

How to Constrain Urban Transportation Carbon Emissions Through Laws and Regulations

- Taking China as an Example

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Abstract: As urbanization continues to accelerate, carbon emissions from urban transportation have gradually emerged as one of the primary contributors to global greenhouse gas emissions. This paper aims to use China as a case study to explore effective methods of constraining urban transportation carbon emissions through laws and regulations. Begin by reviewing the current status and issues of carbon emissions from urban transportation. Subsequently, this paper summarizes the legal and regulatory evolution concerning low-carbon transportation in China, analyzing the impact of existing policies and regulations on carbon emission control and assessing their effectiveness and limitations. Furthermore, this paper will compare how other countries have addressed urban transportation carbon emissions through legal and regulatory frameworks, evaluating their influences and outcomes. This paper will provide recommendations for enhancing legal and regulatory frameworks, thereby contributing to realizing global carbon reduction objectives.

Keywords: low-carbon transportation, urban transportation, laws and regulations

1. Introduction

With the rapid progress of global industrialization and urbanization, the rapid development of the transport sector has contributed significantly to the prosperity and development of cities. However, along with it comes increasingly severe environmental problems, especially climate change caused by carbon emissions, which has become the focus of common global concern. In recent years, the occurrence of natural disasters, both in terms of frequency and type, has brought unprecedented troubles not only to human beings but also to every living organism on this planet, such as floods, tsunamis, hurricanes, typhoons, global warming, extinction of species and so on, and all these natural disasters are more or less related to the excessive carbon emissions from human production activities. Cities, as an essential place for human activities, and their transportation activities directly lead to many carbon emissions, seriously impacting the environment and human society. Therefore, how to regulate carbon emissions from urban transportation through laws and regulations has become an urgent and essential world-class issue.

As the second largest economy in the world, China's carbon emissions from urban transportation cannot be ignored. However, as China's economy grows and urbanization progresses, the demand for transportation continues to increase, and the problem of carbon emissions is becoming increasingly severe. Therefore, finding a feasible way to balance urban transportation development and carbon emission control has essential theoretical and practical value.

Laws and regulations are irreplaceable in restraining carbon emissions from urban transportation. First, rules and regulations can set mandatory emission limits and standards and penalize non-compliant transport vehicles and enterprises, encouraging them to reduce carbon emissions. Second, laws and regulations can support the development and promotion of clean energy and low-carbon technologies to reduce carbon emissions from transportation. In addition, rules and regulations can encourage the public to choose more environmentally friendly modes of transportation through incentives, such as tax reductions and rewards, to reduce carbon emissions.

However, it is a challenging task to formulate and implement laws and regulations. Firstly, adequate policy research and data support are needed to ensure that the rules formulated are scientific and reasonable and can truly achieve the effect of reducing carbon emissions. Secondly, enforcing laws and regulations requires strong law enforcement forces and regulatory bodies to implement the provisions. At the same time, the government also needs to cooperate with enterprises, citizens, and other sectors to work together and share the responsibility of reducing emissions.

2. Current Status of Carbon Emissions from Urban Transportation and Their Harms

Up to now, carbon emissions from urban transportation have been one of the significant sources of global greenhouse gas emissions. Taking the Asia-Pacific region as an example, the figure below shows a pie chart of carbon dioxide emissions from fuel combustion in the Asia-Pacific region by sector in 2017 [1].

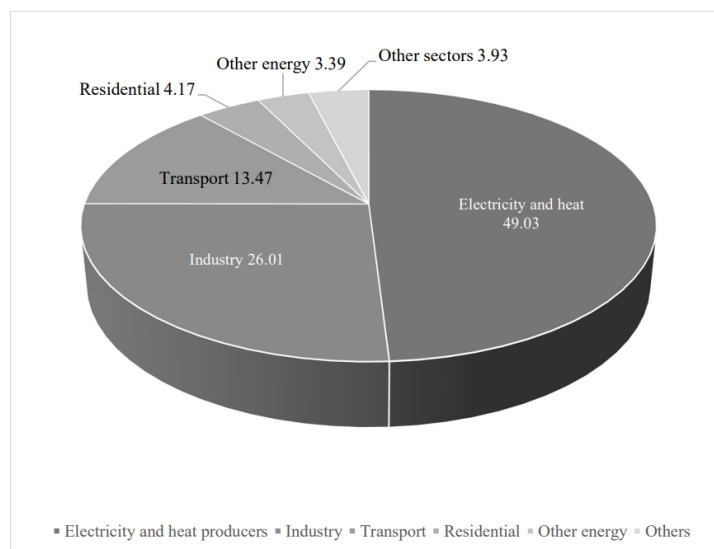


Figure 1: Carbon dioxide emissions from fuel combustion by sector in Asia-pacific, 2017.

