently promoting Route 10 as something that would be generally useful for a new port, wherever it might be located.

On March 8, 2002, LegCo voted against the TB's request for HK$134 million to carry out detailed design for the northern section of Route 10, demanding that the TB reconsider its plan. Prior to the vote of LegCo's Finance Committee, the Transport Panel held numerous meetings to discuss the government's proposal and receive public deputations, most of which raised questions about the basis for many of the TB's assumptions. The fact that these kinds of critical issues were not raised until a late stage of the planning process indicates the failure of the CS and FS to pick up on key problems at an earlier date.

The Route 7 controversy

Controversy over Route 7 is ongoing, even though the plan for a highway from Kennedy Town to Lantau has been axed. The remaining portion of Route 7 was designed as a six-lane highway that would run from Kennedy Town to Aberdeen. Public objection to the Route 7 plan is based primarily on the existence of a direct non-road transport alternative that is arguably more sustainable and cost-effective. The non-road alternative is a South Island Line (SIL) that would connect Aberdeen and Pokfulam to Central. The SIL would provide faster, cleaner, and far more widely accessible transport for people in the area than the proposed highway. In addition, unlike Route 7, a SIL would be mostly self-financing. Based on engineering cost estimates for similar projects and projected ridership, it is estimated that the amount of government support needed for the new rail line would be under HK$5 billion and may well be under HK$4 billion, equal to less than half the cost of building Route 7.

However, the TB's consultancy report showed that the provision of a rail line would only reduce the number of private cars and taxis on the road during peak hours by about 3%. This consultancy model was not based on a rail versus road comparison but on an old model, which considered whether local residents in the area who were private car owners and/or could afford regular taxi rides would use rail or not. As such, the TB's study did not take into account factors such as relieving congestion in Central, convenience of a rail option for major population centers in Southern and Western Districts, and the potential for low-cost park and ride facilities at area stations. A further flaw in the TB consultancy report was that no environmental assessment was done on air and noise impacts.

In the debate over Route 7, the TB argued that "roads and railway are complementary to each other and one cannot always replace the other." This argument failed to address the central question of whether a SIL would provide better service than a road in this particular area. The TB continues to argue that plans for a South Island rail line remain on the drawing board, despite the fact that building Route 7 will...

268 Plans for Route 7 have been scaled back due to public objections to the original design, which located the road along the shoreline, thereby destroying the natural beauty of the area and increasing air and noise pollution. The government was forced to agree to redesign the road to go through Mount Davis, submerging a section to reduce unsightliness. These measures would increase costs dramatically, putting the cost of the whole project in the region of about HK$10 billion. The TB also proposed to reduce the road to four lanes and extend only as far as the new Pokfulam Cyberport.

269 The South Island Line (SIL) was discussed in RDS2 as a desirable but non-priority line.

270 The TB's consultant assumed that 22% of households in the Route 7 catchment area own a car and that even with a rail option, relatively few of them would use rail to travel to the northern part of Hong Kong Island. Community groups lobbying for a rail option, such as SOS-Save Our Shorelines, found it difficult to have an open discussion with transport officials as the TB's dismissal of the feasibility of rail was based on this critical assessment.

271 Mathematical models are essential to decision-making. Yet all models rely on an extensive set of built-in assumptions, many of which may not even be evident to model users. The prudent user recognizes that the model's outputs must complement (not replace) critical human thinking on the part of the analysts.

undermine the financially viability of any rail line in the area.

Furthermore, in November 2001, the PD published a consultation paper showing concept plans for the future development of Aberdeen as a prime recreation and tourist area. Anywhere else in the world, this kind of plan would only go ahead with assured transport support from an appropriate rail link. In private discussions with government planners, it is clear that a SIL would be highly desirable, but it is not within the remit of the PD to express this view in public as rail and road planning are the responsibility of the TB and the TD.

