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## **China's Sharing Mobility Economy**

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### **Abstract**

Evolution in the urban landscape is key for sustainable development in the world because people have progressively moved from rural areas to live in urban cities. The mobility and transport industry offer the greatest potential to reduce carbon emissions in cities. The arrival of application-based and intelligent-sharing systems into the shores of China has been disruptive to local and international businesses. These has led to a liberation of an automobile sharing economy at a much deeper and greater level: a rise in the use of electric vehicles (EVs), car-pooling, and the utilization of bike-sharing models. Integrating the pre-existing but under-utilized low-carbon transportation vehicles in urban cities, such as public transportation, with the various application-based mobility sharing business systems surfacing, we see immense potential in the transformation of urban transportation to long-term viability. However, the accelerated expansions of businesses and innovation in the sharing economy have been challenging pre-existing sources of knowledge, socio-economic ties, and physical and geographical urban infrastructures. This research investigates the relationship between the continual progress of urban structures and the socio-

ecological innovations in the sharing mobility economy, utilizing observational statistics from three studies that focus on sharing transportation industry -- in particular, the sharing of rides, EVs, and bicycles in China. These statistics show that there is a robust evolutionary system that integrates the increasingly sustainable macro-level urban landscape and the innovative business structures to form a meso-level intelligent and green transport framework. Namely, these two levels of evolutionary change in urban landscapes and business structures generated by the disruptive technologies of the sharing mobility sector and brought forth by the urban changes towards increasing sustainability, both subsequently shape one another and reinforce sustainable practices and principles in the swift-changing urban sector and corporate innovation sectors in Shanghai, China.

## **Introduction**

Evolution in the urban landscape is the key for sustainable development in the world because people have progressively moved from the rural areas to live in urban cities. The 11<sup>th</sup> aim of the Sustainable Development Goals (SDGs) of the United Nations is to transform urban landscapes into settlements that are safe, inclusive, resilient, as well as sustainable<sup>1</sup>. Because the mobility and transport industry have been the biggest culprit of emissions, creating close to 25 per cent of emissions worldwide, it also offer the greatest potential for a solution. Furthermore, the industry

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<sup>1</sup> United Nations. 2015. *Sustainable Development Goals*. Retrieved from: <https://sustainabledevelopment.un.org/?menu=1300>

is growing much faster than any other industry, with the emissions predicted to increase two-fold by the year 2050<sup>2</sup>. The early awareness of excessive carbon emissions from different forms of transportation can unquestionably help to ensure sustainability.

Internationally, disruptive technologies by corporations emerged due to the sharing economy are changing the urban transportation landscape significantly, and at the same time, are evidently aligning with the United Nations SDGs in urban areas. This takes the form of the sharing of car rides, EVs, and bicycles. Integrating the pre-existing but utilized-fulfilled low-carbon transportation vehicles in urban cities, such as public transportation, along with using the various application-based mobility sharing business systems, has immense potential to transform the urban transportation system into one with long-term viability. This research investigates the relationship between the continual progress of urban structures and the socio-ecological innovations in the sharing mobility economy, utilizing observational statistics from three studies in the upcoming sharing transportation industry in the sharing of rides, EVs, and bicycles in China.

China has the largest population and is the country that contributes to the most carbon emissions worldwide. Its evolution towards a sustainable model of transportation is key to the international realization of the SDGs. Shanghai represents the city with the largest population as well as land space, but it is also an emerging international city with an extensive cultural, economic, and social influence within

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<sup>2</sup> United Nations-Habitat. 2016. *Urbanization and Development: Emerging Futures*. Nairobi. United Nations Human Settlements Programme. UN-Habitat: Kenya

and beyond China<sup>3</sup>. A 2014 research study states that the transport industry contributed almost 30 per cent of Shanghai's PM2.5<sup>4</sup>. Cleaner and more intelligent transport is essential to economic progress, improvements in the environment, better health and welfare for the people in Shanghai. Ever since 2010, the innovations within the sharing transport sector -- automobiles, EVs, electric and non-electric bicycles have significantly altered corporations' practices and governmental policies in Shanghai. For instance, more than 50 per cent of Shanghai's 24 million population have registered an account with the application-based bicycle sharing model. This is proof of the extensive social impact of the application. Also, in 2017, China's intelligent bicycle sharing industry has contributed to over 20 million bicycles on the roads and has received over 3 billion dollars' worth of funding<sup>5</sup>.