As demonstrated by Figure 1, the transportation sector in Asia has consistently grown over the years in accordance with the global trend, increasing from 625 million tons in 1990 to 210.5 billion tons in 2017. Road vehicles are primarily responsible for these emissions. The transportation sector contributed 13.47% of CO₂ emissions from fuel combustion in the Asia-Pacific region in 2017.

Currently, in major cities around the world, private car ownership is still rising sharply, especially in developing countries, which is a significant contributing factor to the increase in traffic congestion

and carbon emissions due to underdeveloped public transportation systems in some cities or the rising pursuit of commuting quality, which people still prefer to use private cars.

Therefore, urban transportation with substantial carbon emissions has caused many problems for human life. Carbon emissions from urban transport continue to increase, exacerbating the issue of global climate change; transportation emissions include not only carbon dioxide but also pollutants such as carbon monoxide, nitrogen oxides, and particulate matter, which negatively affect air quality and public health, and motor vehicle road congestion is still an urgent challenge in most major international cities, where traffic congestion leads to long periods of vehicle idling, i.e., the engine is running, but the vehicle is not moving. The engine's efficiency and fuel combustion quality are reduced during idling, increasing emissions of harmful gases such as carbon monoxide (CO) and nitrogen oxides (NO_x). Many urban vehicles still use conventional fuels such as gasoline and diesel, the combustion of which releases large amounts of carbon dioxide and other greenhouse gases.

3. The Development of Legal Regulation on Low-Carbon Transportation in China

China's low-carbon economic policy and legal system for the transportation industry is in its infancy, with policy norms dominating and little specialized legislation. Most of the technical means are of low rank, and the distribution of relevant standards is in a wide range of areas with a vast space for development.

3.1. Laws

Article 4 of the 1989 revised "Law of the People's Republic of China on Environmental Protection" states that the public security, transportation, railway, and fishery management departments at all levels have the duty to supervise and control the pollution of the atmosphere caused by motor vehicles and vessels. Chapter 4 is dedicated to the prevention and management of motor vehicle and boat pollution. [2]

Article 21 of the Law of the People's Republic of China on the Promotion of Cleaner Production, implemented in 2003, mandates that enterprises manufacturing significant electromechanical equipment, motorized transport, and other commodities designated by the administrative department for economy and trade of the State Council must enumerate the material composition's standard grades for the main body of the product as per technical specifications formulated by the standardization executive department of the State Council or a State Council authorized agency.

"The Renewable Energy Law of the People's Republic of China," implemented in 2006 and revised in 2009, is one of the fastest-changing laws in China, indicating that its applicability is facing more and more significant variables. In terms of the function of new energy substitution and reduction of greenhouse gas emissions, the general provisions of this law merely do not exclude the application to the transportation industry. Still, the conditions of Chapter 4 on promotion and application only mention the electricity and construction industries and exclude the transportation industry.

"The Law of the People's Republic of China on Energy Conservation," as amended in 2007, gives priority to the development of public transport, encourages the use of non-motorized transportation, improves the degree of organization and intensification of transport and energy efficiency, promotes the development and use of energy-saving and environmentally friendly means of transport and cleaner and petroleum-based alternative fuels, and strengthens the supervision and management of fuel consumption, among other provisions.

The National People's Congress Standing Committee adopted the "Resolution on Addressing Climate Change" on August 27, 2009. Additionally, China signed and ratified the Framework Convention on Climate Change in 1992, as well as the Kyoto Protocol in 1998 and 2002. According to China's Environmental Protection Law, these two worldwide treaties hold the same value as

domestic laws within the country. If there is a conflict between a local law and a global standard, priority is given to implementing the international convention [3].

