Is Hong Kong transport sustainable?

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Abstract

Different transportation systems produce different types of cities and therefore places and spaces within them. The forms of modern cities are therefore subject to modes of movement and transportation, namely, walking, mass transit, and personal automobiles. Walking cities are usually associated with European towns, which gained their vitality from their compactness of the dense city centres. In these cities pedestrians come first. Most of them have also high quality and integrated public transport. The compact nature of Hong Kong’s urban form may be compared with the form of the European medieval city. But instead of being compacted by walls Hong Kong is compacted by its topography: the sea and the unstable hills. As a result, Hong Kong has become a great example of a compact city, one of the very few in the world. The Hong Kong transport system works extremely well. It is probably the only public transport system in the world that makes a profit. But is Hong Kong transport sustainable?

Keywords: sustainability, high-density, layering, mix-use, accessibility.

1 Definitions of sustainable transport

In April 2001 the EU Ministry of Transport and Communication at their meeting in Luxemburg adopted the following statement as European Union’s definition on Sustainable transport:

“A sustainable transport is one that:

- Allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations;
- Is affordable, operates fairly and efficiently, offers choice of transport modes, and supports a competitive economy, as well as balanced regional development;
• *Limits emissions and waste within the planet ability to absorb them, uses renewable resources at below their rate of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes while minimizing the impact on the use of land and generation of noise.*”

From the above definition we can assume that the indicators for sustainable transport are: accessibility, affordability, fuel consumption, and air and noise pollution. In this paper the indicators for sustainable transport will be framed under three goals: environmental, social and economic. Under environmental goals we will discuss fuel and land consumption, the rate of pollution emission as well as modes of transport: car ownership, rail system and pedestrians. Under social goals we will discuss the accessibility and air and noise pollution. Finally under the economic goals the financial limitations, affordability, efficiency, and cost of land, will be discussed.

2 Environmental goals

By environmental goals we understand that the rate of use of non-renewable recourses should not exceed the rate of which renewable substitutes are developed; the rate of pollution emission should not exceed the assimilative capacity of the environment; the land consumption for the transport related activity should be limited to minimum (Fjellstrom, [4]). All of the above are closely related to modes of transport, which will also be discussed in this section.

2.1 Fuel consumption

One of the most important goals in achieving sustainable transport is the reduction in fuel consumption. Unfortunately what we are experiencing now all over the world is dramatic increase in energy consumption. Between 1973 and 1990, transport energy consumption was increased by 50% (Vivier, 2001). However cities where car ownership is low and public transport well developed, consume far less energy than cities, which relay mainly on private cars.

Hong Kong has the lowest energy use per capita in the world among the affluent countries. Hong Kong energy consumption is 6.5 giga-joules per person, per year. Compared with Atlanta in US, where energy consumption is 103.3 giga-joules per person, or Houston with 86.0 giga-joules per person, per year, Hong Kong seems to be doing extremely well (Millennium Cities Database,1995). Most of Hong Kong’s public transport systems use energy in much more efficient way, than in other parts of the world. Due to high-density development occupancy level of public transport is also very high (Hong Kong’s densities 320 people per hectare; Atlanta’s 9 people per hectare) (Millennium Cities Database [17]). Hong Kong’s car ownership is equally low, only 46 cars per 1000 of residents, compared with 746 cars per 1000 residents in Atlanta (Millennium Cities Database [17]). High occupancy level on public transport and low car ownership contribute to very low energy consumption per capita.
2.2 Pollution emission

The extremely low fuel consumption also leads to very low air pollution emission per capita. After Tokyo, with air pollution emission per capita index of only 26 and Zurich of 44, Hong Kong comes in the third place with air pollution emissions per capita index of 49, less than half of that in Atlanta (126) and third of that in Toronto Metro area (142) (Millennium Cities Database [17]). It is therefore surprising that Hong Kong comes on top of the list with the highest spatial intensity of emitted pollutants from passenger transport (Millennium Cities Database [17]). However if we realize that the area in which the pollutants are emitted is by comparison extremely small, the intensity of the emission must be equally extremely large. Hong Kong’s air emissions per hectare measure 321 compared with Tokyo 41 or Atlanta of 29. The extreme compactness in urban form which in many ways helps to achieve one of the most efficient public transports in the world also has its negative effects in terms of the air quality. This will be further discussed in Section 3.