The controversy over Route 7 illustrates a number of serious flaws in the transport decision-making system in Hong Kong:

- Lack of critical analysis and debate and minimal research on alternative options - The TB conducted a road and rail comparison only after considerable public pressure. When it did so, it ran an existing transport model with little or no comprehensive analysis of each of the options. The TB also sought to obfuscate the argument by:
  (a) noting (correctly) that road and rail are complementary, when the issue is whether in the specific case of Pokfulam and Aberdeen, rail is the superior option, and
  (b) implying that road and rail are both possible when it is clear that competition from a road considerably lessens the ability of a rail line to be fully or largely self-financing;

- Failure to consider whether the preferred solution is the most sustainable and cost-effective option - A subsidy of HK$4-5 billion to a rail operator might enable the construction of a SIL, although the TB proposed to spend much more (possibly HK$8-10 billion) on building Route 7;

- Lack of integrated and cross-departmental planning - Coordination between the TB and the PD is basically non-existent, as is evident in discussions of the Aberdeen Focus Study; and

- Lack of rigorous internal assessment of options - The CS and FS, as well as the Executive Council, appear to lack the capacity to pick up on and correct the biased nature of the policy assessment process. Implementation of the POAS will not help unless there is acknowledgement of the systematic problems in the decision-making process at the highest level of the executive.

Chapter 4 discusses various strategies for minimizing vehicle trips as part of a comprehensive policy package for lowering the external costs of road transport. Electronic road pricing (ERP) is a form of transport pricing that aims to reduce the number of vehicles in congested urban areas by charging a toll to travel on roads in these areas.

There is strong evidence that the TD has not been open with regard to the potential value of ERP in Hong Kong. On April 24, 2001, the TD followed up on a 1997 study by announcing that ERP was not warranted in Hong Kong at this time. The feasibility consultancy report found that drastic restraint measures (such as ERP) are not necessary from the perspective of traffic management before 2006.274 No detailed defense of this decision was provided. Moreover, in planning terms, 2006 is a very short time away.

Beyond the arbitrary nature of the decision to reject ERP and abandon the consultation process, which would help smooth the way for implementation of ERP when needed, the consultant’s final report raises serious questions about whether or not the assessment of this concept was adequate. For example, private vehicles (cars, motorcycles, and taxis) were the only group of road users considered, although all vehicular trips contribute to congestion and pollution.275

The ERP study took four years, but should be considered incomplete unless buses and goods vehicles are also considered. If an assessment of buses and goods vehicles was done, the full results of the study should be released to the public. If indeed an assessment was not done, then the consultancy study was

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275 See xxii and para 6.11 of The Feasibility Study on Electronic Road Pricing Final Report. Strikingly, a survey conducted as part of the study found that "40% of car trips in the morning peak may divert to public transport, while 10% of those surveyed would change the time of travel. The remaining 50% would stay-and-pay the road user charge" (para 6.12). It also found that overall emissions within the priced area would be reduced by 4% and that people within the zone would experience reductions in traffic noise (para 6.13-6.14). Transport Department (2001).
Chapter 7: The Dynamics of Decision-making in Hong Kong

fundamentally flawed and needs to be redone. The following examples highlight the potential benefits of ERP and indicate the urgent need to re-assess this option in a comprehensive and transparent manner.

If road pricing was introduced in those areas of Hong Kong where air pollution, noise levels, and congestion are particularly acute:

- Charging all passenger vehicles except buses (and perhaps school buses) would induce people to leave their private cars at home and use high occupancy road and rail transport.

- Charging buses would induce bus operators to consider bus scheduling and routing more carefully so as to avoid running nearly empty buses in priced areas.\(^{276}\)

- Charging goods vehicles and other industrial vehicles could discourage businesses from contributing to congestion at peak times and encourage them to shift the time of their operations to off-peak periods (see Chapter 5).