From this research, I assert that there is a robust evolutionary link between the increasingly sustainable macro-level urban landscape and the innovative business structures for a meso-level intelligent and green transport framework. Namely, these two levels of evolutionary change in urban landscapes and business structures generated by the disruptive technologies of the sharing mobility sector and brought forth by the urban changes towards increasing sustainability, both subsequently shape one another and reinforce sustainable practices and principles in the swift-changing urban sector and corporate innovations in Shanghai, China. To bring forth this relationship, the theory of transformation towards sustainability from the field of

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<sup>3</sup> Berube, A., Leal Trujiilo, J., Ran, T., Parilla, J. 2015. *2014 Global Metro Monitor*. Brookings Institution, Washington D.C.

<sup>4</sup> Shanghai Environmental Monitoring Centre (SEMC). 2015. *Shanghai PM2.5 Report*. Xinhuan News Agency. Retrived from: [https://sh.xinhuanet.com/2015-01/07/c\\_133902037.htm](https://sh.xinhuanet.com/2015-01/07/c_133902037.htm).

<sup>5</sup> State Information Center (SIC). 2018. *China Sharing Economy Development Report*. State Information Center: Beijing.

international environmental change as well as the theory of business ecosystem innovation<sup>6</sup> from the global management studies will be utilized to further investigate the following: how the evolution of urban landscapes and business innovation are intertwined and implications for future policy and research that focus on the sharing economy and sustainability.

### **Theory of Transformation Towards Sustainability**

International environmental change assert that accumulative and technical methods utilized by majority of the existing climatization strategies are ineffective in addressing the weaknesses of climate change and man's systemic contributions<sup>7</sup>. Researchers<sup>8</sup> have proposed a transformative method that does not just involve theories of sociotechnical or technological change to analyze the political, social, cultural, and relational sources of the climate weaknesses and grit.

The theory of transformation toward sustainability stresses the importance of positive social, environmental, and economic advantages of transformative actions and methods. It also emphasizes the significance of intentional or systemic change methods that point out significant socio-ecological-economic systems toward sustainability. The theory comprises adaptation, mitigation, and collaboration, particularly in urban cities where mitigation and adaptation go together to cultivate

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<sup>6</sup> Gawer, A., Cusumano, M. A. 2014. *Industry platforms and ecosystem innovation*. J. Prod. Innovat. Manage. 31 (3): 417-433.

<sup>7</sup> Lonsdale, K., Pringle, P., Turner, B. 2015. *Transformative Adaptation: What it is, Why it matters, What is needed*. UK Climate Impacts Programme. University of Oxford. Oxford: United Kingdom.

<sup>8</sup> Geels, F.W., Berkhout, F., Van, D.P. 2016. *Bridging analytical approaches for low-carbon transitions*. Nature Climate Change.



inter-reliance and alleviate any form of concessions. The application of this theory is useful in the study of urban cities, particularly in rapid-developing international megacities, such as Shanghai, that are defined by large population densities, swiftly expanding economic processes, widening social inequalities, international relationships, and environmental effects. In complex situations, the theory of transformation towards sustainability challenges large difficulties and circumstances.

Applying this theory to the scenario of urban cities, we can identify three factors as important components to ensure transformation toward sustainability in international megacities.

Firstly, physical constraints refer to understanding of the geographical location, climate, infrastructure, and the environmental capacity that is essential for a city to further develop and maintain itself. Secondly, there must be an analysis of knowledge capacities that will, in turn, explains what spaces are available for opportunities and underpins the transformation to sustainability goals in cities. This includes understanding of bottlenecks, unsuccessful ventures, and rising needs in the preexisting transport system and the methods to solve them. Finally, one must examine the crucial socio-economic relations that are catalytic, persevering, and susceptible in view of changes that are made to society. These relations alter the dynamics and interactions between the various stakeholders, between players, and various systems, and the larger framework of economic and political backgrounds.<sup>9</sup>

### **Theory of Business Ecosystem Innovation**

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<sup>9</sup> Gawer, A., Cusumano, M. A. 2014. *Industry platforms and ecosystem innovation*. J. Prod. Innovat. Manage. 31 (3): 417-433.

