

The Present Situation and Future Development Trend of Transportation in Australia

Kai Hao^{1,a,*}

¹*The University of New South Wales, Sydney, 2052, Australia*

a. haokai1125@163.com

**corresponding author*

Abstract: At present, the new scientific and technological reform in the world is having a tremendous impact on the transportation industry, and the future development direction of the transportation field is the focus of the current research. In this context, Australia's transportation system is also in an important period of transformation in the direction of on-demand, low-carbon, network connection and automation. This paper studies and discovers Australia's existing achievements and problems in the field of transportation from three aspects: transport services, transport management and transport policy. Facing the development direction of Australian future transportation, the paper studies the strategic deployment, advantages and disadvantages, and upcoming challenges of Australian future transportation from the two main aspects of self-driving cars and intelligent transportation systems. In the aspect of building a powerful transportation country, learning and accepting the strategies of other countries with an open mind and continuously studying the ideas and progress of other countries in solving traffic problems can contribute to the construction and development of transportation in our country.

Keywords: Transport management, self-driving, intelligent transportation system

1. Introduction

So far, new scientific and technological reforms around the world are having a great and subversive impact on the transportation industry. The future development of transportation is full of uncertainty, and "future transportation" has gradually become a research and discussion topic for countries all over the world to examine and think about the development of transportation [1]. In recent years, the United States, Britain, Japan and other countries have successively issued strategic documents on future communications, opening a new round of prospects for future transportation development. In 2015, the Federal Department of *Transportation released to the public the draft Transportation Development Trends and Policy Choices 2045* [2], which describes the economic, social, natural, technological and other trends facing the development of transportation in the United States, as well as the impact on future travel and freight transportation, and extensively solicits opinions and suggestions from the American public on the future development direction and policy choices of transportation. In January 2019, the Science Office of the British Government published *An Unprecedented Era of Change in the Transport System-Britain's Absence of Travel* [3], pointing out that science and technology will bring great challenges and opportunities to Britain's transport development in the next 20 years. We should make clear the impact of science and technology on

British transport and how the whole society and economy can benefit from it, and seize this opportunity. The overall transformation of the transport system in the UK Japan's Ministry of Land and Transport issued *Changes in Road Scenery in 2040: the Road to People's Happiness* in June 2020, which is not only the implementation of the road policy of the vision of "Super Intelligent Society 5.0" put forward by Japan in 2016 [4]. It is also Japan's thinking on the trend of medium-and long-term road policy after the COVID-19 virus epidemic.

At present, Australia's transportation system is also in a period of transformation, towards on-demand, low-carbon, Internet connection and automation, which is embodied in the emergence of new technologies such as self-driving cars and self-driving taxis. Urban travel and life will be changed in the next few decades, and electric vehicles will develop rapidly in the next few years. 5G mobile network, battery technology, "Internet of Things" sensors, artificial intelligence and other technologies can support the transformation of the transportation system; these technologies also promote the development of "travel as a service", integrate various modes of transportation and focus on user testing, provide seamless travel solutions. The transformation of the transport system will reduce emissions, reduce traffic congestion and increase travel opportunities for people with mobility difficulties. The corresponding government departments need to play an important role in the long-term vision formulation, policy formulation and supervision of transportation, and take positive measures to make better decisions. clarify the future transport demand, changes in travel behavior, how technology promotes the transformation of the transport system, and the impact of energy, economy and environment on the transport system, so as to enable the public to make full use of the transport network. Ensure a safe and sustainable transformation of the transport system while minimizing potential risks.

2. Present Situation of Transportation Development

2.1. Transportation Service

Australia's international sea and air transport industry is well developed. Sydney is the main transportation hub in the South Pacific Ocean. The situation of transportation is as follows:

Railway: Australian Railway has a history of more than 150 years. The Chinese railways' total length is 38445 kilometers, ranking seventh in the world. Between 2011 and 2012, the total transport volume was 2906 billion tons/km, with an annual transport capacity of 784 million passengers. The Australian railway is dominated by electrified railways, and the north-south railway trunk line was connected in 2004, becoming the main artery connecting the north and south ends of the Australian continent. The total length of railways in the country is about 44,000 km. In fiscal year 2006, railways carried 665 million tons of goods, an increase of 3.8% over the same period last year. Since the 1990s, the railway industry has carried out corporatization and private ownership reform. Such as Sydney Yipai, Sydney-Melbourne, Adelaide-Ellis Springs passenger transport is classified as private. In addition, private railways include iron ore transport services in Western Australia, sugarcane fields in Queensland and a small number of mining railways.