2.3 Car ownership

In high density cities, like Hong Kong, road capacity per person is inherently limited and high traffic intensities can emerge. In early 1970s both Hong Kong and Singapore, in response to rise in car ownership, and upsurge in traffic, introduced methods of restraint of car ownership. And although Hong Kong may not be as famous as Singapore for its policies regarding restriction on private car ownership, nevertheless, the results in Hong Kong are surprisingly good. In early 1970s the decision has been made that the simplest way to ensure more efficient use of the road space was through fiscal measures (Hau [7]). In March 1974 the First Registration Tax (FRT) was increased to 15% of the total freight value of the cars and motorcycles (Leung [12]). In 1982 and 1994 further increases where implemented (Hau [7]). The idea of making driving expensive certainly worked well in Hong Kong. High taxes, related to car ownership, high petrol prices, limited and expensive parking facilities, all contributed to keeping car ownership to very low level. This in turn led to very heavy demand for public transport facilities.

2.4 Rail systems

Urban rail system in Hong Kong is one of the most heavily use in the world. By 1993, 50% of the entire population of Hong Kong lived within 500m of Mass Transit Railway (Kenworthy et al., [10]). KCRC, with recently extended lines system provides extensive service for population living in New Territories.

Since 1970s the development of urban rail became a central part of transport strategy in Hong Kong. In 1979 first single line of the system was opened to the public (Rimmer, [21]). In between 1980 and 1990 speed service increased from 27 to 53 km/hr (Lo, [13]).

In addition to MTR and KCR system 23km of new light rail was introduced in the north-western New Territories (Lo, 1992). The system allows for connection
in between Tuen Mun and Yuen Long. MTR in 2001 became the first company to publish a Sustainability report, detailing its performance against targets drawn up on the basis of series of sustainability criteria (Loozen, [14]). Today MTR is providing Hong Kong with one of the most efficient collective transport system in the world. It has been publicly-listed and has won confidence of shareholders locally and worldwide (Loozen, [14]). One of the reasons why MTR is so successful is because of its development strategy. Right from the early start, the MTRC had a right to develop properties above its stations as well as above its depots. Up to 1993 over 18 sites have been developed this way, providing 31,000 flats and 440,000 square meters of commercial floor area, as well as three shopping centres with over 71,000 square meters of retail space (Noble, [19]). Today the numbers have been sufficiently increased. The data from the World Bank suggests that property profit in 1993 and 1994 have provided approximately 15% of the capital cost of the system (World Bank, [23]). Both MTR and KCR contribute great deal to efficiency of public transport in Hong Kong.

2.5 Pedestrians

Since only very small percentage of Hong Kong population has a car and even smaller proportion of the car owners is using their cars for daily travel, most of Hong Kong’s population will end up being a pedestrian at some stage during the day. However the pedestrian environment in many parts of Hong Kong is still less than desirable. A lot emphasis has been given to separate vehicle and pedestrian movement. Great amount of elevated walking system has been provided. Without them the number of pedestrian on the street level would have been impossible to accommodate. By providing reasonable fast and safe access these elevated walkway system definitely improve pedestrian movement, but they are only addressing one problem, which is to move people fast. These pedestrian motorways are similar to fast roads, or motorways and they have very little to do with urban structure, city live, or civic spaces.

But there are some successful and interesting examples of pedestrian infrastructure as well. One of them is the Central escalator. Escalator was open in 1994, in order to provide fast pedestrian connections in-between Central and residential area of Mid-Levels. The main aim of the escalator was to reduce vehicle traffic movements (Kam, [9]). When it was initially built, at the cost of $230 million, it was expected to carry only about 30,000 people every day. In April 2004, it was reported that 350,000 people use the escalators every day (Ma [15]). The project obviously has exceeded any expectations previously made. When first opened, in 1994, the 800m long escalator was cutting through existing urban structure, which at that time was derelict and not very attractive area. Today the area around escalator is one of the most desirable areas in Hong Kong for restaurant and bar location. The life around escalator goes on until early hours in the morning. Escalator did not only contribute to increase land value of the properties adjacent to it. It influences the waste area around it as well. The success of the escalator led to creation of another similar project in Fortress Hill. There are more proposals for escalators around Hong Kong; one in
Western District, 80 meter long escalator connecting Sai Ying Pun area with Caine Road, the other at North Point, connecting North Point MTR station with Braemar Hill. If realized these project will substantially reduce the traffic in both areas.

2.6 Land consumption

High density and compact form of development leads to substantial reduction in land consumption associated with transport facilities. Due to high densities there is significant reduction in road length to accommodate the same number of inhabitants. The length of the railway lines is also very short in comparison with the number of passengers it carries. Hong Kong once again comes on top of the list in terms of cars density on the road and passengers per length of railway lines. Stacking up the roads, elevated pedestrian system and integrated residential developments over the railway station all contribute to substantial reductions in land consumption.

3 Social goals

By social goals we understand that the access to all activities necessary to participate in social life has to be granted as far as possible; air quality and noise should not exceed the health standards suggested by World Health Organization; accident risks should be minimized (Fjellstrom [4]).

