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主　論　文　の　要　旨

論文題目　A Study on Factor Decomposition for CO_2 Emission Generation and its Causal Mechanisms in Urban Transport —A Comparison between Shanghai and Tokyo—
都市交通における CO_2 排出の原因要素分解と因果メカニズムに関する研究　—上海と東京の比較—

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論　文　内　容　の　要　旨

As the biggest developing country, China has experienced quick economic development since the policy of "Open and Revolution", the GDP increase rate in China kept for higher than 8% averagely, and China is now the second biggest economic body in the world. The quickly developing economy stimulates the travel demand of people, especially in mega cities, the traffic demand of people increased in a very high speed. Moreover, more and more family has the ability to own a car, the quick increased in car ownership and car use has caused lots of problems in cites, the government has burden high pressure on traffic congestion, high investment of infrastructure, the environmental degradation and global warming that caused by CO_2 emission increase. Hence, to provide a sustainable transport system that emitter less CO_2 and reduce the financial cost and environmental load of the passenger transport system became a very important issue.

The objective of this research is: (1) take Shanghai and Tokyo as case cities, find out the crucial factors that affect passenger transport system; (2) find the relationship between these factors and conclude the good experience both in Tokyo and Shanghai; (3) based on the experience and the investigation in Shanghai and Tokyo, design a series of policies that based on a policy framework called CUTE matrix, and examine the performance of different scenarios, give proper policy suggestion for the future development of passenger transport system for mega cities.
The paper is organized as follows:

Chapter 1 introduces the background of this research. It shows that there is big presser on developing cites, to have a whole insight of the transport system to solve current problem is very important. In different cities, there are different causes for the

increase of the environmental burden. Therefore, to investigate different causes in different cities would be very important and the developing cities can provide good experience to the developing cities, to find out the correct direction of development.

Chapter 2 reviewed the methodology of decomposition and the practice of decomposition in transport sector all over the world, after that, the individual policy practice and integrated framework and case studies aiming at low carbon transport are reviewed. Firstly, the decomposition is reviewed and finds that the LMDI (Log Mean Divisia Index method) is the best decomposition method for this study, and this method was seldom used for comparing different urban passenger transport sector CO_2 emission, hence this research can fill the gap. Then, the individual integrated transport policy aiming at low carbon transport are reviewed, the case study of low carbon transport policy is also reviewed. And the author finds that there are less researches focus on the integrated low carbon transport policy framework in Asian developing cities, this research will also fill this gap.

Chapter 3 examined the historical tendency and policy changes of population, economic growth, land use change and transport system development of Shanghai and Tokyo. The author finds that: Shanghai is now in the stage of high speed of suburbanization, the population in Shanghai will constantly increase and traffic demand and transport infrastructure will also increase very quickly in the next 10 years. Shanghai now has big potential to change its land use system and transport system to a more sustainable way.

Chapter 4 carries a decomposition analysis in Shanghai's passenger transport system, population, trip generation rate, mode shift, travel distance, load effect show strong effect on the CO_2 emission increase. From 1986 to 1995, mode shift effect shows the strongest positive effect, contribute to 73% of the total change. From 1995 to 2004, mode shift also shows the strongest positive effect, it contribute 56% of the total change, trip generation rate and population contribute 15% and 19% to the total change respectively. From 2004 to 2009, mode shift also shows the strongest positive effect, it contribute 52% of the total change, trip generation rate and population contribute 14% and 18% to the total change respectively. While the fuel efficiency constantly contribute negative to the CO_2 emission, the contribution in the period of 1986 to 1995, 1995 to 2004, 2004 to 2009 are respectively -0.1%, -3% and -6%. The same decomposition analysis has also been made in Tokyo transport system. From 1968 to 1978, population, trip rate and mode shift contribute positive to the CO_2 emission increase, travel distance contribute negative to the CO_2 emission. From 1978 to 1988, the population, mode shift, travel distance contribute positive effect, while the trip generation rate, load effect and the fuel efficiency contribute negatively.

From 1988 to 1998, population, mode shift, travel distance and fuel efficiency contribute positively, only the load effect shows negatively effect. From 1998 to 2008, only population and trip rate effect shows positive effect, mode shift, travel distance and fuel efficiency shows the strong negative effects. Totally, population constantly shows positive effect, mode shift and fuel efficiency is very sensitive factor to the CO_2 emission change. The causality map was also made based on the decomposition analysis.

Chapter 5 examines a series policy package to achieve low carbon transport system. CUTE MATRIX is used to design the policy package. From the performance of the different scenarios, we find that: TOD development contribute a lot to the control of travel distance and mode shift to railway. Strict car parking policy on car and high usage fee of car, together with the high service level of rail make the car use manner in a very eco-friendly way, namely shorter travel distance and less use ratio. And the recent policy on redevelop the railway station make the population increased 1.88 million around railway stations in Tokyo, which also contribute to the mode shift to railway. The fuel efficiency change contributes a lot to improvement, the main reason is the improvement of the engine technology and tax policy changed to preference of the low emission cars.

Finally, chapter 6 concludes the main findings and the contribution of this research, and looks forward to the future possible works.