Case Study 4: Trams and Electric Trolley Buses

The feasibility of trams and electric trolley buses for Hong Kong is addressed in Chapter 5. Trams and electric trolley buses produce no pollution at street level and generate less noise than buses. Considering the unhealthy quality of air at street level and the widespread exposure to traffic noise in Hong Kong's urban areas, these technologies would seem to offer an attractive option worthy of in-depth government assessment. However, this does not appear to have been the case.\(^{277}\)

Modern trams, such as those in operation in various European cities, were not mentioned in CTS3, although the report concludes that Hong Kong's existing "antique" trams should continue to operate - without expansion of services - to provide feeder service for heavy rail.\(^{278}\) The major limitations of trams are that they are restricted to flat or nearly flat areas and, being heavy, may require strengthening of roadbeds. In Hong Kong, trams are best suited to reclaimed areas that tend to be very flat, such as the northern shoreline of Hong Kong Island. However, trams could also be introduced in much of the Kowloon peninsula (particularly in new reclaimed areas\(^{279}\)) and in parts of the New Territories.\(^{280}\) Trams can also be used imaginatively in conjunction with pedestrian schemes, such as those being proposed by the Hong Kong Institute of Planners.\(^{281}\)

Like trams, electric trolley buses are a long-established technology used worldwide. Citybus, one of Hong Kong's franchised bus operators, has expressed interest in this technology and is now testing electric trolley buses at its Aberdeen depot. CTS3 stated that:

"Before recommendation to trolley buses could be made, there should have to be confirmation of the

\(^{276}\) A key criticism of Hong Kong's current transport system is the vast number of empty buses in urban areas, particularly in Central, which are a major cause of congestion and an important source of air and noise pollution. Transport officials have been unsuccessful in dealing with this issue due to the failure to develop a clear policy on competition and coordination between transport modes. See Chapter 3 for more on this point.

\(^{277}\) Chapter 5 compares trams and electric trolley buses with diesel buses in terms of air and noise pollution.


\(^{279}\) An ideal area would be the planned South East Kowloon reclamation.

\(^{280}\) Introduction of modern tram service would be very suitable in Tseung Kwan O, a large new development where government planners failed to consider options for eliminating transport-related local pollution during site design.

\(^{281}\) *The Des Voeux Road Central Pedestrianisation Focussed Study, Final Report*, produced by the Hong Kong Institute of Planners in April 2001, and other pedestrian schemes are discussed further in Chapter 4.
potential degree of penetration and the degree of environmental benefits. This would have to be weighted against the extra costs involved and the loss of highway capacity and so would require further study.²⁸²

CTS3 argued that the disadvantages of electric trolley buses outweighed the benefits - even though there are clear environmental advantages associated with use of trolley buses, while mobility and flexibility (on hills and off-line) could be improved.²⁸³ Furthermore, the TD's subsequent report, the Feasibility Study on Introducing a Trolleybus System in Hong Kong, also failed to ask the relevant questions in its assessment of policy options, such as:²⁸⁴

· Which are the particular routes on which electric trolley buses or trams could largely or even entirely replace buses powered by internal combustion engines (ICEs)?

· On those routes, would air quality and noise benefits (external benefits) outweigh the costs of investing in trolley buses or trams (internal costs)?

The Feasibility Study took a negative view of the financial viability of trolley buses. It concluded that both capital and operating costs were higher than those of diesel buses and that this would require a fare premium of 24% to 33%. Citybus disputes these numbers as being too high. While the capital costs of trolley buses and overhead wiring are high, trolley buses have a much longer lifespan and have lower maintenance costs than regular buses. Operating costs are not expected to be much higher than for diesel buses.²⁸⁵

Citybus is conducting its own trials on a test track and has included side-by-side performance comparisons with a comparable diesel bus. The resulting database should provide useful information for future assessments, particularly if the findings are independently verified.

### 7.5 Recommendations

Given that Hong Kong is about to implement a new ministerial system, it would seem that an opportunity exists to reflect on the deficiencies of the current decision-making system in order to ensure that the policy assessment process is more open, rigorous, and inclusive and that more cost effective and sustainable solutions are considered.

As part of this evaluation, we recommend a number of specific steps:

1. Senior policy-makers need to build a coherent and balanced policy framework that is based on clear objectives and principles and prioritizes sustainable development. At a basic level, there needs to be a clear understanding of what sustainability means in terms of Hong Kong's future development.