3.1 Accessibility

Accessibility comes as major factor in determining sustainability in terms of social goals. Accessibility means possibility for all inhabitants to reach their place of work, services, business and amenities, in reasonable time and at affordable level. Without any doubt car offers flexibility and independence for its owner to travel to any place at any time. However the ever increasing distances in between places, congestion, and lack of parking facilities, often makes accessibility by car not that desirable.

Accessibility may seem as a simple concept, but in real life it is very complex and difficult to measure. In simplify form we can describe accessibility as a measure of the ease with which people and goods can reach a location. Table 1 shows data for three Asian cities as well as the data for average European, American, and Australian cities. Accessibility indicator suggests that all three Asian cities perform much better than average Australian and American, and only Singapore perform worst than average of European cities. In terms of accessibility, Hong Kong comes second after Tokyo.

It is very surprising that American cities, with very high level of mobility (the highest rate in the international sample) score very low in terms of accessibility. High mobility should suggest the high accessibility, however the results shows the opposite. Hong Kong with low level of motorized mobility, scores highly in accessibility. The data in table one shows another surprising fact. It is clear that low accessibility cities force their inhabitants to travel further to achieve the
same thing. It is also clear that the lower the accessibility the higher the spending on passenger travel relative to income.

### Table 1: Accessibility.

<table>
<thead>
<tr>
<th>Accessibility Indicator</th>
<th>Theoretical affordable distance per day (km)</th>
<th>Actual motorized travel per day (km)</th>
<th>Personal spending on motorized passenger travel (% of GRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asian cities:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tokyo</td>
<td>95</td>
<td>44.7</td>
<td>23.8</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>89</td>
<td>23.9</td>
<td>12.6</td>
</tr>
<tr>
<td>Singapore</td>
<td>40</td>
<td>19.5</td>
<td>16.3</td>
</tr>
<tr>
<td><strong>Regional averages:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>44</td>
<td>28.0</td>
<td>23.3</td>
</tr>
<tr>
<td>N. America</td>
<td>30</td>
<td>35.0</td>
<td>45.3</td>
</tr>
<tr>
<td>Australia</td>
<td>18</td>
<td>23.8</td>
<td>32.0</td>
</tr>
</tbody>
</table>

#### 3.2 Air quality and noise

As mentioned in Section 2 extreme density of build form and compactness of the development means that even relatively low emission level will be compacted in a very small area. This in turn will lead to extreme cases of air pollution. The very low car ownership and the very low energy consumption and very low level of emission, cannot help to reduce it. Hong Kong’s air emissions per hectare are by far the highest in the world and measures 321 compared with Tokyo 41 or Atlanta of 29 (Millennium Cities Database [17]).

Another problem associated with high density development is the noise pollution. It is believed that noise pollution affects around one million people in Hong Kong (Environment Hong Kong, 2001). Most of these people are expose to traffic noise above 70 decibels (Gilbert [3]). With air pollution and noise pollution being as high as that Hong Kong transport cannot be truly sustainable.

### 4 Economic goals

By economic goals we understand mobility of person and goods necessary to achieve prosperous economic development. This should be achieved without creating congestions and without over-burdening the financial limitations of the public and private budgets (Fjellstrom [4]).

#### 4.1 Affordability

In Section 3 it was mentioned that Hong Kong transport comes second, after Tokyo, in terms of personal spending related to transport. Hong Kong transport is cheap and it can afford to be cheap because it is heavily used.
personal spending on public transport amounts to 4.7% of GRP. Compared with average European, which is 7.3%, or American, which is 12.25%, or Australian, which is 12.7%, it looks very well.

Hong Kong transport also offers variety of transport modes at variety of prices. The cheaper mode of transport is a tram. Tram is probably the slowest way to travel and is heavily used by elderly people. Tourists also enjoy travelling by tram. Slow speeds, lack of air-condition and upper deck views seem to be an attractive way to travel and experience the city. Buses are cheaper than mini buses, KCR and MTR trains. Trains may be more expensive to travel but they offer much faster and more convenient way of travelling. They are also well connected to other modes of transport. There are also ferries Peak Tram and taxis. Taxis in Hong Kong are plentiful and affordable. Five people sharing a taxi may end up paying the same amount per person than travelling by bus. In Central, Mid-Levels, Kowloon, and many other parts of Hong Kong the average waiting time for the taxi, could be counted not in minutes, but seconds. To sum it up people in Hong Kong have many choices how to travel, how fast to travel and how much to spend.

4.2 Cost of land

The biggest cost of any development in Hong Kong is the land. The price of land is disproportional to cost of construction. The land is the biggest commodity in Hong Kong. Therefore it is extremely important that land consumption related to transport facilities should be reduced to minimum. As mentioned in Section 2, when it comes to land consumption Hong Kong comes at the bottom of the list. The land consumption in Hong Kong is extremely low making public transport much more efficient and more economic to run. However it still looks like a lot of land designated to road structures could have been saved through more inventive designs.

