Department of Civil & Environmental Engineering

University of Connecticut

CE 5710

Case Study in Transportation Engineering

Transportation Policies of Singapore: Creating a Sustainable City

Submitted to

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INTRODUCTION

Asia, although comprising 65% of the world's population, accounts for barely over 10% of the world's automobile population and 25% of the world's truck and bus fleet (Midgley, 1994). However, automobile growth rates in the 1980s were dramatic. For example, between 1984 and 1988, the annual growth rates of motor vehicles in Korea, China and Thailand were 30, 14 and 9%, respectively, compared to 2% in the US and 3% in the UK. Much of this has been in urban areas. Despite lower levels of vehicle ownership, congestion has been a major issue in these cities. But amidst these woeful tales, Singapore has been able to develop a world class transportation system which brings a hope for better transportation future for all Asian cities.

SINGAPORE

Singapore is a sovereign city state in south-east Asia. It was founded in 1819 by Stamford as a trading post of the East India Company. After its independence from the UK in 1963, it went through years of turbulence. Despite lacking natural resources and adequate land, the nation developed rapidly as an Asian Tiger economy.

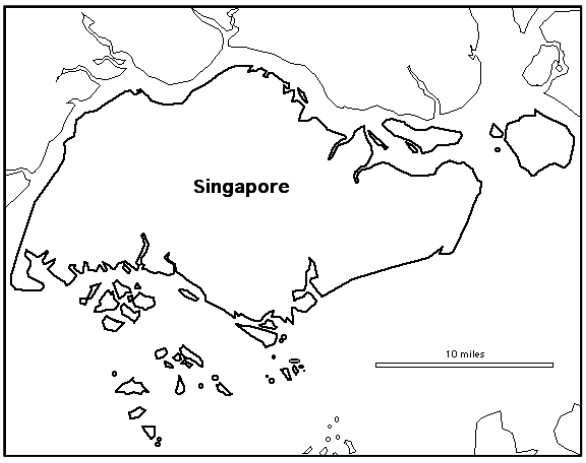

Fig- 1 Singapore

It has an area of only 278 sq. miles. The total population of the country is 5,610,000 (2016) with a population density of 19,935/mile^2, making it the ***most densely populated*** country in the world.

Singapore is a thriving global financial hub and is often referred to as one of Asia's economic "tigers". It was ranked as the most "technology-ready" nation (WEF), city with "best investment potential" (BERI), 2nd-most competitive country, 3rd-largest foreign exchange market, 3rd-

largest financial center, 3rd-largest oil refining and trading center, and the second busiest container port.

Singapore ranked 11th internationally and first in Asia on the UN Human Development Index. It is ranked highly in education, healthcare, life expectancy, quality of life, personal safety, and housing. It has been named the most expensive city to live in the world by the Economist Intelligence Unit (EIU) in 2016.

TRANSPORTATION POLICIES OVERVIEW

With limited land and extremely high population density, the city required appropriate transportation policies in order to be functional. Singapore has a road system covering 2,085 miles, which includes about a 100 miles of expressways. 12% of the total land area in Singapore is already dedicated to road use whereas residential housing only comprises of 14%.

The Singapore Area Licensing Scheme (ALS) is the world's first congestion pricing scheme (1975). The policy also includes other complementary measures such as stringent car ownership quotas and improvements in mass transit. In 1998 Singapore updated the ALS to world's first Electronic Road Pricing (ERP) system.

Singapore has one of the most smoothly functioning public transport system. As Singapore's land transport authority, LTA regulates and oversees all three main modes of public transport (buses, trains, and taxis). Two major private companies run the public bus and train transport system—SBS Transit and SMRT Corporation. In 2015, LTA has launched "A people centered land transportation system" to improve the overall quality of transportation facility by 2030.