The main amendments to the 2014 Law of the People's Republic of China on Environmental Protection include:

Expanding the content on governmental responsibility into a chapter on "Supervision and Inspection," strengthening supervision and inspection measures, and implementing governmental responsibility;

Improving the system of environmental quality standards, improving the design of environmental monitoring, and standardizing the system of environmental protection planning, Improve the system of environmental quality standards, improve the system of ecological monitoring, standardize the design of environmental protection planning, connect the system of environmental impact assessment, improve the system of inter-administrative pollution prevention and control, supplement the system of total amount control, and improve the specific measures for protecting the environment, etc.

Further, complete the corporate pollution prevention and control responsibility system, connect the response provisions to environmental pollution emergencies, and increase the penalties for law violations [4].

3.2. Policies and Regulations

Policies and regulations set forth by the Chinese government regarding climate change, energy conservation, and emission reduction are outlined in various official documents. One of these documents is the white paper "China's Policies and Actions to Cope with Climate Change," which was issued on October 29, 2008. One of the main policies for mitigating climate change is to increase research efforts in this field, while another is to promote energy conservation and improve energy efficiency. These policies are particularly relevant to the transportation industry.

In November 2006, the National Development and Reform Commission (NDRC) released China's inaugural Medium- and Long-Term Special Plan for Energy Conservation, the country's most methodical and unequivocal low-carbon policy directive. The plan scrutinizes the characteristics of China's energy consumption, the state of energy utilization, the main issues in energy conservation, and the circumstances and challenges surrounding energy conservation. It presents the guiding ideology, regulations, and goals of energy conservation, critical areas of energy conservation, key projects, and safeguard measures. It presents the guiding ideology, regulations, and goals of energy conservation, critical areas of energy conservation, key projects, and safeguard measures. The text does not require any further improvement.

On June 4, 2007, the Ministry of Transportation and Communications (MOTC), as the essential administration of the transportation industry, formulated and issued the Special Action Plan for the Entry and Exit of Fuel Consumption of Commercial Vehicles. In addition, there are departmental regulations such as the Measures for the Implementation of the Energy Conservation Law of the People's Republic of China in Highway and Waterway Transportation, which was formulated on July 29, 2008, the Circular on the Policy for the Development of Resource-saving and Environmentally-friendly Highway and Waterway Transportation, which was developed on February 2009, and the Measures for the Detection and Supervision and Management of Fuel Consumption in Road Transportation Vehicles [5], which was formulated on November 2009, among others.

The Eleventh Five-Year Plan for National Environmental Protection issued by the State Environmental Protection Administration (now the State Ministry of Environmental Protection) on November 26, 2007, as a comprehensive environmental protection authority, stipulates that large and mega cities should make the prevention and control of motor vehicle exhaust pollution an essential element of improving the quality of the urban environment.

Other administrative departments in the transportation industry, such as the Ministry of Railways, the General Administration of Civil Aviation, and the Ministry of Industry and Information Technology, have also established and put into action departmental regulations associated with energy conservation and emission reduction. The Ministry of Industry and Information Technology enforced the “Rules for the Administration of New Energy Vehicle Manufacturing Enterprises and Product Entry,” effective since July 1, 2009. Additionally, the “Provisions for the Administration of Fuel Consumption Labeling for Light-Duty Vehicles” has been in effect since January 1, 2010. Regulations concerning the Administration of Fuel Consumption Labeling for Light-Duty Vehicles, effective from January 1st, 2010, were established jointly by the Ministry of Finance and the Ministry of Science and Technology. In January 2009, the Interim Measures for the Administration of Financial Subsidies for the Demonstration and Popularization of Energy-Saving and New Energy Vehicles came into effect.

4. Legal Regulation of Carbon Emissions from Transport in China and Its Optimization

Although China has established many laws and regulations for developing new energy, which plays a vital role in the standardization of modern low-carbon transportation, the story of China’s low-carbon carrier needs to be revised. The legal system is still to be perfected, the leading cause of the lack of energy laws and regulations. Developing and operating low-carbon transportation without the government’s support and rules and regulations is challenging.

4.1. Imperfect Subsidy Procedures

China’s laws have clarified that appropriate subsidies for low-carbon transportation are needed; however, the amount of donations, support time, and subsidy process are still to be perfected. Citizens, in the active response to the national policy, it isn’t easy to use the laws and regulations for the actual operation of low-carbon transportation, and it is challenging to implement the phenomenon.

