An Analysis on the Sustainable Land Transport System in Singapore — The Case of CBD Area

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Abstract: The development of technology and economy caused the dramatic increasing of car ownership. Therefore, infrastructures such as freeways have been built extensively in order to give the priority for private car using. However, large number of motorcar using caused problems for sustainability in aspect of environment, economy and society worldwide. Singapore has 5.7 million people living in a total land area of 728.6km2 by 2020, which makes this city state one of the most populated and urbanized countries in the world. In order to balance the increasing motorcar-using demand and scarce land, innovative approaches have been set for sustainable land transit. This essay describes background, institutional and policy environment of sustainable land transport system in CBD area, Singapore as case study to give the evaluation of the system and suggestions.
***Keywords*:** sustainable land transport system, institutional and policy environment, CBD area

1. Introduction

Singapore is an island city-state located on the southern part of Malay Peninsula. The population has increased rapidly from 2.07 million in 1970 to 5.7 million in 2020. Rapid industrialization and intensive development happened in the same period which have requirement for transport infrastructure growth. In 1998, the roads and road-related facilities have taken up 12% of total land area and 45% of household owned a car in Singapore. As Maria and Teo (2000) indicated that demands on Singapore's land transport have been increased since 1990s. The number of daily car travel grew from 2.6 million to about 9 million from 1981 to 1997. Considered about the scarce land resources in Singapore, relying on road expansion cannot settle the increasing demand and what is more it would be at the expense of facilities such like housing, schools, shops and parks.

Improving land transport was a challenge by 1960s. Because the infrastructure was not adequate to keep up with rising transport, there was a lack of good public transport services and there was traffic congestion in the city. In the 1970s, measures were taken to improve Singapore's transport system. The government reorganized bus and taxi industry to improve services to the public and introduced congestion pricing system and area license scheme to restrict car using (LTA Gallery, 2016). In addition, the important decision was made to build the MRT system to meet the growing travel demand in 1982.

After a decade of discussions, the government gave the MRT the green light in 1982. Today, the MRT forms the backbone of land transportation within Singapore, offering Singaporeans a viable alternative to public transport. Together with buses, it forms an integral part of the public transport system, connecting people to places seamlessly. What is more, expressway also played on important role in land transit. The government have took measures to decrease automobile using and most of them are successful.

2. Institutional and policy environments for the project

Before 1995, responsibility for land transport were separated into different public sectors. In September 1995, Singapore government set up the Land Transit Authority (LTA) to improve land transport system. Four public sector agencies (the Mass Rapid Transit Corporation, the Roads and Transportation Division of the Public Works Department and the Land Division and Registry of Vehicles of the Ministry of Communications) in charge of land transport merged into LTA. As Maria and Teo (2000) indicated that as a integrated entity, the responsibility of LTA is planning, designing, developing and managing land transport-related function. What is more, the mission is to provide commuters affordable, convenient, safe and comfortable rides, especially for public transport system (Tai and Chong, 1998).

While the most land transport responsibilities are on LTA, there are 3 exceptions. Firstly, private sector operate public transport. All the bus services are run by 2 private companies and SMRT runs the MRT system. Then, represented on the

Public Transport Council, LTA can report separately to the Ministry of Transport to suggest improvements on transport infrastructure. Finally, LTA corporate enforcing policies with Traffic Police which in charge of drive licensing, road safety education and so on.

There are two government departments are responsible for policies which influence transport. The Urban Redevelopment Authority (URA) in charge of making overall Concept Plan. The Concept Plan include Master plan and Development Guide Plans (DGPs) which provide guidance to transport strategy of LTA. And another is the Ministry of the Environment which is responsible for specify environment standards. As May (2004) indicated that this government department supervise on vehicle emission, noise and air quality has achieved the standard. If the standard have not been meet, the LTA would be asked to take actions.

