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## Green Innovation for Urban Traffic

**Abstract** With the development of economy, the issue of urban traffic is becoming highlighted, the pollution of the urban traffic has become one of the main factors to influence environment. It faces the broader problem of achieving sustainable development of urban transportation at present. The current situation of urban traffic is analyzed through studying the existing articles at home and abroad in this paper; the problems such as green innovation of urban traffic are elaborated. In addition, this paper puts forward the relevant measures to promote the development of green innovation of the urban traffic.

**Keywords:** urban traffic, green innovation, green transportation, sustainable development

### 1 Introduction

With the rapid development of economic and industrial globalization, urbanization is increasing. The city is a symbol of human civilization development. Young people living in rural areas, aspire to live in such modern metropolis. There are eighty eight mega-cities (having population over five million), according to the 2014 Sixth China Census. Consequently such immense cities typically have severe congestion of urban traffic, and environmental pollution problems have become increasingly prominent.

Urban transport plays an important part in the survival and development of the city. The degree of transportation infrastructure directly effects the development of urban economic, and the improvement of the level of urban residents. At the same time, as people's environmental awareness becomes stronger, there's a focus on developing sustainable urban transport. In recent years, many domestic and foreign scholars have studied the relationship between urban transport and the environment (Wang & Shen, 2004;

Wang, 2006; Liu, 2008; Lei, Zhang, & Li, 2012; Liu, 2013). "Green Transportation" realization is becoming a major topic for scholars. A green innovative solution, with important theoretical and practical significance, applied to the direction of urban transportation infrastructure. This should help solve the traffic congestion problem, whilst also addressing the environmental concerns.

### 2 The development status of urban transport

An efficient and green urban transportation infrastructure helps promote the development and evolution of the city. This is a basic function which the city needs, to solve the increasingly serious environmental problems caused by growing vehicle congestion, which threatens the survival of humanity.

#### 2.1 Exacerbating urban traffic pollution

Urban transports often affect vegetation, the living environment of animals, and living activities during the construction of inner-city transportation. It pollutes the air and water in metropolitan traffic construction. These questions violate the requirements of sustainable development between the development of inner-city transport and the environment (Cao & Ding, 2012). First, the air pollution, this is mostly caused by motor vehicles which are the main mode of transportation. With the rapid development of the economy, there is a surge in the annual increment of new motor vehicle registrations. According to government data, car ownership had reached 154 million by the end of 2014, and this caused an enormous pressure on urban traffic congestion. At the same time, the total motor vehicle exhaust emissions became a major source of environmental pollution, 90% to 95% lead and carbon compounds, 60% to 70% of the nitrogen and hydrogen compounds are derived from the city traffic. There is a close relationship between the phenomenon of the smog and metropolitan transport; this brings to enormous bane to mankind (Chen, 2003). Second, the noise pollution, which

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is generated by motor vehicles, is not to be underestimated. Such noise pollution is mainly from the exhaust system and the noise from the vehicle's horn. Noise from the vibration of the vehicle's transmission system, noise from the tires, is lower however. Sound levels reaching more than 90db, at peak periods of China's urban traffic, is a serious noise pollution problem. It also causes restlessness and lethargy (Lu, 2009). Third, it is the problem of water pollution. Urban construction tends to change natural surface water drainage, together with affecting the quality of ground water. Particles from metropolitan city construction will contaminate the water, and lead to soil acidification and other forms of pollution.

## 2.2 Making urban traffic congestion

Whilst urban roads are updated, and improved, it does not improve the traffic congestion, since the number of vehicles is also increasing. The growth rate of the motor vehicles is over 40%, the number of private cars is over 105 million, and 25 privately owned vehicles for every one hundred homes. Traffic congestion is getting worse according to statistics. In rush hour traffic the average speed may be under 10 km/h on the main roads. The increasing number of vehicles lead to a colossal waste of resources, also aggravated auto emissions, made people's lives inconvenience, there are 34% of the cars on the road during peak hours, the emissions of PM2.5 are 1ton/hour within the 6th Ring Road area of Beijing.