4.2. Imperfect Carbon Emission Trading Laws

Economic measures have been increasingly emphasized and widely used among the various greenhouse gas emission reduction policies. More and more countries worldwide have begun to take carbon emissions trading as the main path to achieving their greenhouse gas emission reduction targets. In the face of the medium- and long-term low-carbon emission reduction targets set by various countries for 2020-2030 and even 2050, countries that take carbon emission trading as an essential emission reduction measure have begun to promote further, improve, and strengthen carbon trading market mechanisms. Carbon emissions trading has been proven in practice by various countries as a market instrument with effectiveness and efficiency.

However, departmental regulations cannot establish norms that diminish the rights or increase the responsibilities of citizens, legal entities, or other organizations without a legal or administrative basis, as per Article 80(2) of the Legislative Law of the People’s Republic of China. Therefore, the current norms of the National Development and Reform Commission (NDRC) and the pilot provinces and municipalities to increase the obligation of the emitters to pay the quota for a fixed period through departmental regulations and local laws and regulations are not in line with the relevant provisions of the Legislative Law of the People’s Republic of China. Without a national legal framework, the current regulatory system governing carbon emissions trading in pilot provinces and cities is inferior. As a result, there is inadequate authority, stability, and transparency regarding carbon emissions trading norms, hindering the efficient implementation and overall effectiveness of the system [6].

4.3. Reference to the U.S. Low-Carbon Transportation Legal Regulation

To foster the enhancement of the logistics sector, increase transportation efficacy, and decrease energy usage, the US government prioritizes equipment standardization and the cooperative utilization of diverse transportation modes. The US boasts the world's most comprehensive transportation system, consisting of a national management system with unified objectives, precise roles, and unambiguous responsibilities.

In 1975, the Energy Policy and Conservation Act was passed and implemented in the United States with the aim of improving fuel efficiency in transportation. The Act outlined average fuel economy standards for both small cars and light trucks produced by the company. The standards accounted for the percentage of total sales as a weighted coefficient multiplied by the fuel economy of the particular type of vehicle. Then, the fuel efficiency ratings of each model are totaled to determine the plant's overall average fuel efficiency, known as the total average fuel efficiency value. That is the company's average fuel economy. The implementation of fuel economy standards in the US is enforced through the imposition of fines and high gas mileage taxes on automobile manufacturers or owners who fail to meet these standards.

In 2007, Governor Schwarzenegger of California signed Executive Order S-01-07, which established the Low Carbon Fuel Standard. The aim of this initiative is to decrease California's greenhouse gas emissions by reducing the carbon intensity of transportation fuels over their lifecycle. Additionally, the Standard strives to achieve a 10% reduction in greenhouse gas emissions intensity that is generated by transportation in California by 2020.

In addition to the gasoline tax, the U.S. also promotes the development of new energy transportation through tax incentives; The Energy Policy Act was enacted by the U. S. government in 2005 to offer tax credits of up to \$3,400 for newly purchased light-duty hybrid vehicles. [7].

4.4. Optimization Methods

Referring to the development of the US government's legal regulation in low-carbon transportation construction, it has the following insights for China in this regard:

First, the tax burden in China on automobiles is significant during the acquisition and retention stages, but much lighter in the used car market. Taxes during the acquisition stage, including value-added tax (VAT), consumption tax (CST), and vehicle purchase tax (VPT) [8], exceed 30%, whereas taxes in the used car market mainly consist of the fuel consumption tax, which is comparatively low. As a result, the threshold for entry into the automobile market is very high. Still, the cost of energy consumption and pollution emissions during use are negligible, so consumers tend to focus on the upfront cost of purchasing a car. This approach hinders the goal of encouraging consumers to minimize automobile usage and obstructs the realization of economic benefits from energy-saving and new-energy automobiles during use. Secondly, except for the sales tax and taxes on vehicles and vessels, which have different tax rates based on engine displacement, all other taxes in China are levied at the same rate, which does not accurately reflect the real cost of transportation externalities. Finally, China must establish an automotive tax system that is based on fuel consumption or carbon emissions. Therefore, it is necessary to amend and enhance the tax system related to automobiles in China to establish a coordinated and integrated link with energy conservation and emission reduction in transportation. This will provide guidance for consumption and encourage the internalization of vehicle environmental externalities [9].

