

RELEVANT CONTRIBUTIONS TO SDG TARGET 11.2 BY THE SHENZHEN MUNICIPAL
GOVERNMENT AND TRANSPORTATION BUREAU

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Introduction

Established in 1980 as China's first Special Economic Zone, Shenzhen enjoys a privileged position in China's social and economic history. Growing from a small fishing village of approximately 30,000 people to a regional economic powerhouse, Shenzhen is held up as a national model for the benefits of *kaifang gaige*, opening up and deepening reforms (Tao 2017). As of 2010, the functional urban area of Shenzhen had a population of 23.3 million people and an official urban population of 10.4 million people making it the fourth largest functional urban area in China (OECD 2015). Located at the mouth of the Pearl River in Guangdong Province and adjacent to Hong Kong, Shenzhen is situated in the heart of the Pearl River Delta Megacity, also known as the Greater Bay Area, with a population of more than 100 million people, surpassing Tokyo and making it the world's largest conurbation (World Bank 2015). Shenzhen is also one of the most economically prosperous cities in Greater China with a GDP of 2.24 trillion RMB (\$322 million USD), greater than neighboring Hong Kong and Guangzhou (Hong Kong Trade Development Council 2018).

The primary responsibilities of the Shenzhen Municipal Government and Shenzhen Transportation Bureau are informed by the China Central Government and Guangdong Provincial Government Five-Year Plan. In turn, the Shenzhen Municipal Government issues a Five-Year Plan that informs the economic and social responsibilities of the city's nine administrative districts' Five-Year Plans. The 13th Five-Year Plan for Economic and Social Development of the People's Republic of China is in effect from 2016-2020 and states explicit goals for the country's transportation system, including interconnected domestic and international transportation networks, modern and efficient urban and intercity transportation, integrated multimodal transportation hubs, and low-carbon, smart, and safe transportation services. This paper intends to demonstrate three ways in which the Shenzhen Municipal Government and Transportation Bureau are putting these broad policy goals into practice.

Plug-in Hybrid Electric Vehicles (PHEV) and Battery Electric Vehicles (BEV) Subsidies and Incentives

The Asia-Pacific region is home to 17 of world's 28 megacities (OECD 2015), with an increasing number of inhabitants owning passenger cars and, specifically, rapid growth in car ownership in the China market (ESCAP MCT (3)8). The growing passenger car transport sector is a major contributor to global oil consumption and total world energy consumption. In the Western Pacific and South-East Asia, pollution generated from the burning of fossil fuels contributed to ambient air pollution that is responsible for 1.67 million and 996,000 deaths per year, respectively, (World Health Organization, 2014). More specifically, in China, PM10 (large air particulates) contribute to over 350,000 premature deaths per year and disproportionality affect children and the elderly (OECD 2015). Furthermore, a common remedy in China for reducing PM10 is restricting intra-urban traffic, making it more difficult for people far from public rail transport to move freely about the city (OECD 2015).

To combat ambient air pollution, especially PM10, the Shenzhen Municipal Government has provided a range of subsidies and incentives to public transportation companies and individuals to encourage the adoption of plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) in the civil service sector, taxis, and privately-owned passenger vehicles. These incentives include purchase subsidies, usage subsidies, parking fee incentives, license and registration incentives, and charging fee incentives (International Council on Clean Transportation 2018). These subsidies have had a significant impact on the number of PHEVs and BEVs on the road in the civil service sector, as well as on taxis and privately-owned passenger vehicles. At the end of 2017, Shenzhen's entire fleet of more than 16,000 public buses had transitioned to being electric vehicles (Ren 2018). Furthermore, by the end of 2019, all taxis will be BEVs (Ren 2018). As a part of China's larger Made in China 2025 campaign, the subsidies and incentives have resulted in rapid domestic production of electric vehicles, with a large majority of corporate revenues being reinvested to improve efficiency and production of electric vehicles in the future. Public bus companies in Shenzhen receive a 500,000 RMB (\$72,000 USD) subsidy for each electric bus in operation; 400,000 RMB is supplied by the Shenzhen Municipal Government and 100,000 RMB is supplied by the central government (Ren, 2018). Taxi operators also receive subsidies from municipal and central government totaling 136,000 RMB (\$19,500 USD) for each electric vehicle in operation each year (Ren 2018). Overall, this contributes to a decrease of approximately 500 barrels of oil per day consumed by civil sector vehicles and taxis (Ren 2018).

PHEVs and BEVs account for 10% of all new privately-owned passenger vehicle purchases in Shenzhen (International Council on Clean Transportation 2018). However, in the privately-owned passenger vehicle market, subsidies and financial incentives operate differently from those in the public sector. Many Tier 1 cities in China, including Shenzhen, cap the number of vehicle registrations permitted by city ordinance, driving up the cost of license plates for traditional gasoline vehicles to as high as 130,000 RMB (\$19,000 USD) (International Council on Clean Transport 2018). However, in Shenzhen, there is no cap on the number of electric vehicle registrations and all registration fees are waived (International Council on Clean Transport 2018).

