

Collaborative Freight Network Design in Future Megacity



The numbers, land-scale and the urban population, of future Megacities (Over 10 million inhabitants) will increase rapidly by the year 2030. The advancement of science, industry, and digital technologies has shaped the lives of many people and has encouraged more people to live in cities. Urban freight transport (UFT) is the main set of activities for urban mobility, which satisfy all the material demand within the urban area and provide services to the corresponding residents and enterprises. Future Megacities can result in rapid growth of the urban population and economic scale change. There are many prospective challenges to be faced by the UFT system, particularly in the aspects of the environment and supply demands.

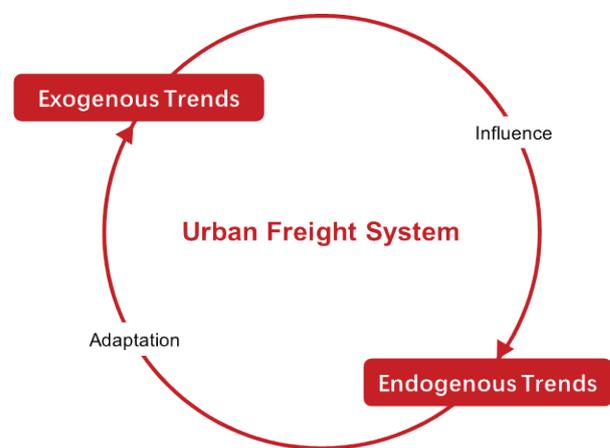
In addition, urban population growth and consumer behavior changes have led to the transformation from the logistics demands characteristics into diversification, complexity, and individualization. These completely aggravate the unsustainability of city logistics and the costs pressure.

The future trends of Megacities are driven by urbanization, aging community, energy choice, and urban agglomeration, etc. However, thus far, not much attention has been paid to the link between the urban development and city logistics. It is widely recognized that the main negative impact of the UFT are emission, congestion and noise. Therefore, the companies and local authorities have paid more attention to innovative strategies of urban freight planning and promoting the emerging technologies. They intend to balance the environmental impact and the economic scale in the city while achieving a sustainable development and livable state of the city in the future. Meanwhile, the collaboration and consolidation in the city logistics is part of the future trends.

Therefore, the urban freight system has been affected by two aspects: exogenous and endogenous trends (see the following figure). The former have been created by urban development, and the latter have been generated by technological innovations. The exogenous relevant factors, have

influenced on urban freight demands and structure, while endogenous trends have changed business mode and operational strategy. For this, the private companies and local authorities need to find appropriate internal ways to adapt the exogenous trends created by the urban development.

The main objective is to suit the change of urban development in the future, to achieve the sustainable and livable city. Hence, comprehensive consideration of exogenous and endogenous trends is beneficial to design and plan the future urban freight network. Additionally, the potential risks of integrating the various emerging technologies also need to be considered in the freight network design.



Exogenous and Endogenous Trends

Research Question

There are many prospective challenges and new technologies with applications for the future urban freight system. Hence, an innovative urban freight network design has reserved much attention in recent years, particularly in Megacity.

Academics and practitioners agree on the advantages of the urban freight collaboration. Due to this scheme enable



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to reduce the negative impacts of freight activities within urban areas, and to enhance the enterprise's competition in the market as well as on the urban economic scale. The collaborative freight network in Megacities will be of great benefit to the future urban development. Therefore, the main research question is how to design an innovative collaborative freight network in future Megacities.

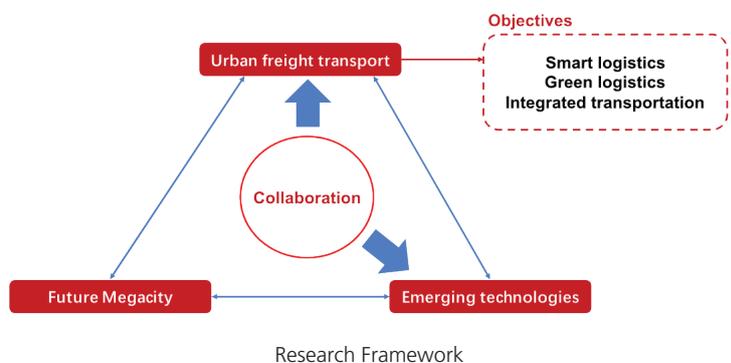
Additionally, the network structure of the UFT needs to consider the inter-urban freight collaboration due to the urban agglomeration generation. Thus, the Multi-tier city logistics network is an efficient solution to optimize the current freight network. However, the structure of a Multi-tier network still raises numerous issues involving high costs pressure, complex operational strategy, and potential risks etc. In addition, facilities' location choice and fleet route planning have also challenged the optimization proceed and network design. Consequently, determining types of the network structure and the potential risks analysis are necessary for the network design.

This research aims to design an urban freight network for future Megacities. The exogenous and endogenous trends will be comprehensively considered. Additionally, "collaboration" not only relates to the cooperation among the stakeholders or partners, but also to the collaborative transport among the various emerging technologies. Hence, to design an *urban collaborative freight network* while considering the future challenges in Megacities and the applications of the emerging technologies, there are several questions, which need to be taken into consideration:

- What are the exogenous and endogenous trends for urban freight systems?
- What are the future trends and prospective challenges on Megacities?
- What are the risks related to these trends?
- In which aspects will these factors influence the urban freight network?
- Which type of emerging technologies or strategy planning could resolve these problems?

- How to design the collaborative freight network to provide services to the future Megacities?
- How to choose the facilities' location and design the network structure?
- How to achieve the smart, green and integrated transportation in this design?

Consequently, three perspectives will be studied: the changes of future Megacities, the impact of the changes on the collaborative freight network, and the application and the collaboration among emerging technologies:



Possible Contribution to Praxis or Application

This research intends to reduce the negative impacts of freight activities within urban areas, to enhance the market competition of companies and economic scale of cities. Moreover, it will be able to optimize the operational structure and to reduce the potential future risks, while promoting smart, green and integrated transportation within the city logistics. Significantly, it will propose a new strategic planning and operational scheme for the urban freight system from a perspective of the future development.

The developed urban collaborative freight network can provide a systematical perspective to decision makers and enterprises on the UFT reconfiguration.