The setting and allocation of carbon emission allowances set the corresponding burden for the emission subjects in the carbon emission trading system, i.e., the obligation to fulfill the quota clearance within the compliance period. According to Legislative Law provisions and China's current climate change legislation, carbon emissions trading legislation should be subordinate to the proposed

Climate Change Response Law [10], the Climate Change Response Law will provide for carbon emissions trading in principle through a particular chapter or specific articles. At the same time, the State Council can stipulate the particular system and measures in the form of administrative regulations [11].

5. Conclusions

In the above paper, this research has elaborated on the current situation of China's carbon emission in urban transportation by reviewing the information and literature, studying the history of China's legal regulation of low-carbon transport, and giving my humble suggestions for improving China's law in this area by analyzing the current legal code in China and comparing with that in the United States.

This paper exhaustively lists the specific laws and regulations of China and foreign countries (taking the United States as an example) in terms of carbon emission limitation in urban transportation so that it can be more obvious to carry out comparative research and learn from the more perfect laws and regulations in other countries in this regard, and then make contributions to Chinese laws and regulations at the theoretical and academic levels, to facilitate the further research of the future generations, to construct the urban low-carbon transportation system better and create a better, convenient and healthy life for the citizens. The study will also contribute to the theoretical and academic level of China's laws and regulations to facilitate future research by future generations to build a low-carbon transportation system in cities and create a better, more convenient, and healthier environment for citizens' lives. However, the world is still facing many problems that need to be included in this paper, such as the development and use of clean energy, the balance between convenience and environmental protection for citizens' transportation, etc. More scholars and people will study these problems in the future to add bricks and mortar to a community of shared future for humanity.

References

- [1] B20-00584 (E) TP300920 Economic and Social Commission for Asia and the Pacific Committee on Transport Sixth session. (n.d.). Retrieved September 5, 2023, from https://www.unescap.org/sites/default/d8files/event-documents/EN_3_ENVIRONMENTALLY%20SUSTAINABLE%20TRANSPORT%20SYSTEMS%20AND%20
- [2] Zhao, G.(2022). *Research on Carbon Peak and Carbon Neutral Regulation and Policies for Transportation in China. Reform and strategy* (04),14-30.
- [3] Cao, M.(2021). *Legal Issues and Legislative Proposals for Carbon Emissions Trading in China. Legal and Commercial Studies* (05),33-46.
- [4] Hong, X.(2023). *EU Carbon Border Adjustment Mechanism from the Perspective of Consistency with WTO Rules. Guide to Sustainable Development Economics* (05),62-63.
- [5] Li, S.(2012). *Policy, Legal Measures and Implications for the Development of Low-Carbon Transportation in Developed Countries. Journal of Shanxi University of Finance and Economics* (S1),186-189.
- [6] Zhang, Y, Wang, Y, & He, C. (2010). *Research on the Status of Residential Energy Consumption in Coastal Towns of Zhejiang. Value Engineering*, 29(26), 2.
- [7] Schafer, A., Heywood, J. B., Jacoby, H. D., & Waitz, I. A. (2009). *Transportation in a climate-constrained world. MIT Press.*
- [8] Ma, J., Heppenstall, A., Harland, K., & Mitchell, G. (2014). *Synthesizing carbon emission for mega-cities: A static spatial microsimulation of transport CO2 from urban travel in Beijing. Computers, Environment, and Urban Systems*, 45, 78-88.
- [9] Castiglione, C., Infante, D., & Smirnova, J. (2012). *Rule of law and the environmental Kuznets curve: evidence for carbon emissions. International Journal of Sustainable Economy*, 4(3), 254-269.
- [10] Vandenbergh, M. P., Stern, P. C., Gardner, G. T., Dietz, T., & Gilligan, J. M. (2010). *Implementing the behavioral wedge: Designing and adopting effective carbon emissions reduction programs. Envtl. L. Rep. News & Analysis*, 40, 10547.

- [11] Zhang, H., Chen, B., Deng, H., Du, H., Yang, R., Ju, L., & Liu, S. (2022). Analysis on the evolution law and influencing factors of Beijing's power generation carbon emissions. *Energy Reports*, 8, 1689-1697.