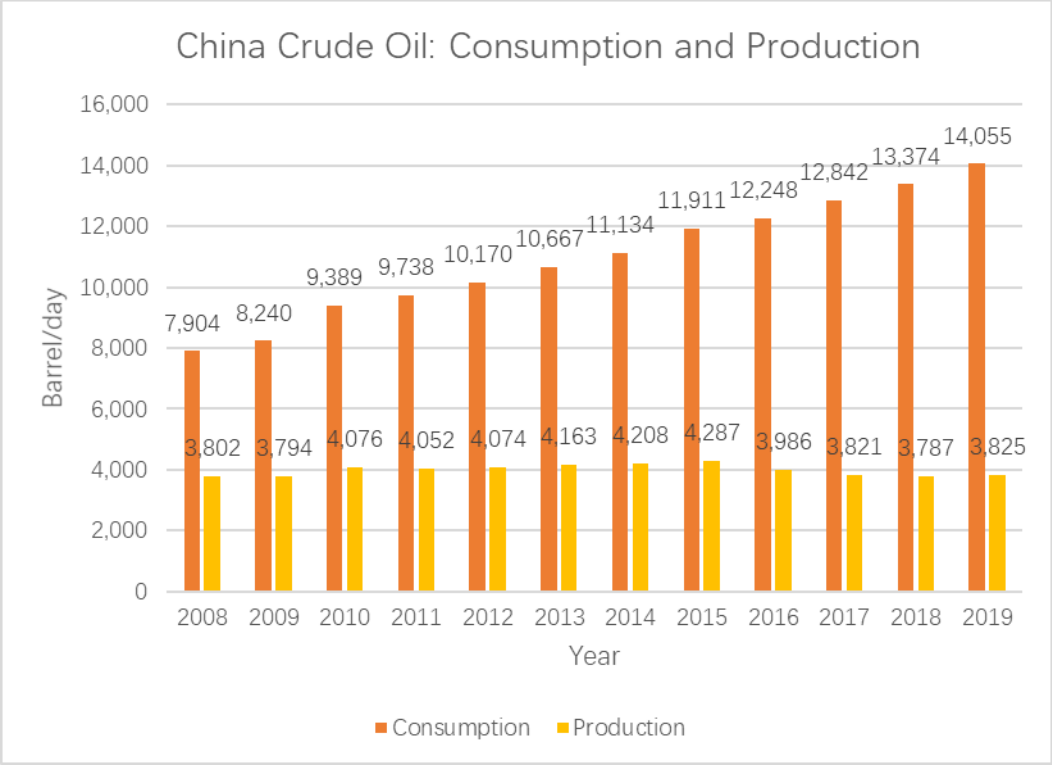
Technology changes the environment: A case study of new energy vehicles in China

Introduction: The protection of the ecological environment is the foundation of economic development. The impact of economic development on the environment includes increased consumption of fossil fuel and nature resources, increased environmental pollution, global warming, etc. To prevent global warming and reduce greenhouse gas emissions, new energy vehicles would play a significant role in industrial society. China's economy is developing rapidly, and the level of industrialization continues to increase, but China has faced energy resources shortages and environmental pollution problems in the long term. The central government suggests developing new energy technology as main policy to reduce the vehicle industry's dependence on non-renewable resources and reduce emissions of polluting gases.

China is a large country with 1.4 billion people. The total number of motor vehicles and drivers ranks 1st in the world. According to a report from the China National Bureau of Statistics, by the end of 2019, China has approximately 246 million cars and 410 million drivers. The numbers are increasing year by year. In 2019, China produced 25.721 million cars and sold 25.769 million units. With the development of the economy, the automobile industry has become China's largest oil consumer. These motor vehicles consume over thousands of tons of oil every day, *shown as table below,* and the emission of vehicle exhaust leads to serious air pollution.



With the over-exploitation of the energy resources, the reserves have dropped

sharply, and energy crises have emerged in various countries. In addition, scientific research has found that the carbon dioxide produced by the use of oil, natural gas, and coal not only pollutes the air, but also the emission of carbon dioxide into the atmosphere causes global warming, bringing the climate crisis to many countries.

