REFLECTIONS ON URBAN SUSTAINABLE DEVELOPMENT IN SHENZHEN, CHINA

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Introduction

Established in 1979 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 (OECD 2015) and an official urban population of 12.5 million people making it the fourth largest functional urban area in China (Shenzhen Government 2018). Of the 12.5 million residents, 4.3 million people hold a permanent household registration, or *hukou,* granting full access to public services and social security (Shenzhen Government 2018). 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).

Driving this economic development are the seven Fortune Global 500 companies, namely, Huawei, China Merchants Group, Ping An Group, Tencent, Vanke, Amer International Group, and Evergrande that are based in Shenzhen (Shenzhen Government 2018). Furthermore, an additional 200 Fortune 500 companies operate or have invested in enterprises in Shenzhen (Shenzhen Government 2018). In 2008, Shenzhen was named a UNESCO Creative City of Design and boasts more than 6,000 design firms that are awarded approximately 20,000 design patents annually (UNESCO 2018). In 2017, Shenzhen was named a model demonstration zone for China's implementation of the 2030 UN Sustainable Development Agenda by the Chinese Central Government. For these reasons and more, Shenzhen is often named one of Mainland China's most livable cities in popular publications.

Discussion of SDG Target 11.1 Safe and Affordable Housing in Shenzhen

Safe and affordable housing in Shenzhen is a complex phenomenon due to Shenzhen's unique geographical location and economic status. Relative to Hong Kong, where as of Nov. 2018 home prices average more than $22,000HKD per square foot ($2,816USD per square foot, or about $30,000USD per square meter) (South China Morning Post 2018), Shenzhen is affordable with an average home price of 69,843RMB per square meter (about $10,000USD per square meter) or about one-third of housing prices in Hong Kong (Reuters 2017). However, Shenzhen has experienced rapid increases in housing prices over the past five years, with home prices soaring by more than 40% from July 2016 to July 2017 (Reuters 2017). This has made Shenzhen the least affordable Mainland Chinese city for home ownership with a price-income multiple of 19.6 (Cox 2014). This is ten times higher than notoriously unaffordable San Francisco (multiple of 9.3) (Cox 2014). Further complicating the problem is the preponderance of informal housing developments in Shenzhen, taking up an estimated land area of 113.8 square kilometers in the city and housing approximately nine million people (Lai, Zheng, Choy, and Wang 2017). To categorize such housing as "slums" would be inappropriate; informal housing in

Shenzhen refers to the government categorization of land on which a housing complex is built, not the quality of the structure of connectedness to utilities. Indeed, informal housing in Shenzhen is typically built to the same level of quality of formal housing, but because it is constructed on land not designated for residential housing, residents often lack formal ownership rights of homes, including not holding titles to homes, placing them in an economically vulnerable position. Furthermore, the most affordable housing units in Shenzhen, so-called urban villages, have been demolished in recent years as the municipal government seeks to continue to develop more comprehensive urban development plans. As early as 1992 urban villages ceased to exist in the legal sense (Bach 2010). A plaque in the city's municipal museum celebrates this stating, "the urbanization of Baoan and Longgang districts made Shenzhen the first Chinese city with no villages, allowing for harmony among urban economy and society as a whole and the establishment of a firm basis for sustainable development." (Bach 2010) However, these urban villages long supported, and continue to support, the large number of migrant workers who have sought out better economic opportunities in Shenzhen.

The Shenzhen Urban Village (Old Village) Master Plan 2018-2025 seeks to reverse the trend of skyrocketing housing prices and marginalization of urban villages and informal structures by acknowledging the existence of the 241 urban villages that exist within the city (Bach 2010) and seeking ways to convert them into affordable housing opportunities. The Plan's objectives are to

> "comprehensively promote the organic renewal of urban villages, and gradually eliminate the hidden dangers of urban villages, improve the living environment and supporting services, optimize urban space layout and structure, and…promote the comprehensive transformation and development of urban villages…into an orderly and harmonious city space." (Shenzhen Urban Village (Old Village) Master Plan 2018-2025, 2018, p. 5-6)

Renewal of the urban villages includes stated policy the strongly discouraging the demolition of urban villages calling it "inappropriate" and "not in line" with reconstruction policy (Shenzhen Urban Village (Old Village) Master Plan 2018-2025, 2018, p. 7). The policy also divests authority to districts and urban village collectives to create an urban village renewal plan to be submitted to the municipal government for approval. In total, the municipal government has instructed districts to remediate urban villages that taken together occupy 55 sq. km. of land, or 56% of all urban villages. In the core districts of the city, Futian, Luohu, and Nanshan, where housing prices are the most expensive, 76% of all urban villages are scheduled for renovation. This puts a cap on the number of urban villages that can be demolished and used for luxury high-rise construction, ensuring higher stocks of affordable housing in the city in the near future. Further measures that upgrade existing urban villages should be considered

Discussion of SDG Target 11.2 Affordable and Sustainable Transportation Systems in Shenzhen

Shenzhen has a well-developed, integrated public transportation system that includes metro, tram, inter-city rail and high-speed rail, urban and inter-city bus, ferry, and electric taxi service, which can be accessed with a Shenzhen Tong card. 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.