Highway: the total length of highways in the country is more than 900,000 kilometers. In 2015, there were 18 million motor vehicles registered, which consists of 13.55 million passenger cars, 95000 buses and 2.91 million light trucks. The construction and maintenance of roads are undertaken by state and local governments, and the federal government actually invests in major interstate highways. With the exception of the Sydney Harbour Bridge and a few highways in Sydney, Melbourne and Brisbane, toll roads are not common in Australia.

Water transport: there are 97 ports. Melbourne is the largest port in the country. In recent years, the average annual volume of Australian international waterborne goods is more than 800 million tons, and in fiscal year 2012, the freight volume reached 1.169 billion tons. Australia has a coastline

of 36735 km and is well-developed in international shipping, with nearly 80% of exports and more than 70% of imports by sea. The inland waterway mileage of Australia is about 2000 km, with more than 60 ports and 96 merchant fleets with a carrying capacity of 2.82 million tons. In recent years, Australia's international water freight volume has averaged more than 800 million tons a year. In 2012-13, the freight volume reached 1.169 billion tons, mainly for iron ore, coal, liquefied natural gas, grain and other commodities [5]. The main ports are Melbourne, Sydney, Brisbane, Dampier, Bernie, Devenport and Townsend.

Air transport: Australia is the eighth largest aviation market in the world. From 2013 to FY14, there were 643 million domestic flights, 57.7 million domestic commercial service passengers and 203500 tons of air cargo. There are 1737 thousand international flights, 32.4 million international passengers and 881000 tons of goods and materials by air. More than 50 international routes go to Australia. There is a total of 480 airports with licenses and 349 airports with runways in Australia and its overseas territories. Australia has 12 international airports that serve international airlines. Australia's major international airports are located in Sydney, Melbourne, Brisbane, Perth, Hobart, Adelaide, Keynes and Darwin. International airports with an annual passenger flow of more than 1 million passengers are Sydney, Melbourne, Brisbane and Pess. Sydney Airport is Australia's largest international airport, accounting for 50% of international passengers to and from Australia. The aviation industry is mainly dominated by Qantas and Virgin Australia. The top 10 airports are Sydney, Melbourne, Brisbane, Perth, Adelaide, Gold Coast, Keynes, Canberra, Hobart and Darwin. China's Beijing, Guangzhou, Shanghai and Haikou, Hangzhou, Shenzhen and Chengdu all have flights to Australia, while Air China, China Southern, China Eastern, HNA and Sichuan Airlines have offices in Australia.

2.2. Traffic Safety Management

The Australian Department of Infrastructure and Regional Development (Department of Infrastructure and Regional Development) is responsible for the planning and implementation of Australian infrastructure, transport and regional development policies aimed at promoting infrastructure and regional development, fostering an efficient, sustainable, competitive and safe transport system, and promoting good partnerships among governments at all levels.

The Ministry of Infrastructure and Regional Development is composed of the following departments: (1) Enterprise Services Bureau, which mainly provides governance financial services, legal services, information inquiries, etc.; (2) Infrastructure Investment Bureau, management of infrastructure policy, railways, major infrastructure and other projects; (3) Ground Transport Policy Bureau, which manages maritime shipping, road safety and production, vehicle safety standards, etc. (4) Policy Research Bureau, responsible for infrastructure, transport and regional economic policy research, regional employment and investment plans, regulatory reform, land transport market reform, etc.; (5) Traffic Safety Bureau, responsible for aviation safety, maritime safety, air cargo safety, traffic safety system reform, etc. (6) Aviation and Airport Bureau, which manages aviation industry policy, airport affairs, aviation environment, air transport policy, etc.; (7) Local Government and Territory Bureau, which is responsible for handling local government and territorial and regional development affairs; and (8) West Sydney Group, responsible for financial, commercial, communications, legal and other affairs in the region [6].

2.3. Transportation Policy

The National Infrastructure Plan was submitted to the Australian Government Commission by the Australian Infrastructure Agency in 2013 [7]. The plan is not to set infrastructure construction targets, but to put forward reform proposals based on Australia's growing demand for infrastructure in the

past 50 years. These include: (1) the establishment of a unified national infrastructure fund; (2) more creative use of the government budget; and (3) recycling of funds to support new infrastructure construction. (4) give users more voice and decision-making power; (5) reduce the level of government; (6) strive to be world-class in project management; and (7) more intelligent and simple infrastructure procurement. Each reform direction proposal also includes a number of physical measures, a total of 27. In the annex to the National Infrastructure Plan, a list of current national infrastructure priorities is listed according to the project progress stage, which is of important reference value.

In addition to the federal level, some state governments have also formulated infrastructure development plans for their own states. For example, the Ministry of Infrastructure of New South Wales has formulated the New South Wales Infrastructure Strategy 2012-2013. The Capital Special Economic Zone has formulated the Capital Special Economic Zone. Government Infrastructure Planning 2011-2021. Strategic Infrastructure Planning for South Australia 2004 Universe 05-FY15 2014 is the state's first infrastructure plan, and a new infrastructure plan is being prepared prior to the Transport and Infrastructure Planning Department of South Australia. The National Infrastructure Progress Database, launched by the Australian Federal Department of Transport [8], provides detailed information on large federal, state and local government infrastructure projects (over A \$50 million, including some projects above A \$25 million).