What is new energy vehicle? Firstly, New energy refers to different forms of energy rather than non-renewable resources—for example, solar power, wind, hydro, and biomass, etc. New energy vehicles prefer to use untraditional fossil fuels as energy sources. The biggest feature of new energy vehicles is the use of electric motors to provide power. The equipment that powers the motors is batteries. The methods for charging the batteries include the interior-type alternator, AC charger piles, or solar energy. Therefore, hybrid electric vehicles are not classified as new energy vehicles. Today, new energy vehicles include electric energy vehicles, hybrid vehicles, and fuel cell vehicles. In China, the most popular new energy vehicle brand is Tesla.

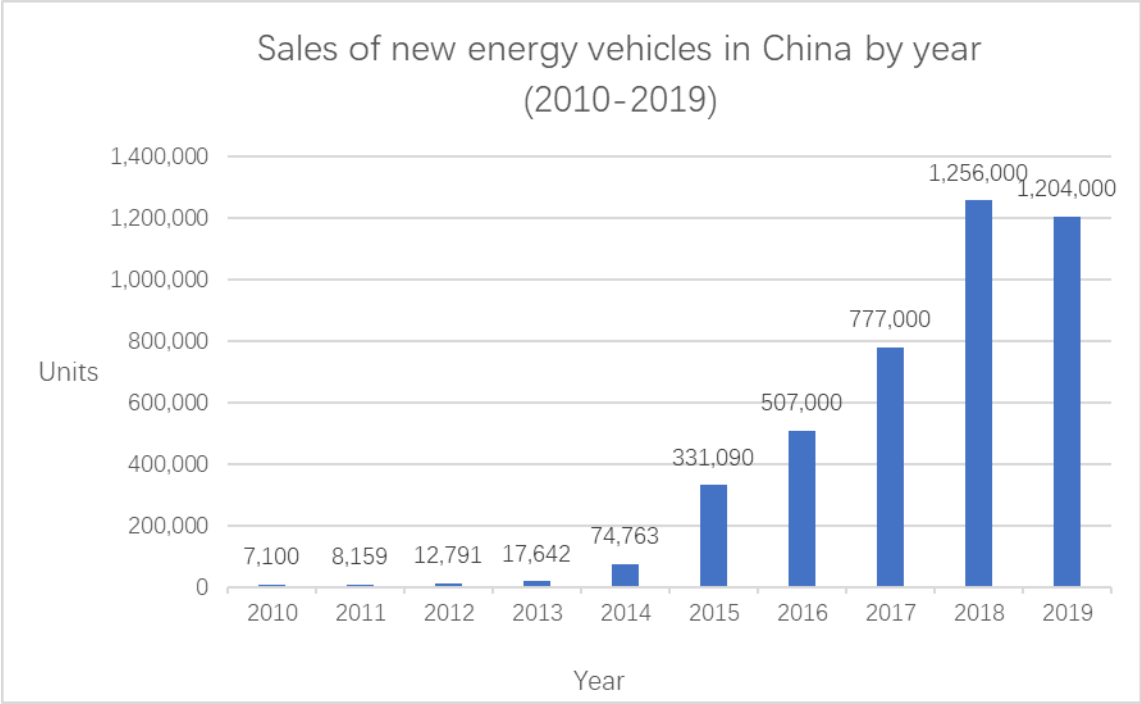
Why should China develop new energy vehicles? Firstly, the issue of China's oil reserves. China is largest oil importer of the world. In 2019, China's oil imports reached 510 million tons, and China's domestic oil production was 191 million tons. China's oil reserves are 72% dependent on imports. However, 55% of China's oil is used to fuel vehicles. China's domestic oil production cannot meet the demand of the transportation industry. New energy vehicles can reduce the consumption of fossil fuel resources (oil, natural gas), improve the security of non-renewable resources, and reduce the emission of air pollutants. Through the development of new energy vehicles, the energy transition can be realized to drive greater power to reduce carbon emissions. Furthermore, China's electric energy ranks 1st in the world and China has abundant electric power resources, such as wind power and hydropower. New energy vehicles can make full use of power resources, which is conducive to improving China's energy structure.