4.3 Efficiency

Without any doubt Hong Kong Public transport is extremely efficient. It includes subways, rail systems, ferry boats, taxis, trams, escalators, travelators, as well as buses and mini-buses networks. The frequency of the services, accessibility and affordability makes Hong Kong transport extremely efficient. Today public transport activities in Hong Kong amount for more than 90 per cent of motorized passenger transport. Hong Kong’s public transport use is 50 percent above the urban region with on average of 485 journeys per resident annually. Compared again with 11 journeys per year on public transport in Atlanta, this may seem extremely high (Millennium Cities Database [17]).

5 Urban form and transport - conclusions

In previous sections we discussed various sustainability indicators in relation to Hong Kong public transport. Most of the indicators suggested that Hong Kong transport is very sustainable. But the amount of pollution per square meter is the
highest in the world and the noise level is in many parts of Hong Kong higher than desirable level allowed by WHO. Therefore Hong Kong’s transport can not be considered sustainable. Hong Kong Government has been trying to deal with these problems by reducing the density levels and increasing the number of roads. Even a very simple calculation show how adequate this approach could be. Lower densities mean more roads. More road space means less pollution per square meter of the road, less noise pollution as well; all together better indicator for sustainability. But according to Batter we will need to build approximately 40 times as much road space in order to keep up with desirable standards (Barter [2]). If we were to do that there will be no room in Hong Kong for any development. It is clear than that Hong Kong transport will have great difficulty of becoming sustainable unless we introduce clean fuel and substantially reduce number of cars on the road. The first solution looks like is more easily achievable than the second one. In the past few years Hong Kong already managed to covert its eighteen thousand taxis from diesel fuel to liquid gas. At the moment the Government is trying to covert buses and mini busses to liquid gas as well. If it succeeds the pollution level will decrees dramatically. Civic Exchange has been caring a research relating to the use of energy resources, climate change and the setting of air quality management policies in Hong Kong and the Pearl River Delta. In Electrifying Hong Kong: making transport sustainable, Richard Gilbert, argues that electricity will become by far most important end use of energy in Hong Kong (Gilbert [3]). It may not be easy to reduce vehicle emission and improve the air quality in Hong Kong, however, it is possible and it looks that with some efforts it could be achieved in relatively short time.

The second solution of reducing amount of vehicles on the road is a little bit more difficult, but once again not impossible. Simple change in policy could help a great deal. At the moment Government subsidize public bus system but do not subsidize the rail transport and therefore the prices on MTR and KCR are much higher. If the government was to subsidize rail transport, the prices could be reduced and amount of passengers will increase and therefore it will be possible to reduce number of buses on the road. The rail cannot access all the places, so buses and mini busses are important part of transport system, but reduction in numbers will definitely be beneficial.

Some methods of reducing the number of cars on the road, already in operation in Hong Kong are the escalators. If we look at how heavily use is the escalator, serving 35 000 people every day, it is clear that more escalators and travelators in Hong Kong could dramatically reduce the amount of trips taken by vehicle. The benefits of escalators as discussed before are not only related to reduction on vehicles on the roads, they also contribute great deal to rehabilitation of the areas they go through. They initiate activities and opportunities for business. The benefits of escalators are substantial for all.

So far we talked about most obvious solutions, but actual opportunities are even greater than that. If we were to dream a little bit more and open our eyes to more daring ideas our future may be even brighter. For too long the way we design cities has been by designing infrastructure separate from built form. This
leads to huge land consumption. The ideas of elevated roads, viaducts, air-right structures, may have help a little bit in term of land consumption but they definitely did not contribute to environmental qualities. But, is it possible to design infrastructure together with the built form? High density city like Hong Kong, offers great opportunities for doing just that. In some ways Hong Kong has been doing it for some times already. The vertical transport of Hong Kong is never mention when transport system is discussed. In Hong Kong we can accommodate the population size of the whole village in a single tower (1000 people per tower is not unusual). The time needed for people living in these towers to get to shopping, sports facilities, cinemas, restaurants, etc could be counted in seconds. Most of these tower developments are also connected or built on top of railway lines, MTR system, or bus system offering incredible and fast connectivity. However the environment created by such developments could be still greatly improved. We need more exciting ideas for the future, new morphologies, new way of thinking. And these ideas may not be possible anywhere else in the world, but in Hong Kong this is not only possible but in near future may be the only answer to go forward.

Today pollution in Hong Kong reaches unacceptable levels, and proposed solutions are still not acceptable, and therefore the answer to the paper question whether Hong Kong Transport is Sustainable, is not. But in the same time it is clear that Hong Kong transport could become very sustainable indeed.

References