Road Pricing Scheme

Like all developing city, the problem of traffic congestion reached a peak in Singapore during early 1975 when average vehicular speeds during the morning and evening rush hours within the

Central Business District was only 19 km/h (Phang and Toh,1997). This led policy makers in Singapore to consider alternative measures to decrease congestion in the city. So in 1975 Singapore introduced world's first area licensing scheme (ALS). Initially, the ALS required cars with fewer than 4 passengers to display a $3 daily license when passing through any of the 22 police-guarded entry points to the downtown (Gomez-Ibanez and Small, 1994). The area covered by ALS gradually increased and the hours were also extended.

In 1998 and **Electronic Road Pricing System (ERP)**, replaced ALS. Motorists are charged when they use priced roads during peak hours. This minimises traffic volume in heavily used roads in the CBD and major expressways. It also encourages motorists to consider alternate routes or modes. Charges are based on usage which means those who use the roads more during peak hours pay more. This system has been very successful in restricting private vehicle usage in Singapore. It has been adopted many other places ever since. The following figures shows the historical ALS and current ERP locations in Singapore (Fig-2 & 3).

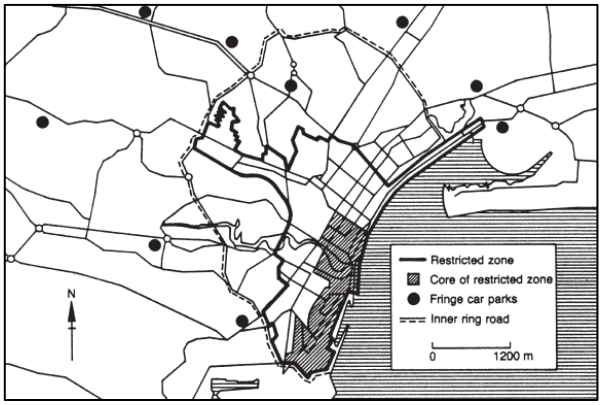

Fig-2 Restricted Zone covered by the ALS

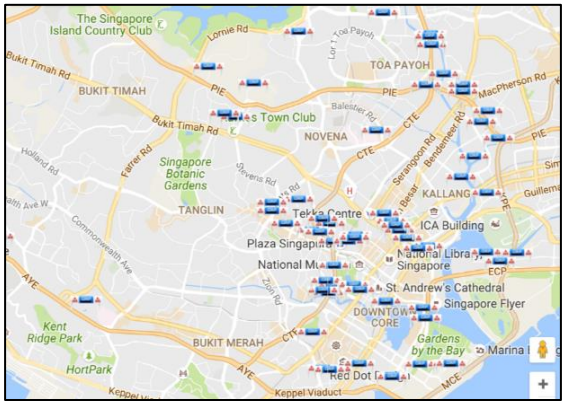

Fig- 3 Current ERP Locations

RESTRICTING CAR OWNERSHIP

One of the most unique features of Singapore's transportation system is it's restriction on number of private cars. In late 1980s, rising affluence and population in the city meant that the demand for vehicle ownership will eventually spiral out of control, resulting in traffic conditions

exceeding the criterion of a healthy road network (Chu, 2015). The policy that Singapore adopted was to make cars inaccessible for most people.

On May 1st 1990, the transportation unit of Singapore's Public Works Department (PWD) instituted a quota limit to vehicles called the Singaporean Certificate of Entitlement (COE). Before buying a car, buyers are required to bid for COE. This procedure is extremely expensive and allows only certain number of private vehicles to be registered per period. Car buyers must also pay for duties 1.5 times the vehicle's market value. COE allows the car to run on the road for a decade. The policy has allowed Singapore to limit the number of cars in the city and keep the city thriving. Number of registered vehicles have remained almost constant over the past few years (Fig-4).