A best practice to learn from Shenzhen's developed, yet still expanding, public transportation system is the Shenzhen Metro Corporation's Metro + model. A traditional barrier to rapid expansion of urban rail networks is that most systems require high initial capital investments, high operational costs, and low profit margins (Zhang and Liao 2018). Indeed, most of the benefits of urban rail networks are realized as positive externalities. This makes urban rail unattractive to private firms. At the same time, the public sector often lacks funding to build a robust, affordable urban rail network, making public-private partnerships (PPP) like the Shenzhen Metro Corporation's Metro + model an attractive solution. The Shenzhen Metro Corporation's Metro + model can best be described as a quasi-market profit model for transit-oriented development (TOD) (Zhang and Liao 2018). In this model, the Metro + refers to urban rail + property development in which the Shenzhen Metro Corporation is given land leases with favorable terms from the government and, in turn, develop residential, commercial, and public goods properties around metro stations and integrated transit hubs. These mixed-use real estate developments often include schools and hospitals in their design and offers another public benefit from the private sector. Therefore, the Metro + model provides a financially viable and economically and socially sustainable way of putting TOD into practice.

Discussion of SDG Target 11.6 Reducing Environmental Impacts of Cities in Shenzhen

Shenzhen has earned numerous distinctions for its work in reducing the environmental impacts of the city including the United Nations Environment Programme Global 500 Roll of Honour and named a National Model Zone for Sustainable Development, National Model City for the Protection of the Ozone Layer, and a National Model City for Environmental Protection (Shenzhen Government 2018). Shenzhen is in the top 10 cities in Mainland China for air quality with an average annual concertation of PM2.5 of 28 micrograms per cubic meter (Shenzhen Government 2018). The city has recently completed renovations on three waste management sites to improve flue gas treatment and upgraded 114 waste transfer stations (Shenzhen Government 2018). Shenzhen has accelerated water reclamation projects in the Pearl River Delta and Shenzhen Bay with 486 water quality control projects underway (Shenzhen Government 2018). To keep pace with the rapid expansion of the city, more than 2000 kilometers of sewage pipes were added to the city's infrastructure in 2017 (Shenzhen Government 2018). Furthermore, in 2017 an additional 152 new housing estates were given access to quality drinking water

(Shenzhen Government 2018). The city has set targets to reduce energy consumption by 4.2% and water consumption by 10.3% during the current five-year plan (Shenzhen Government 2018).

In 2014, Shenzhen was named a pilot zone for implementing a sponge city concept to better manage urban water runoff and surface flooding in coastal areas, upgrade traditional grey infrastructure, and integrate natural bodies of water such as wetlands and lakes into the comprehensive stormwater management plan (Chan, Griffiths, Higgitt, Xu, Zhu, Tang, Xu, and Thorne 2018). The sponge city concept is similar to low impact development (LID) in the United States, Blue-Green Cities (BGCs) in the UK, Water Sensitive Urban Design (WSUD) in Australia, and Low Impact Developments Urban Design (LIDUD) in New Zealand (Chan et. al. 2018). Visible examples in the city include bioswales along city sidewalks and roadways, rain gardens in densely populated residential areas, and pervious pavements in the construction of new roads. Rather than being fully funded by the government, 24 of the sponge city projects being implemented in Shenzhen are funded through public-private partnerships (PPPs) with a total investment of more than $300 million (Cai 2017). On example of this is collaboration between an urban village in Futian District with the local government and The Nature Conservancy. Furthermore, changes in urban building codes further incentivize new construction to include sponge city concepts (Chan et al. 2018). However, coordinating building codes and land use policy has remained difficult with various agencies' competing interests (Chan et. al. 2018). Though challenges remain to fully making Shenzhen a sponge city, the sponge city concept provides a sound model for reducing the environmental impacts of cities on the environment.

Discussion of SDG Target 11.7 Providing Access to Green Spaces in Shenzhen

Signs can be seen across Shenzhen promoting it as the *senlincheng* or, "forest city." In fact, forests cover 41.2% of the city's area (Shenzhen Government 2018). Overall, Shenzhen is home to nearly 1,000 public parks, ranging from national geoparks, a Mangrove nature reserve, a 15km long coastal park, and 20 public beaches to small, one city block residential parks found among the cities ubiquitous high-rises (Shenzhen Government 2018). See figure 1 for a map of green spaces in Shenzhen.