As a result of these subsidies and incentives, the Shenzhen Municipal Government is actively contributing to SDG Target 11.2 by encouraging the use of electric vehicles in major modes of public and private transport. Because the majority of electric vehicle purchases are from domestic manufacturers (Ren 2018), these subsidies and incentives also contribute to Target 8.2, achieving higher levels of economic productivity through...technological upgrading and innovation, and Target 8.3, promoting development-oriented policies that support productive activities and decent job creation. Perhaps most importantly, the decreased number of gasoline vehicles on the road contribute to Target 3.4, reducing the number of premature deaths from non-communicable diseases, and Target 3.9, substantially reducing the number of deaths and illnesses from air pollution.

Dockless Shared Bicycles

Connection and smooth transfer between modes of transportation is an important factor in successful urban transport systems (ESCAP MCT (3)8). Non-motorized transport also provides a

viable option for short trips (ESCAP MCT (3)8 and for providing connections to forms of motorized public transportation. While relevant data for Shenzhen is unavailable, in neighboring Guangzhou, walking and cycling account for 46% of all modes of transport (ESCAP MCT (3)8). Dockless shared bicycles represent an urban transport innovation because they allow easy, low-cost, one-way non-motorized transportation that can help connect individuals to public transport stations quickly and efficiently. For example, dockless shared bicycles charge as little as 0.5rmb per 30 minutes (\$0.07 USD) and increase the radius of public transport stations immediately available for use without the upfront or maintenance costs associated with non-motorized vehicle ownership.

Originally hailed as one of China's four modern great inventions (along with high-speed rail, ubiquitous QR code payment, and e-commerce), dockless shared bicycle companies such as Ofo and Mobike have raised more than \$450 million USD and \$600 million USD, respectively, and were valued as high as 1 billion USD as of 2017 (Xinhua 8 August 2017). However, lack of oversight and regulation resulted in massive oversupply clogging city sidewalks, parks, and abandoned lots with unused bicycles. At the peak of the bike sharing boom there were nearly 900,000 shared bicycles on Shenzhen's streets, mostly from Ofo and Mobike, and the Shenzhen Municipal Government has since issued an ordinance banning the introduction of any new bicycles. (Shenzhen Daily 19 January 2018).

Through cooperation with Shenzhen Municipal Government, dockless shared bicycles are also restricted on main pedestrian thoroughfares during peak times and holidays to protect pedestrians. This is an advancement that can contribute to decreasing the number of non-motorized vehicle – pedestrian fatalities, which disproportionately affect vulnerable transport users such as pedestrians and bicyclists. To reduce this risk, the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) urges governments to make greater efforts to incorporate cyclists and pedestrians into infrastructure design and land-use planning.

Furthermore, using both incentives for parking dockless shared bicycles in safe spaces and punishments for parking in restricted spaces, fewer dockless shared bicycles are being left in areas prone to traffic accidents. To aid this development, the Shenzhen Municipal Government will create 8,000 more safe parking areas and add 200 kilometers of bicycle lanes in 2018, 300 kilometers in 2019, and 500 kilometers in 2020, including equipping all new and renovated roads with bicycle lanes (Shenzhen Daily 18 May 2018).

While building infrastructure capacity to safely accommodate more bicyclists, the Shenzhen Municipal Government and Traffic Bureau have also taken measures to cap the number of new bicycles and assessment the overall management and quality of shared bicycle operators. The assessment is publicly announced, rated on a scale of 0 to 30, and consists of 24 indicators covering six areas; operational services, operations management, security and emergency response, innovative management, public evaluation, and other (Tang 2018). This formal assessment system can help local officials decide which companies should be permitted to expand operations and create a data set of best practices to share with other cities suffering from an oversupply of shared bicycles. However, the most innovative cooperation between the Shenzhen Municipal Government and dockless shared bicycle companies is data sharing of shared bicycle user data with relevant branches of the municipal government. By tracking the use

of shared bicycles in the city, local officials are able to (1) identify areas of bicycle oversaturation and redistribute them to underserved areas and (2) identify frequently used bicycle routes to adjust public bus routes and scheduling.