²⁸³ Overall, TD arguments against introducing electric trolley buses focus on short-term logistical obstacles rather than long-term environmental and social benefits, as evident in the statement that electric trolley buses are not feasible because "it would not be reasonable to fit all streets with electric cabling." Transport Department (2001), Executive Summary to the Feasibility Study, Hong Kong: HKSAR Government.
²⁸⁴ In May 2001, the TD released the Executive Summary to the Feasibility Study, which considered technical challenges to the introduction of trolley buses rather than evaluating potential benefits. Nonetheless, it concluded that "trolleybus operation would be technically feasible in most circumstances in Hong Kong. However, various important technical and operational issues would need to be resolved." Yet no further studies were recommended.
²⁸⁵ John Blay (2002), Citybus Hong Kong Limited, personal communication on March 6, 2002. It should also be noted that diesel buses benefit from the fact that the ultra low sulfur diesel (ULSD) currently sold in Hong Kong carries no import duty as part of the government's plan to reduce vehicular pollution.
2. The HKSAR government should take a greater interest in energy issues and include transport as an integral part of any planning decision. The Sustainable Development Unit (SDU) and/or the Central Policy Unit (CPU) could carry out a multidisciplinary study to be presented to the Council for Sustainable Development soon after its formation and also to the Legislative Council and other relevant advisory bodies. The SDU and the CPU should make it a point to address energy issues and collaborate with local as well as overseas experts to better understand Hong Kong’s potential as a leader in sustainability experimentation.

3. Specifically, policy-makers need to promote critical review and discussion of issues such as rail financing, competition between different modes of transport, electronic road pricing (ERP), and alternative technologies such as trolley buses. At a very basic level, this is dependent on government willingness to reframe the critical questions being asked.

   - A useful step would be for the terms of reference (scope of work) for major transport planning assessments to be made public before being finalized so that independent comment prior to the award of consultancy work is possible.

   - Consultancy studies should be automatically released to the public in their entirety upon completion.

   - A number of consultancy studies should be re-done, including those on electronic road pricing (ERP) and trolley buses.

4. The HKSAR government as a whole needs to ensure that it has the organizational capability to respond to change. Combining the Transport portfolio with the portfolios for Works and the Environment could result in better integration and implementation of policies than the original POAS restructuring.

   - The more open style adopted by the PD in recent years, which utilizes a series of public and focused stakeholder consultation meetings, should be used as a framework to promote further community involvement in exploring sustainability for Hong Kong.

5. Policy-makers should consider using Hong Kong Island South as a pilot area for the development of a sustainable integrated land use/transport/environmental strategy, which would give policy-makers new insights into how to practice sustainable development.

6. LegCo should take up the issues outlined here to help push for greater transparency and critical review in government. The legislature has the authority to question the administration in open session, which can be a powerful measure for promoting accountability.
8.1 The need for better transport planning

This summary brings together the major features of our vision of a more sustainable transport system for Hong Kong. Readers are referred to preceding chapters for the arguments underpinning the recommendations listed here, as well as related secondary proposals. In framing our vision, we sought to be pragmatic visionaries, looking beyond Hong Kong's transport system as it is today while retaining a firm sense of what is practical - economically, technically, and socially - over the next 30 years.

Our vision of a more sustainable transport system for Hong Kong consists of a number of distinct but inter-related components. For the most part, the introduction of specific technologies is addressed within the context of needed institutional reforms, since current institutional arrangements tend to hold back implementation of more desirable technological options in Hong Kong.

As noted at the outset of this report, the HKSAR's transport system works reasonably well today with respect to mobility. However, mobility itself is increasingly jeopardized and comes with external costs that are unacceptably high. Road transport, which accounts for more than two of every three journeys, exposes large numbers of people to unhealthy street level air quality and subjects at least one million people to harmful levels of noise.

Looking ahead, current government plans\textsuperscript{286} will keep street level air pollution at hazardous levels and expose more people more of the time to higher levels of harmful noise. At the same time, mobility on Hong Kong roads will continue to decline.

The people of Hong Kong need and deserve a better vision for the future: one that seeks to reduce the negative impacts of transport on the quality of life in Hong Kong and improve the quality of transport services, rather than merely slowing the rate of decline.