## 2.3 Unreasonable development structure of urban transport

The development structure of Chinese urban transport has room for improvement, such as network, transportation, and mixed traffic. In addition, management administration, often becomes chaotic between "urban planning" and "transportation planning" departments (Liu & Chen, 2011). These issues handicap creation of a comprehensive integrated transportation infrastructure. Without such integrated solutions, serious traffic jams cause pressure on roads at certain peak periods.

## 2.4 Urban transport resources are severely depleted

Expansion of urban transport needs to occupy a lot of land resources. Urban transport often requires accounting for at least 1/5 of the city area, however, the unit output efficiency of urban traffic land in China is much lower than it in developed countries, so urban transports often waste large amounts of land (Liu, 2014). In addition, the construction of urban transport needs a lot of time, money and other resources. On the other hand, the level of fuel consumption in China is much higher than in the developed countries, the problems of urban traffic trigger vast resource depletion.

## 3 The sustainable development of the urban transportation and green innovation

Sustainable development of urban transport is the solution that meets the needs of the present without compromising the ability of future generations to meet their own needs. At the same time, the development of the urban transport will become more harmonious, stable and balanced through planning, monitoring, evaluation, regulation and other means. In general, key problems to the sustainable development of urban transport systems, are likely to be settled by minimizing the consumption and pollution of energy and other natural resources. Ensuring efficient urban transport, that is fast, safe and comfortable, promises to meet the needs of the contemporary development of urban transport and the future development of urban transport.

Traditionally, urban traffic only meets the transportation demands of the people. It often ignores the negative impact of urban transport on energy, resources and the environment. Traditional urban traffic does not fit the conditions for sustainable development at the beginning of urban transport planning. The development of urban transport encompasses three sustainable areas: i) economical, ii) social, and iii) environmental. Genuine sustainability can only be achieved if the urban transport develops in co-ordination with economy, society, and environment.

## 4 Green innovation strategies for the sustainable development of urban transportation

The green innovation of urban transport mainly refers to creative integration of the urban traffic and environment in harmonious development. The modes of environmentally friendly solution include the integration of the products, technology, management, and services.

### 4.1 Green innovation of the transport system in urban transport

To establish green urban transport systems, it is necessary to adhere to the concept of public transportation leading urban development. Also making the managers of the city, plan the transportation rationally according to the characteristics of their own city. Large and mega-cities in the urban transportation construction should increase the construction and improve the coverage of urban rail transit, for the benefit of suburban area residents. Meanwhile, constructing the urban rapid transit (BRT) system, can solve the urban traffic congestion and form a three-dimensional system of communications. The development of urban traffic should give priority to roadways, improve public transportation, take the construction of rail transit as

the auxiliary means, and promote the non-polluting vehicle in the policy.

#### 4.2 Green innovation of the product in urban transport

“Green” gas car plays a key change for the sustainable development of urban transport. The appearance of these vehicles greatly reduces the pollution which is from urban transport. At present, the emergence of electric vehicle adds new impetus for the environmental development of city traffic. At the same time, improving the car’s engine technology achieves automotive innovation in exhaust emissions, noise and other aspects through modern technology. It’s important to improve the quality of fuel and achieve cleaner fuel processing (Bai, Wei, & Qiu, 2006).

European countries had made good progress in this regard. And, the United States in the late 1980s had begun to develop cleaner fuels and low emission vehicle program (CF / LEX), and manufactured zero-emission vehicles (ZEV).

#### 4.3 Green innovation of the technology in urban transport

Intelligent Transportation Systems (ITSs) which combines the technology of advanced IT, data transmission, electronic control, sensor technology and computer processing. Technology has also been efficiently applied to entire transportation systems. These establish a large-scale, full-functioning management system which is real time, accurate and efficient. Its purpose is to make people, vehicles, and roads, work in close cooperation and harmony, promoting greatly improved transport efficiency. It also helps ensure traffic safety, ease traffic problems and improve environmental quality and energy efficiency. ITSs industry can improve the security and flexibility in road traffic, reduce congestion, and improve the capacity of the existing road network, especially reduce the impact of road transport on the environment. The internet technology, advances the development of intelligent transportation, and helps to break through the bottleneck of the development (Liu & Wu, 2012).