Figure 1. Location and district divisions of Shenzhen (China) as well as the public green spaces within it in 2008. (You 2016)

Study area
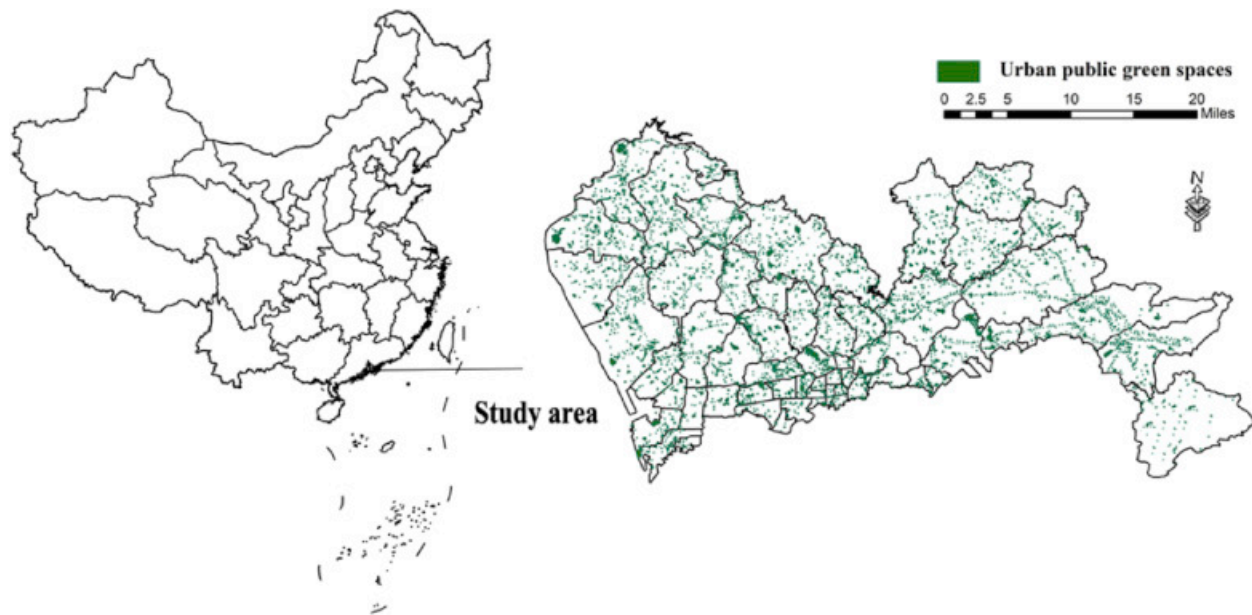
However, access to public green spaces in Shenzhen are inequitably distributed, with greater access to green spaces found in socioeconomically wealthy neighborhoods (2016). You also finds that migrant workers have the least access to public green spaces (2016). Public green spaces are more fragmented in densely populated districts, meaning there are more, smaller parks, for citizens to access, whereas there is less fragmentation towards the edges of the city, meaning more large, single parks that may not be accessible or relevant to residents (You 2016). Xu, Xin, Su, Weng, and Cai also find that the greatest social inequalities exist in park accessibility in Shenzhen under bus, metro, bicycling, and walking modes of transportation (2017). That is, to fully enjoy access to the public parks in Shenzhen requires car ownership or use of a private taxi. This means access to many parks are not only inequitable but also inconvenient. However, this assessment does not account for the private parks that exist both within the majority traditional urban villages and many newly constructed high-rise apartment complexes. Nevertheless, the city can increase access to its public parks in two ways. First, by increasing public transportation to parks the most socioeconomically disadvantaged populations will have better access to green spaces. While there have been some encouraging developments in this area, such as new metro lines with stations at the *Hongshulin* Mangrove Park and Xili Lake, the larger nature reserves in the north and east of the city remain largely inaccessible without a private vehicle. Second, land use policy should encourage more parks accessible by foot that are integrated into peoples' daily neighborhood activities as opposed to large parks often divided from residential areas by large roadways. Though Shenzhen boasts some successes in urban public space construction, especially given its rapid development in the past 40 years, opportunities exist to further improve access to urban public green spaces.

Conclusion

Having undergone rapid transportation from a fishing village of 30,000 people at the mouth of the Pearl River in South China to a world megacity of more than 10 million people and a GDP greater than neighboring Hong Kong, Shenzhen is celebrated as an economic miracle for Mainland China and the *kaifang gaige* opening up and reform policies of Deng Xiaoping. Increasingly, the city has begun to plan and take action to promote comprehensive and

sustainable development that ensures not only more economic wealth, but social development and environmental protection, too. The city enjoys strong support from the Central Government as a model zone for sustainable development and will be used as a blueprint for China's other rapidly developing and urbanizing regions. How these small and medium size urban areas in China develop will have a profound impact on the rest of the planet. Therefore, it is imperative for Shenzhen to continue to pursue sustainable development in order for the planet to achieve the UN Global Goals.

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