8.2 A vision for a more sustainable transport system for Hong Kong

Rail and road assessments:

1. The Transport Bureau should conduct a thorough review of the way government policy influences the availability of rail and road services in the HKSAR.
   - As part of this review, the matter of competition versus coordination among different transport modes should be examined. The scope of this review as well as the manner in which it is conducted should be subject to comment both by government agencies outside the Transport Bureau and experts from outside government.

2. As part of the review mentioned in Point 1 we recommend that government consider funding approximately two-thirds of the construction costs for new rail lines as a direct grant (not as a loan or equity capital), in line with transport policy worldwide.\textsuperscript{287}


\textsuperscript{287} In other respects, rail systems should continue to be largely self-financing, that is retaining provisions for the rail provider to be able to capture the added financial value their stations generate for property built directly above or adjacent to their stations. However, for the purposes of assessing the viability of new rail lines, this provision should be extended to the KCRC as well.
3. We further recommend that government take into account the impact of any proposed transport link on property values along the route as part of the assessment of all new rail lines and roads.
   - The associated adjustments to overall government income over the life of the project should be incorporated into the decision-making process.
   - Further, where roads or elevated rail lines take up or otherwise restrict the use of potentially valuable land or coastline, the economic consequences (opportunity costs) of such site losses should be an integral part of the assessment.

4. A thorough assessment should be made of at least two areas where a "hub and spoke" bus (and public light bus) feeder service to rail stations would significantly reduce congestion and environmental impacts, while still providing adequate transport service for the area.
   - This study (or a separate study) should examine the question of the extent to which wasteful competition between certain rail and long-haul bus routes exists, with the result that one or both systems are significantly underutilized.

5. A number of the Transport Department's recent assessments were structured in such a way as to largely pre-determine the findings, and should therefore be re-done in a more open and fair manner (see Point 13 below). In particular, assessments should be re-done for electronic road pricing (ERP), electric trolley buses, and park and ride facilities.
   - The ERP study should consider the costs and benefits of potentially including all classes of vehicles (except emergency vehicles) in a road pricing system.
   - The electric trolley bus assessment should give due consideration to the local environmental situation along likely routes. The Transport Department should begin to work with, not against, Citybus Hong Kong Ltd. with regard to a pilot route for electric trolley buses on Hong Kong Island.
   - The feasibility of low-cost park and ride facilities should be assessed in conjunction with increases in parking fees in congested areas.

6. As part of the re-assessments mentioned under Point 5, we recommend that a detailed examination be made of the feasibility of using tethered electric transport systems (electric trolley buses and modern trams) to provide a large share of local transport needs.
   - Further, from a list of the most congested and polluted/noisy corridors in the older urban areas of Hong Kong, a number of transport corridors should be selected for an in-depth and site-specific assessment of the potential for replacing most or all of the diesel buses with trolley buses or modern trams.

7. In general, government should re-examine the ways in which the environmental benefits of cleaner road transport are incorporated into technology assessments, both for tethered electric systems and for on-board fuel systems such as Compressed Natural Gas (CNG), oxygenated petrol, and bio-diesel. 
   - In particular, we recommend that the HKSAR government support and encourage the timely introduction of a Liquefied Natural Gas (LNG) facility in Guangdong and subsequently promote CNG as a transport fuel and industrial fuel, in addition to its role as an energy source for the electric power sector.

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288 Government presumably did something along these lines with respect to the conversion of taxis and public light buses from diesel to LPG. While the LPG switch has been useful, as an isolated measure it is clearly not sufficient to reduce air pollution to acceptable levels at street level or substantially lower exposure to excessive noise.
8. Until electronic road pricing (ERP) is introduced inclusive of goods vehicles (see Point 5), goods vehicles (except for demolition/construction work) should be banned from the most congested areas for a three- to four-hour period each day, split between morning and evening rush hour periods.