In February 2016, the Australian government released the first 15-year development plan for infrastructure, the Australian Infrastructure Plan, which is also Australia's first long-term national infrastructure construction plan. The aim is to improve people's living standards and national productivity by building the necessary infrastructure [9]. The plan was developed by the Australian Infrastructure Agency, on the basis of which the Australian Infrastructure Agency also issued an Infrastructure priority list of 93 priority projects and plans for the *Australian Asian Infrastructure Plan* [10]. The infrastructure priority list is updated regularly, and as of February 2017, six priority lists have been updated on the official website of the Australian Infrastructure Agency. Planning and priority lists have laid a solid foundation for Australia's future economic development.

3. Future Development Trend

3.1. Self-Driving Car

In recent years, Australian Internet Union and self-driving vehicle (Connected and Autonomous Vehicle, CAVs) regulations, infrastructure, investment have significantly accelerated, and governments at all levels are working closely with industry to support the deployment of self-driving vehicles.

At the policy and regulatory level, federal and state transportation ministers agreed in 2016 to carry out a phased reform of existing driving regulations to gradually remove obstacles to the application of self-driving cars, led by the National Transportation Transport Commission, NTC. In 2018, NTC issued a statement on the impact of consulting regulations, outlining the main risks that need to be addressed in order to ensure safe commercial deployment of self-driving vehicles, as well as measures to deal with them, and issued a policy document on amending driving regulations to support self-driving vehicles. New regulations allow self-driving systems to drive, ensuring that legal persons are responsible for system driving accidents. A statement on the impact of decision-making regulations was issued, outlining the appropriate safety assurance system for the first application of AVs in Australia. At the state level, most state governments have incorporated AVs into law.

In terms of investment and pilot projects, the Standing Committee on Industry, Innovation, Science and Resources of the House of Representatives recommended in 2017 that the Commonwealth Government, in cooperation with state and territorial governments and local committees, consider in

metropolitan areas and areas, funding for trials of self-driving cars in public transport. Under the proposal, Australia has invested a number of public sector funds, including \$10 million in the AVs pilot in New South Wales and continued investment in future travel fund laboratories, \$9 million in Victoria to support researchers and industry, and \$1.35 million in Canberra for the AVs trial. Bosch received a \$2.3 million award from Victoria Netflix and the self-driving car test grant program and received the state's first road test permit. In addition, the government has supported a number of AVs pilot projects, including the Western Australian government piloting self-driving taxis and driverless buses in 2019, Lexus testing network-connected cars in Queensland and self-driving buses in colleges and universities.

3.2. Intelligent Transportation System

Australian governments at all levels strongly support emerging technologies for intelligent transportation systems (ITS) and automated vehicles. The Australian government. The Australian government is releasing bandwidth for a dedicated cooperative intelligent transportation system (C-ITS) and investing more than A \$200m in satellite and global positioning system technology. Government transport departments also provide open databases to the industry. This will help consolidate Australia's position as an important global player and contribute to the growth of market space.

These developments have promoted the commercial operation and investment of the Ministry of Transport, automobile factories, and transnational companies. BMW, Bosch, Hyundai, Mercedes-Benz, Volvo and technology companies such as Tesla, Navya and EasyMile are all active in Australia.

3.2.1. Assist in the Development and Utilization of Intelligent Transportation Systems

The transportation and transportation sectors of the future will be characterized by a shift from ownership to "household ownership", from transport to mobility, and from internal combustion engines to electric transmission.

Australia is committed to using these technologies to improve the security, efficiency and sustainability of its transport systems, providing a good environment for companies at home and abroad seeking to research, develop and test innovative technologies and solutions.

Intelligent Transportation System (ITS) has brought important and gradual changes to Australia's transportation system. The deployment of dynamic speed zones and active lane management, ramp metering, passenger information systems, electronic toll collection and other systems have brought significant convenience for travel.

3.2.2. Improve the Traffic Management System

Australia is a leader in the export of advanced traffic management systems (ATMS). In the 1970s, New South Wales designed the Sydney coordinated adaptive transportation system, often referred to as SCATS. SCATS has become one of the main technologies of global traffic management and has been applied in more than 100 cities around the world.