By building infrastructure capacity to accommodate additional bicyclists, issuing assessments of shared bicycle company performance, and entering into data sharing agreements with shared bicycle companies, the Shenzhen Municipal Government is contributing directly to achieving Target 11.2 by providing additional sustainable, safe transport systems and improving road safety. Furthermore, by providing safe, convenient ways for individuals to access bicycles without the burden of ownership, contributions are being made to Target 9.4, specifically, greater adoption of clean and environmentally sound technologies. Increased bicycle use also contributes to achieving Targets 3.4 and 3.9, reducing premature mortality from non-communicable diseases and the number of deaths from air pollution. Finally, the data sharing agreements between shared bicycle companies and municipal government help to achieve Target 17.18 by increasing the amount of available data to inform decision-making that contributes to the Global Goals.

Intelligent Transport System

In alignment with policy guidelines outlined in China's 13th Five-Year plan calling for intelligent, integrated urban and rural-urban transport systems (China 13th Five-Year Plan) the Shenzhen Municipal Government and Shenzhen Traffic Bureau have developed an intelligent transport system to contribute to achieving SDG Target 11.2 through a combination of implementing and enforcing traffic laws and regulations to make roads safer for vulnerable road users, including children, elderly people, pedestrians, non-motorized vehicle users, motorcyclists, and persons with disabilities. This actively contributes to recommendations outlined at the 2016 ESCAP Ministerial Conference on Transport Session Three on September 9, 2016 that calls for "development of national policy frameworks for urban transport." (p. 8) A major structural advancement in the Shenzhen Municipal Government has been the integration of law enforcement, traffic, and data monitoring agencies into an "integrated transportation administrative management system" captured in the phrase "one city, one transportation" (Huang 2011). This is highlighted in the case of Longgang District that has harnessed the power of the internet of things (IoT), cloud computing, mobile and social data, and big data analytics in collaboration with Huawei Technologies Limited, Ltd. by eliminating traditional siloes among government agencies. This has led to quicker, more coordinated responses in emergencies by dispatching relevant first-responders to incidents while being able to proactively manage traffic flows during times with high traffic volume (International Data Corporation 2016). This style of intelligent transportation system can aid in decreasing the number of traffic fatalities in China. Currently, China is home to the largest number of traffic fatalities in the Asia-Pacific with a total of 261,367 per year, accounting for nearly 1/6th of all traffic fatalities in the region (ESCAP MCT (3)9).

Another example of the "one city, one transportation" phrase is the Shenzhen Tong 深圳通. Shenzhen Tong is an integrated ticketing and stored value card that can be used to access subway, bus, select inter-city rail routes, and taxi fares. Recently, this has been complemented by the addition of QR code readers for payment through WeChat and other digital wallets at subway stations across the city. Currently the subway system consists of eight lines and 198 stations with

286 kilometers of track (Shenzhen Metro Corporation 2018). Six additional subway lines are currently under construction that will increase the total operational length of the Shenzhen subway system to over 1,000 kilometers (Shenzhen Metro Corporation 2018). Additionally, integrated passenger terminals dot the city, including Shenzhen North Metro Station with access to intercity high-speed rail, Futian Metro Station with access to intercity high-speed rail, including access to Hong Kong Special Administrative Region, Luohu Metro Station/Shenzhen Station with access to intercity high-speed rail and transport links to Honk Kong Special Administrative Region, Airport Metro Station with access to domestic, international, and cargo airport terminals, Shekou Port Metro Station with access to ferry terminals to Central Pier Hong Kong, Hong Kong International Airport, Macau, and Zhuhai, and a number of integrated metro stations and bus terminals. When used in conjunction with multiple modes of transport (e.g., subway and bus), users of Shenzhen Tong cards enjoy discounts of up to 25% on the second leg of their journeys.

This integrated intelligent transport system contributes to achieving Target 11.2 by integrating sustainable, affordable means of public transportation to an increasing number of city residents. It also contributes to reduced air pollution which contributes to achieving Targets 3.4 and 3.9.

Conclusion

The Shenzhen Municipal Government and Transportation Bureau have invested heavily in creating an integrated, intelligent transportation system that serves the social and economic development of residents, the city, and the greater Pearl River Delta region. By providing multiple modes of safe, low-carbon, and smart transportation services, Shenzhen is contributing to achieving Target 11.2, providing access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. By studying the case of Shenzhen, other municipalities can learn the benefit of a long-term, centrally planned transportation sector planning that makes use of technology, data sharing, and financial incentives to induce environmentally-friendly behaviors. Nevertheless, points for improvement remain, especially with regard to equity for most vulnerable populations. Often, internal migrants are informally employed to complete large scale infrastructure projects (OECD 2015). By virtue of building new infrastructure and living in nearby temporary housing, these workers often live the farthest from convenient public transportation to enjoy the economic and social benefits of being connected to a major urban center. Furthermore, ongoing construction projects in densely populated areas pose safety risks for young children and the elderly while also creating a large amount of noise pollution. As Shenzhen continues to develop it is imperative that the Municipal Government, Transportation Bureau, and contractors account for the most vulnerable populations and continue to pursue people-oriented development.

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