The pedestrian experience:

9. The pedestrian experience must be treated by the Transport Department as an integral part of every public transport journey. In addition, the responsible government departments (e.g., Transport, Planning, Works etc) must work together to ensure that walking on urban streets in Hong Kong is safe, and, as far as is possible, pleasant.
   • In particular, pedestrian walkways must be wide enough to avoid excessive crowding; obstructions (permanent or temporary) must not force pedestrians onto roadways; there should always be an interrupted sidewalk (on at least one side) for the entire length of each urban block; and seating, shade, and shelter should be provided at intervals.
   • For new development areas, uninterrupted pedestrian (and in some cases bicycle) corridors should be provided to permit residents to walk between home and major transport access points (as well as to shopping and amenity sites) without experiencing excess motor vehicle exhaust and noise or the need to cross busy roads.

Greater transparency in policy formulation:

10. The Legislative Council should push for greater transparency and critical review of transport issues and policy formulation.

11. The Transport Bureau should be re-structured so as to enable transport decision-making to be integrated more effectively into overall planning in the HKSAR government.
   • The re-structured Bureau should follow the lead of the Planning Department in holding focused stakeholder public consultations to promote community involvement in sustainability issues.

12. To make the assessment process more transparent and those leading it more accountable, the Transport Bureau and Transport Department should seek public comment on the terms of reference (scope of work) for all major transport planning assessments before these are finalized. The whole of a consultancy study (not just the summary) should be released to the public automatically upon completion.

A new approach to transport planning:

13. Government should explore the possibility of using Hong Kong Island South as a pilot area for developing integrated (and far more sustainable) land use/transport/environmental strategies.

Table 8.1 summarizes the major elements of our vision for a more sustainable transport system for Hong Kong.
Table 8.1 Key elements of a more sustainable transport system for Hong Kong

<table>
<thead>
<tr>
<th>Road &amp; rail assessments</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>With outside input, the Transport Bureau should conduct a thorough review of the way government policy influences ridership on rail and road service. This review should also consider the issue of competition versus coordination among (and within) different transport modes.</td>
</tr>
<tr>
<td>2.</td>
<td>In line with practices elsewhere, government should provide funding for about two-thirds of construction costs for new rail lines as a direct grant (not as a loan or equity capital).</td>
</tr>
<tr>
<td>3.</td>
<td>Assessments of new rail lines and roads should take into account the impacts of the proposed link on property prices along the route. Where roads or elevated/at grade rail lines (and their setbacks) take up land or coastline, the economic consequences of such losses should be made an integral part of the assessment.</td>
</tr>
<tr>
<td>4.</td>
<td>Government should assess the feasibility of introducing a &quot;hub and spoke&quot; bus (and public light bus) feeder service to rail stations in at least two areas.</td>
</tr>
<tr>
<td>5.</td>
<td>Several recent Transport Department assessments should be re-done, including those on electronic road pricing (ERP), trams and electric trolley buses, and park and ride facilities.</td>
</tr>
<tr>
<td>6.</td>
<td>Planning for all new development areas should incorporate electric trolley buses and/or modern trams as a key component of local surface transport systems. In selected urban areas where air pollution and/or excessive noise is especially high, tethered electric transport should replace diesel buses as far as possible. The Transport Department should also undertake to work with Citybus Hong Kong Ltd. to introduce electric trolley buses into Hong Kong.</td>
</tr>
<tr>
<td>7.</td>
<td>Government should re-examine the way in which the environmental impacts of cleaner road transport are incorporated into technology assessments, both for tethered electric systems and on-board fuel systems. Government should support the creation of the Liquefied Natural Gas (LNG) facility in Guangdong, and promote CNG as a transport fuel. In addition, oxygenated fuels and bio-diesel should be re-evaluated with due consideration given to emissions benefits.</td>
</tr>
<tr>
<td>8.</td>
<td>Until electronic road pricing (ERP) inclusive of goods vehicles is introduced, goods vehicles (except for demolition/construction work) should be banned from congested areas during the most congested parts of each working day.</td>
</tr>
</tbody>
</table>

Pedestrian experience

| 9.                     | The pedestrian experience should be treated as an integral part of every "public transport" journey. Hence, responsible departments must ensure that walking in urban Hong Kong is safe and pleasant. In new development areas, uninterrupted pedestrian corridors between residences and major transport access points should be provided for as much of the local population as possible. |