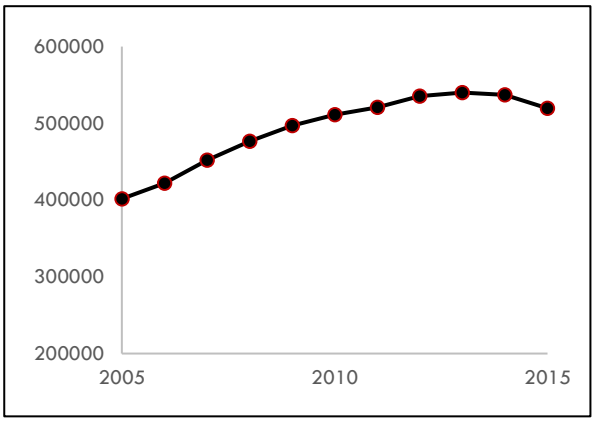

Fig -4: Total Private Cars in Singapore

MAKING THE CITY ACCESSIBLE WITHOUT A CAR

The next step after restricting car usage was to make transit popular. Singapore has a well-integrated cost efficient multi modal transportation system. 54.4% of Singaporean residents use transit to go to work. It consists of MRT lines running the length and width of the Island, LRT lines connecting major residential areas with MRT lines, buses feeding almost every corner of the city, and finally taxis covering the small gaps in the system.

With a network of 142 stations across the island and more to come, the MRT and LRT system is one of the cleanest, reliable and fastest growing train system in the world. Five MRT stations began running first in 1987 as compared to 90 today. The train frequency during peak hours (7am to 9am) is about 2 to 3 minutes and about 5 to 7 minutes during off-peak times.

Complementing the MRT system is the LRT system is designed to acts as a feeder service and takes commuters to closer to home. Since it first started in 1999, the LRT system has expanded into Bukit Panjang LRT, Sengkang LRT and Punggol LRT.

Bus Transport forms a significant part of public transportation in Singapore, with over 3.8 million rides taken per day on average as of 2015. Three private corporations (SBS transit, SMRT Buses and Tower Transit Singapore) operates on 298 routes with over 4800 buses.

A study was done to compare Singapore with cities with excellent transit system such as London, Hong Kong, New York and Tokyo. It was found that average annual ridership in Singapore is much higher than New York and London. Average passenger km vs vehicle km of Singapore is the highest (77) in the world, meaning much less energy usage and emission per capita. Another interesting thing about Singapore's transit is that although average fare per boarding is the lowest compared to the same cities ($0.8), it has very high fare box recovery ratio (1.5).

SOLVING THE FIRST AND LAST MILE PROBLEM:

Walking has been popular Singapore's high density and mixed used corridors since the beginning. Safe pedestrian facilities encourage people to walk to the station and take transit. Today about 65% of the household live within half a kilometer of a train or bus station. Almost all of the train stations are equipped with overhead pedestrian bridge. To improve connectivity to public transport nodes over the next five years, the length of covered walkways will be quadrupled in neighbourhood towns. Their current goal includes making 8 out of 10 houses within the walking distance to the stations by 2030. Riders are also allowed to bring folded bicycles in buses and trains.

"Walk Cycle Ride" is a vision that has been working to make Singapore a more inclusive community that travels "car-lite". Intra town cycling tracks are installed in some places. One of the most recent sustainable project implemented the Ang Mo Kio "walking and cycling town".

Their aim is to provide every HDB town its own cycling network by 2030. These cycling paths will connect commuters from their homes to MRT stations and bus interchanges, and nearby key amenities such as shopping malls and schools, making it a truly interconnected city.

CONCLUSION:

Singapore is a perfect example that density is a good thing. Many Asian cities are struggling with the same problem as Singapore, resource restriction versus high demand. But through their policies to restrict car usage in the city and to make transit popular, Singapore has been able to overcome its struggle. The figure below shows how far singapore have come since 1974.

Fig 5- Junction of beach road and Bras Basah road, 1974 (Media image- 20060000434 - 0060)

Fig 6- Junction of beach road and Bras Basah road, 2016

The current goal is to have 75% commuters choose public transport as their main mode of travel by 2030, and 85 per cent by the 2050s. Singapore proves that planning for the desired future rather than just providing service based on past trends yeilds a better solution. Their plans and positive outcomes have helped them become the economically, socially and environmentally sustainable city.

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