Discussion on Implementation Countermeasures of Green Freight on Hunan Rural Highway Based on Internet of Things*

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Abstract—**The rapid development of Internet of things technology has laid a foundation for the implementation of green freight on rural highways in Hunan. This paper analyzes the existing problems of rural highway freight in Hunan, and presents some countermeasures in terms of policies, standards, implementation subjects and investment and financing system.**

Keywords—*the Internet of things; green freight; countermeasures*

I. INTRODUCTION

The development of rural economy in Hunan Province is a significant constituent part in the development of whole social economy of Hunan Province. During its economic development, Hunan Province promotes a development mode including new industrialization, new urbanization and rural integration, and builds a new Hunan country with the theme of "green, ecology and environmental protection". As an inseparable part of rural social and economic development in Hunan, logistics activities may also pollute the environment. For instance, one of main causes of the current urban environmental pollution is fuel pollution from transportation vehicles, so green freight is an inevitable choice for the development of rural freight industry in Hunan Province. Meanwhile, the Internet of things industry has developed rapidly in recent years, which has laid a solid technical foundation for the construction of smart cities and the implementation of smart logistics. Therefore, how to exploit the advantages of Internet of things technology to the full in rural Hunan and how to build a green freight system in rural Hunan will become a topic worth discussing in the construction of rural Hunan.

II. MAIN PROBLEMS IN THE DEVELOPMENT OF RURAL HIGHWAY FREIGHT INDUSTRY IN HUNAN

In 2018, the total amount of social logistics in the

province was 10.85762 trillion yuan, with a year-on-year increase of 8% based on comparable price. In terms of composition, agricultural products logistics totaled 648.89 billion yuan, with an increase of 3.5%; industrial goods logistics totaled 5.52661 trillion yuan, with an increase of 7.3%; import goods logistics totaled 105.28 billion yuan, with an increase of 17.6%; the logistics of goods from other provinces totaled 3.5112 trillion yuan, with an increase of 8.6%; renewable resources logistics totaled 16.57 billion yuan, with an increase of 3.6%; the logistics of unit and resident goods totaled 1.04907 trillion yuan, with an increase of 23.4%.

After decades of development, the rural logistics industry in Hunan Province has begun to take shape. Generally speaking, the logistics industry is still in the initial stage of transformation from traditional logistics to modern logistics, but there is still a big gap between rural logistics and urban logistics in terms of its development trend and demand of economic development.

A. Backward Means of Transport

Rural freight in Hunan Province is mainly carried out by highway. The survey finds that there are generally excessive exhaust emission from vehicles, excessive use of vehicles, and poor vehicle conditions in highway freight enterprises. The phenomenon of "waste of resources and environmental pollution" is prominent in freight transport. However, new environment-friendly and energy-saving urban freight and distribution vehicles are rarely used.

B. Less Application of Internet of Things and Other New Technologies

In recent years, the high and new technology represented by the Internet of things technology is booming. The application of new technology in the field of freight can optimize the distribution route, improve the transportation efficiency, track the status of freight vehicles in real time, and reduce the transportation energy consumption in the process of freight. At present, only a small number of rural freight enterprises in Hunan have changed their ideas earlier, and adopted new software or technologies including GPS, GIS, RFID, etc. The wide application of these new

technologies in the field of freight transportation needs to be promoted by national policies.

C. *Obviously Unreasonable Transportation Among Rural Areas in Hunan*

There are unbalanced regional development and industrial structure in Changsha, Zhuzhou and Xiangtan cities to some extent, which leads to unreasonable transportation among rural areas of Hunan. Through the investigation, it is found that most freight transport enterprises have unreasonable transport modes including detour, etc. Besides, the less specialized organization of rural freight in Hunan results in the coexistence of empty driving and overload.

D. *Irregular Freight Market and "Scattered, Small and Disordered" Freight Operators*

Now, the freight market is almost completely opened up with low entry barriers, resulting in non-standard management of the entire freight market and numerous freight operators. The phenomenon of "scattered operation, small and chaotic operation" is common. Up to now, there are no large freight enterprises that have sufficient market share in the freight industry. As a result, the development of freight market lacks motive force, and low level and unfair competition is widespread. The vast majority of enterprises focus on "profit", and hardly have the concept of "green freight".

III. MAIN INFLUENCES OF INTERNET OF THINGS TECHNOLOGY ON THE DEVELOPMENT OF RURAL HIGHWAY FREIGHT IN HUNAN PROVINCE

The Internet of things is defined as the "Internet in which everything is connected". It is an extension and expansion of Internet-based networks. It combines all kinds of information sensing devices with the Internet to form a huge network, realizing the interconnection of people, machines and things at any time and at any place

Internet of things is an important part of the new generation of information technology. It is also called universal interconnection in IT industry, which means that all things in this circle are connected. Therefore, the Internet of things is the "Internet in which everything is connected". It has two meanings: first, the core and foundation of the Internet of things is still the Internet, which is an extension and expansion of the Internet. Second, its user sides extend to any goods to exchange information and communicate with each other. Therefore, the Internet of things, by definition, is a kind of network that connects any object with the Internet for information exchange and communication through information sensing devices including radio frequency identification, infrared sensor, global positioning system and laser scanner based on the agreed protocol, so as to realize the intelligent identification, positioning, tracking, monitoring and management of the object.