3.2.3. Improve the Efficiency of the Highway

The Australian Government has joined hands with the private sector to develop an intercity highway network to improve traffic flow around major cities. So as to improve the efficiency and safety of the major intercity highways in Australia. Headquartered in Queensland, Transmax is a leader in intelligent highway technology in Australia, and its platform is called STREAMS. STREAMS has been implemented on highways in Australia and is mainly used to coordinate on-ramp metering,

automatic event detection, dynamic variable speed limits and lane usage management. Drawing on this experience from Australia, STREAMS is piloting highway projects in the United States.

3.2.4. Actively Develop Internet Connections and Automatic Vehicles

The Australian Department of Transport and the transport industry are actively developing networked and autonomous vehicle (CAV) technologies. This emerging transportation technology has the potential to change the traffic situation in Australia and even the world. It is estimated that the global self-driving market will reach 173.15 billion US dollars by 2030. Australia is committed to using these technologies to improve the safety, efficiency and sustainability of its transport system. Australia has begun extensive networking (using cellular V2X and DSRC) and automated vehicle testing and timely deployment of emerging transport systems, including networked and self-driving vehicles (CAVs).

3.2.5. Mobile Travel

Mobility service (MaaS) is a comprehensive mobility solution that focuses on the needs of individuals from A to B. It is developed from the service model of providing vehicle transportation without purchase cost.

Car-sharing has rapidly become popular on university campuses, where it originated. Ride-sharing or ride-hailing services, such as Uber are relatively new formats at present. Mobile services combine a variety of traffic modes, such as shared cars and public transport. In essence, mobile service products are intended to beat traditional car transportation options in the competition through convenient user experience, dynamic itinerary and simplified payment process. The New South Wales Department of Transportation has created the Future Traffic Digital Accelerator, which will ensure that innovators and start-ups work directly with appropriate organizations. The goal is to launch convenient transportation projects such as customized experiences for passengers.

All parties in the industry are eager to develop and promote on-demand intelligent public transport. Keolis Downer, a consortium member of Data61, is offering on-demand public transport trials in Sydney. The original intention of the project is to provide a faster and more personalized travel experience for the local community. Mobility services can be classified according to mobile integration, including scheduling, booking, payment, etc. The development of the mobile services industry in Australia is a continuous evolution of the shared economic market. Australian companies such as Car Next Door and SkedGo are promoting improved traffic congestion, pollution control and mobility options.

4. Conclusion

The Australian government and industry have recognized the urgency of self-driving and other new technologies to promote the development of transportation transformation, and in the formulation of relevant strategies, policies, regulations, deployment, application and pilot demonstration of new technologies, a lot of preparatory work has been carried out on the impact of new technologies, as well as public acceptance investigation and research, financial support and so on. Because the application of a new technology has many uncertain consequences, it is necessary for the government to adopt policies and regulations, scientific decision-making and effective supervision while vigorously supporting and promoting the application of technology. Taking the self-driving technology, electric vehicle technology and the promotion and application of the "travel as a service" (MaaS) model as examples, the government needs to consider the energy demand of electric vehicles, the impact of the change of travel mode on the communication network, the management of MaaS, the reduction of government revenue affected by new technology, the scientific decision-making of

infrastructure investment and so on. In the process of building a traffic power, we will more or less face the difficulties encountered by other countries in moving towards the future. at present, there is no standard answer, which needs continuous research, exploration and practice.

References

- [1] Zijun Zhou. *Analysis and Enlightenment of EU Road Transport Policy in the Future* [J]. *Traffic Transportation Research*, 2019pi 5 (4): 140-146.
- [2] Foreign Traffic tracking Research Group. *Transportation Development trend and Policy Choice in the United States in 2045* [M]. Beijing: people's Communications Publishing House, 2017.
- [3] Government Office for Science. *A time of unprecedented change in the transport system* [R]. London: Government Office for Science, 2019.
- [4] The Ministry of Land and Communications. *The road vision of 2040 will change-the road to people's happiness* [EB/OL]. June 16, 2020. <https://www.mlit.go.jp/road/vision/01.html>.
- [5] Shujun Yang, Xueying Yang. *The future direction of transportation reform in Australia* [J]. *Engineering Research-Engineering in an Interdisciplinary Perspective*, 2017 Ji 9 (02): 156-164.
- [6] See the official website of Australian Ministry of Infrastructure and Regional Development [EB/OL]. <https://infrastructure.gov.au/departments/about/structure.aspx>
- [7] National Infrastructure Plan (June 2013), Report to COAG and Assessments [EB/OL]. <http://infrastructureaustralia.gov.au/policy-publications/publications/June-30-Reportto-COAG-and-Assessments.aspx>.
- [8] National Infrastructure Construction Schedule. An Australian Government Initiative [EB/OL]. <https://www.nics.gov.au/>.
- [9] Infrastructure Australia. *Australia Infrastructure Plan* [R]. 2016.
- [10] Infrastructure Australia. *Infrastructure Priority List-Project and Initiative Summaries* [R]. 2016.