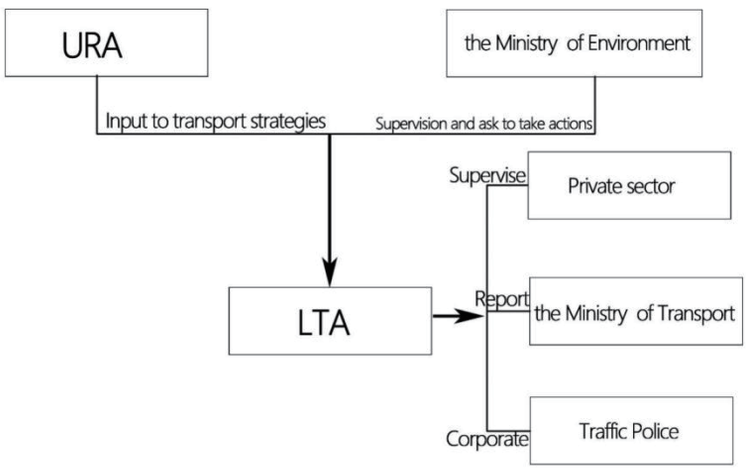

Figure 1. Made by the author

3. Case study

Then the CBD area will be used as case study to evaluate the sustainable land transportation system in aspect of demand control and public transportation in Singapore. The CBD area is located in the southeast of Singapore near Marina Bay . In Concept Plan in 1971, the CBD area has been set up. And the ring corridors linking residential estates to the CBD. The land transport system have connected CBD area with other sub-centers which prevent the deterioration transport environment in the core area.

As center area, it is important to decrease motorcar using to mitigate traffic congestion. There are 2 measures have been taken by LTA which are Area license Scheme and Electronic Road Pricing. LTA (1996) indicated that the ALS has been introduced to Singapore in 1975. And this system has controlled the congestion in the CBD effectively. In 1994, the introduction of the whole-day ALS reduces traffic volume in the CBD by 9.3% as figure shows. Along certain stretches of the Central Expressway, the congestion is severe that the volume of traffic flow during peak period is lower than before and after the peak period. What is more the ERP started from 8 AM to 8 PM in CBD area, and the rate is S$ 2.5-3 in peak time and S$1-1.5 in other time in weekday.

Integrated with the Raffles Place MRT station, most land were planned to be used as commercial function with high density and plot ratio. And the radiant scope of public bus and MRT stations covered the whole CBD area. LTA (2008) indicates that people can access to bus or MRT station within 10 minutes' walking in CBD area.

As in-site photo shows, the timetable and route information can be accessed easily in bus stations. What is more, the design of metro and bus station has took the disabled group into consideration. Continuous sidewalk for the blind and wheelchair access in the stations could strengthen the social equity. What is more, covered walkway provide commuters a high-quality walking environment and some of walkways have direct connection with public transportation stations which encourage people to take public transportation.

4. Evaluation and suggestions

As a survey in White Paper 1998 shows 45% respondents think taking public buses were long waiting times, 43% unknown waiting times and 31% long journeys. For MRT, around 56% respondents think overcrowding during peak hours and 32% think stations not easily accessible. Therefore it is very important to decrease the public transport density by adding

new MRT lines and bus lines and encourage non-motor mode to share the stress of bus and MRT. Inter-modal facilities like park and ride and bicycle parking also can be added to station area.

Another challenging is increasing motor car using. Although the government has initiated ERP and ALS to restrict car using, the ownership of private car shows an increasing trend. LTA should initiate both active and proactive strategies in the future to decrease car using. Education and providing high quality public transport can decreasing car using in a long time. In another aspect, applying ERP and ASL in specific area to restrict private car using is effective in a short and middle term.

5. Conclusion

Singapore has reputation for its innovative land transport system in the world. As a city state with limited land, the government tried to solve the contradictory between increasing travel demand with scarce land by using infrastructure investment. In general, they use the methods to restricting private car using and developing public transport. As an integrated entity, LTA in charge of the vision making, planning and management of land transport. Many policies have been implemented and successful since 1995 which also provide experiences for other countries' development. In the future, LTA can focusing on non-motor mode more and strengthen integration with land use, in the meanwhile decrease commuters' reliance on private car by active and proactive approaches.

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