Policy formulation

| 10.                    | LegCo should play a larger role in pushing for greater transparency and critical review of transport issues and policy formulation. |
| 11.                    | The Transport Bureau should be re-structured so as to better integrate transport decision-making into overall planning. The re-structured Bureau should follow the Planning Department's lead in holding stakeholder public consultations to promote community involvement in sustainability issues. |
| 12.                    | Public comment on the consultants' terms of reference should be sought and considered before the scope of work for major transport planning assessments is finalized. The entire consultancy study should automatically be released to the public upon completion. |
| 13.                    | Government should consider using Hong Kong Island South as a pilot area for developing sustainable land use/transport/environmental strategies. |
Appendix 1  The Environmentally Sustainable Transport (EST) Guidelines

Extracted from the Organization for Economic Cooperation and Development (OECD),

1. Develop a long-term vision of a desirable transport future
2. Assess long-term transport trends, considering all aspects of transport
3. Define health and environmental quality objectives
4. Set quantified, sector-specific targets
5. Identify strategies to achieve EST
6. Assess the social and economic implications of the vision
7. Construct packages of measures and instruments
8. Develop an implementation plan
9. Set provisions for monitoring implementation and for public reporting on the EST strategy
10. Build broad support and co-operation for implementing EST
Appendix 2  *Agenda 21: "Recommended Principal Activities related to the Transport Sector"


*Chapter 7, Section 7.52*

Promoting efficient and environmentally sound urban transport systems in all countries should be a comprehensive approach to urban-transport planning and management. To this end, all countries should:

a. Integrate land-use and transportation planning to encourage development patterns that reduce transport demand;
b. Adopt urban-transport programmes favoring high-occupancy public transport in countries, as appropriate;
c. Encourage non-motorized modes of transport by providing safe cycleways and footways in urban and suburban centers in countries, as appropriate;
d. Devote particular attention to effective traffic management, efficient operation of public transport and maintenance of transport infrastructure;
e. Promote the exchange of information among countries and representatives of local and metropolitan areas;
f. Re-evaluate the present consumption and production patterns in order to reduce the use of energy and national resources

*Chapter 9, Section 9.15*

Governments at the appropriate level, with the cooperation of the relevant United Nations bodies and, as appropriate, intergovernmental and non-governmental organizations, and the private sector, should:

a. Develop and promote, as appropriate, cost-effective, more efficient, less polluting and safer transport systems, particularly integrated rural and urban mass transit, as well as environmentally sound road networks, taking into account the needs for sustainable social, economic and development priorities, particularly in developing countries;
b. Facilitate at the international, regional, sub regional and national levels access to and the transfer of safe, efficient, including resource-efficient, and less polluting transport technologies, particularly to the developing countries, including the implementation of appropriate training programs;
c. Strengthen, as appropriate, their efforts at collecting, analyzing and exchanging relevant information on the relation between environment and transport, with particular emphasis on the systematic observation of emissions and the development of a transport database;
d. In accordance with national socio-economic development and environment priorities, evaluate and, as appropriate, promote cost-effective policies or programs, including administrative, social and economic measures, in order to encourage use of transportation modes that minimize adverse impacts on the atmosphere;
e. Develop or enhance, as appropriate, mechanisms to integrate transport planning strategies and urban and regional settlement planning strategies, with a view to reducing the environmental impacts of transport;
f. Study, within the framework of the United Nations and its regional commissions, the feasibility of convening regional conferences on transport and the environment.
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This report was edited by Rachel Stern and Elizabeth Hutton, with assistance from Lisa Hopkinson and Yip Yan-yan.

Civic Exchange and the Asia Foundation wish to acknowledge the following individuals and organizations for their help in preparing this report:

- John Blay, Citybus Hong Kong Limited
- Jarrad Brownlee
- K.Y. Chang, Sustainable Development Unit
- Ranapriya Dias (layout)
- Christopher Donnolley, Airport Authority Hong Kong (AAHK)
- Malcolm Gibson, Mass Transit Railway (MTR) Corporation Limited
- Planning Department
- Sound by Design (cover design)
- K.B. To, Transport Department
- R.H.C. Wong, Commissioner of Customs & Excise
- Christopher Young
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