A large number of sensors and other devices are provided for infrastructure, means of transportation and related equipment of freight transportation, so as to facilitate the collection of a large number of freight information and realize the transmission of information by means of efficient communication technology. In addition, the Internet of things not only collects information, but more importantly, it makes comprehensive analysis and processing based on the collected information. According to big data analysis, it can intelligently control all links of freight transportation and related facilities and equipment to maximize the utilization efficiency of resources and logistics service efficiency in the field of freight transportation.

A. *Intelligent Management of Freight Infrastructure*

Freight infrastructure is the cornerstone of the development of freight industry. A sound and well-functioning freight infrastructure is the guarantee of safe and efficient operations in the freight industry. Freight infrastructure can sense the status of freight infrastructure in real time by means of sensor technology of the Internet of things so that freight infrastructure can be maintained in an emergency.

B. *Monitoring of the Running State of Freight Vehicles*

On the premise that management of freight infrastructure has been perfected, the Internet of things technology can be used to further monitor the running state of freight vehicles in real time, including their serviceable condition, running speed, cargo quantity, route information, etc. The automatic detection of running state of freight vehicles can be completed by using infrared technology, piezoelectric leaflet, ground induction coil and other sensor technology and communication technology in the Internet of things.

C. *Comprehensive Coordination of All Elements of Freight System*

GPS, GIS, RFID, IC card, video monitoring and wireless communication technology can be adopted to analyze the running state of freight infrastructure and freight vehicles in a comprehensive way, and dynamically sense the loading status of each freight infrastructure and running location and speed of freight vehicles. Furthermore, it is necessary to combine the corresponding route planning and scheduling software to complete intelligent scheduling and improve freight efficiency and security.

IV. IMPLEMENTATION COUNTERMEASURES OF GREEN FREIGHT ON HUNAN RURAL HIGHWAY BASED ON INTERNET OF THINGS

A. *Formulation of Relevant Laws and Regulations and Encouragement Policies for the Coordinated Development of Various Regions in Hunan Province*

Rural Hunan is further accelerating the pace of coordinated development of various regions, which not only means a city mergence in hardware, but also the coordination and unity from the perspective of software. However, it is impossible to push green freight in rural Hunan only with the help of a single freight transport enterprise. It mainly depends on the logistics directors and related government

departments in Hunan. Government departments related to logistics should formulate relevant policies to advance the development of green freight industry, and develop relevant laws and regulations to restrict enterprises' "non-green freight behaviors".

1) Promoting the development policies of green freight based on the Internet of things: Rural logistics departments in Hunan can make "green subsidy" policies based on the Internet of things technology, and give financial subsidies to enterprises that have a goal of achieving "green freight" and purchase and provide advanced equipment, new systems, new technologies and new energy of the Internet of things for freight vehicles and freight infrastructure, so as to promote the application of Internet of things technology in the "green freight".

2) Laws and regulations restricting enterprises' "non-green freight": Rural Hunan should make full use of its unique policy advantages as a "resource-economical and environment-friendly society" pilot zone, formulate relevant green freight standards, regulate the freight market in terms of air pollution and noise pollution, standardize and constrain freight enterprises' behaviors, and realize resource conservation and environmental friendliness.

B. Formulating Standards and Specifications to Support the Construction of Green Freight Internet of Things

In order to realize the interconnection between upstream and downstream enterprises of the freight supply chain and related freight facilities and equipment, the government should organize experts in relevant fields, study carefully, compile and issue technical standards and operating guidelines for the green freight Internet of things, and establish a standard system for the green freight Internet of things, so as to realize the linkage development of the Internet of things industry and the freight industry.

C. Carrying Out Demonstration and Guidance for Enterprises and Cultivating the Green Freight Service Principal

Most of freight enterprises do not know enough about the environmental pollution from freight transport, lack sense of responsibility for environmental protection, and have not formed the management concept of green logistics. Therefore, in the early stage, the government can establish the "green freight" development fund, and support a group of demonstration projects and demonstration enterprises that advance the green logistics through the application of Internet technology. At the same time, it also can set up a benchmark for green freight, accumulate relevant successful experience, and lay the foundation for the large-scale promotion of the application of Internet of things in the freight industry.

D. Establishing the Investment and Financing System for "Green Freight"

The construction of the "green freight" system based on the Internet of things is costly. However, the previous funds for the construction of traffic information mainly come from highway and port charging, which cannot meet the current construction demands. Therefore, it is necessary to set up special funds for green freight Internet of things technology, and industrialization and demonstration projects, establish an Internet of things investment and financing system for "green freight", and support the research and development of key technologies for "green freight" of the Internet of things, as well as the construction of public service platforms, key projects and infrastructure for freight.

V. CONCLUSION

In spite of some application of the Internet of things in the freight industry, a range of issues such as technology, culture and policies also need to be addressed. However, it is foreseeable that in the near future, Internet of things technology will certainly revolutionize the "green freight" industry in rural Hunan.

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