Secondly, China is facing severe air pollution and environmental problems. The exhaust emissions of fuel vehicles are becoming more serious to the environment, causing severe pressure on urban air quality. More than 80% of carbon monoxide in large and medium-sized cities, more than 40% of NOx and hydrocarbons are polluted, and 20%~ 30% of particulate pollutants come from the exhaust emissions of fuel vehicles. New energy vehicles can reduce vehicle emissions' environmental impact, such as electric vehicles can achieve zero emissions. The energy recovery technology of new energy vehicles can effectively improve energy utilization and reduce energy consumption. China is developing a low-carbon economy and low-carbon technologies conducive to saving social development costs, improving the ecological environment, protecting resources security, and effectively controlling the environmental harm of gas emissions.

As of 2019, China's central and local governments have invested more than 300 billion RMB in new energy vehicles' subsidies. The market of new energy vehicles in China is formed through government policies and subsidies. It shows that Chinese central government attaches importance to the development of new energy vehicles. In China, new energy vehicles play a significant role in strategy of sustainable

development.

Current status and future development of new energy vehicles in China: The production of new energy vehicles in China began in 2005. Since 2010, the sales of new energy vehicles increased every year.



"Five-Year Plan" is an important plan for China's national economic and social development in every five year. The 10th Five-Year Plan (2001-2005) clearly set the goal of fuel-efficient vehicles; To improve the production level of vehicles and their key components, and low-emission automotive motors hybrid systems. The "11th Five-Year Plan (2006-2010)" encouraged the development of eco-friendliness and environmentally friendly new energy vehicles. The "12th Five-Year Plan (2011-2015)" focused more on developing emerging industries, such as new information technology, new energy and materials, and new energy vehicles. It defined the future development direction of new energy vehicles in China, among which plug-in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell vehicles (FCV) would be the vital parts for the development of new energy vehicles in the future.

2015 was a critical year for new energy vehicles to enter Chinese market, new energy vehicles developed rapidly in this year, with a concentrated explosive growth in some cities. The annual production of new energy vehicles was 340,000, and the sales were 330,000, an increase of 3.3 times and 3.4 times respectively compared with the previous year, has accounted for 1.35% of the overall sales of vehicles, and its production and sales have increased significantly and ranked 1st around world. The "Made in China 2025" plan predicts the total sales of new energy vehicles will be 20% of the China whole vehicles' market by 2025. The plan estimates that the annual sales of new energy vehicles in China by 2025 will reach to 5 million units.

The development of new energy vehicles in China still has a long way to go. In

particular, the core technologies need to be strengthened, such as power battery, one of the core components of electric vehicles. The current battery problems have insufficient battery life, batteries are expensive, battery life is short, and the battery's charging time is long.

Overall, with society's development, fossil fuel, such as oil, natural gas, and coal, has brought an unprecedented crisis to society. On the one hand, with the over-exploitation of these energy resources, its storage capacity drops sharply, and an energy crisis appeared. On the other hand, the carbon dioxide produced by oil, natural gas, and coal pollutes the air quality and causes global warming, which brings climate crisis to many countries. Therefore, the transition of fossil fuel to new energy will address the problem of energy shortage and reduce the global climate change crisis. New energy vehicles can reduce pollution to the environment and bring citizens a green, low-carbon, and sustainable living environment. The new energy has added strong new energy to economic growth. It can also help reduce pollutant gas emissions, decrease the challenge of climate change, and improve the global ecological environment.

Reference

NBSC, National Bureau of Statistics of China. China Statistical Yearbook 2019. Beijing: China Statistics Press; 2019.

Chris Kimble, Hua Wang. China's new energy vehicles: value and innovation. Journal of Business Strategy, Emerald, 2013, 34 (2), pp.13-20.

Godfrey Yeung (2019) 'Made in China 2025': the development of a new energy vehicle industry in China, Area Development and Policy, 4:1, 39-59.

Gong, H., Wang, M.Q. & Wang, H. (2013). New energy vehicles in China: policies, demonstration, and progress. Mitig Adapt Strateg Glob Change 18, 207–228.

Liu, Z., Hao, H., Cheng, X., & Zhao, F. (2018). Critical issues of energy efficient and new energy vehicles development in China. Energy Policy, 115, 92-97.

Yuan, X., Liu, X., & Zuo, J. (2015). The development of new energy vehicles for a sustainable future: A review. Renewable and Sustainable Energy Reviews, 42, 298-305.