At present, ITSs had been used in many of the Chinese cities such as Beijing, Shanghai, Tianjin. The application of these systems had played a role in saving energy and reducing pollution, it contributes to the sustainable development of urban transport.

#### 4.4 Green innovation of the service in urban transport

Green innovation of the service in urban transport mainly refers to the establishment of bus priority service system, and the effective implementation of a strategy for such. The managers of urban traffic should strengthen policies to support public transport enterprises. At the same time, the quality and efficiency of public transport should also be

strengthened. Based on the big data of traffic, urban traffic will be rationally controlled in optimizing the flow of traffic. Simultaneously, the short-distance trains can be set up to meet the needs of urban residents. On the premise of meeting the needs of urban development, parking, transfer centers and other urban transport infrastructure should be increased. Developing the public bicycle system revitalizes bicycle traffic in order to achieve green transportation construction in many ways.

#### 4.5 Green innovation of the policy in urban transport

Government departments should increase environmental protection input in the development of urban transport. Government departments should reasonably impose fuel tax, establish the national standards for discharge of car pollutants, formulate and complete laws and regulations. Strengthen the construction of the traffic law enforcement contingent, and improve the equipment and techniques. Government departments can make regulations on conservation and emission reduction of urban traffic. Additionally make different standards of vehicle emission in order to realize to run the country according to law. Furthermore, Government departments should raise public awareness on energy saving and environmental preservation by launching encouraging citizens to walk, bike or use public transport.

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## 5 Conclusions

We cannot deny the benefits of urban traffic, but environmental problems which are caused by urban traffic cannot be ignored. With the development of technology and science, we need a deep “revolution” in the technology, ideas, policies and new transportation system. We need to change the traditional mode of thinking development from the concept, change the concept of urban transport which is only service-oriented to the concept of urban transport which is ecology and environmental, carry out green innovation of urban transport to achieve sustainable development of urban transport.

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## 6 Recommendations for future research

Article provides an overview on green innovation of urban transport from theories, points out the problems of urban transport, summarizes the main measures on green innovation, but it lacks the necessary empirical research. Because different urban transports in our country have different characteristics, we should take different ways to research. The influence factors of green innovation in urban traffic is also not the same, so conducting an empirical study of urban transport drivers of green innovation is the focus we should pay close attention to.

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## References

- Bai, Y., Wei, Q., & Qiu, Q. (2006). Discussion of urban transportation development based on green transportation. *Journal of Beijing Jiaotong University (Social Science Edition)*, 5, 10–14
- Cao, Y., & Ding, D. (2012). Study on the energy-saving emission reduction development of city traffic and countermeasures. *Economic Research Guide*, 2, 89–91
- Chen, X. (2003). The sustainable development concept, value and planning method of urban transportation. *Urban Mass Transit*, 1, 78–81
- Lei, X., Zhang, J., & Li, J. (2012). A system dynamics model for urban low-carbon transport and simulation in the city of Shanghai, China. *AISS: Advances in Information Sciences and Service Sciences*, 4, 239–246
- Liu, H. (2014). *The Effect of Urban Transport Infrastructure on Urban Agglomeration Economy*. (Master thesis). Beijing: Beijing Jiaotong University
- Liu, L. (2013). Urban transportation intelligent options of low-carbon development. *Forum on Science and Technology in China*, 1, 105–108
- Liu, Q., & Chen, W. (2011). *Research on construction of urban low carbon transport system*. In Materials for Renewable Energy & Environment (ICMREE), 2011 International Conference. IEEE, 2, 1263–1266
- Liu, X. (2008). Synthetical evaluation research on sustainable developing coordination capability of urban traffic system. *Journal of Chongqing Jiao tong University. Natural Science*, 27, 105–108
- Liu, X., & Wu, M. (2012). Vehicular CPS: an application of IoT in vehicular networks. *Journal of Computer Applications*, 32, 900–904
- Lu, H. (2009). Approaches towards realization of urban green transportation. *Urban Transport of China*, 7, 23–27
- Wang, G., & Shen, J. (2004). Study on the green traffic planning in cities. *Planners*, 7, 63–65
- Wang, X. (2006). *The Influence between the Urban Traffic and the Environment*. (Doctoral dissertation). Lanzhou: Lanzhou University