To achieve sustainability, there needs to be rapid innovation in the business ecosystem as well. A corporate ecosystem is a financial community that comprises various players, including the government, industrial and corporate connections, competitors, clients, and anyone else who shares the same financial landscape and co-evolve with one another. The ecosystem is significant for inducing emerging technologies and corporate innovations, as all players will expedite their commercialization methods during the early stages of the uprising industry. The corporation ecosystem backs up not just the pool of resources and network as essential features, but also the inter-cooperation methods and industrial feedback and transformation.<sup>10</sup>

### **The Transport Industry's Sharing Economy**

The breathtaking uprise of online intelligent sharing and collaborative platforms have drawn attention to the consequential policy as well as generated interest from academics, who have deliberated on the concept of a sharing economy facilitated by the online sharing processes and actions as well as its socio-economic effect. China's urban transport industry has the most disruptive sharing economy in the world. Ever since 2010, innovations within the automotive sharing economy including EVs, and bicycles have arisen and essentially altered corporation practices, the making of governmental policies, rules and regulations, as well as everyday life in the People's Republic of China. However, the accelerated expansions of businesses

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<sup>10</sup> Ibid.

and innovation in the sharing economy has challenged pre-existing sources of knowledge, socio-economic ties, and physical and geographical urban infrastructures.

For example, increasingly connected cities made possible by technological advancements and an automotive sharing platform needs to find an equilibrium with the potentially higher travel demands on the roads that intensify pre-existing congestion and pollution. Furthermore, the effects of the drastic transport behavioral changes that arose from the sharing economy and instigated by big data technologies and the inflow of private investment that improves connectivity by the use of smartphone applications. Lastly, managing the equilibrium between the encouragement of the sharing economy corporations through private investment and governmental policy mediation remain a great challenge. To advance the sustainability of the sharing transport industry innovations, and simultaneously deal with the unsatisfactory outcomes, holistic comprehension of the changing mechanism and its environmental, economic, and social effect to the society is crucial.

## **Research Methods**

To better understand the link between advances in urban landscapes and business innovations, an analysis of the sharing economy will be conducted. This study analyze secondary data that focuses on the new and rising transport sharing economy in Shanghai, China. Firstly, the transformation to sustainability of the transport sector in Shanghai, in light of China's efforts to reduce carbon emissions, is contextualized. Next, three case studies of corporations in the transport sharing industry in Shanghai will be analyzed. These are Di Di Chu Xing (a private ride sharing corporation), EVCARD (an electric vehicle sharing corporation, backed by

the government), and Mobike (a bicycle sharing start-up). Existing research and the three case studies are studied to comprehend and find similarities and differences between development trends in tie to sustainability goals.

Thirty interviews were analyzed with respondents and representative agents in the transport sharing industry in Shanghai. The respondents consist of owners and management teams of elected corporations, governmental policy makers in the automobile industry segments, university administration and specialists of sustainable development, and the strategic planning teams of the largest automobile corporations in Shanghai. The interviews focused on three areas of sustainability in the transformation of their corporation models:

1. The significance of the disruptive technologies and innovations brought about by the automobile-sharing sector to their own corporation practices.
2. The significance of low carbon emissions and a sustainable transition of the urban cities and the nation to their own corporation practices.
3. The processes amongst the players in the macro and meso levels of development pertaining to sustainability.

Corporation information, public resources and accounts of and reports from the automotive sharing corporations and others—along with governmental policies in Shanghai and most of urban China, legislative actions, processes of development, and reports from media--were used to gain a holistic overview of the situation and to analyze and reaffirm the respondents' perspectives.

After analyzing the data, oen can argued that there is a strong relation between the evolution towards increasingly sustainable urban cities on the macro level while the corporation ecosystem improvements towards a more intelligent and greener

transport system on the meso level.

### **Shanghai's Transformation towards Sustainability on the Macro level**

The analysis conducted above sheds light on how Shanghai has begun to adapt and evolve towards sustainability. Lowering the carbon emissions has become a national aim of China to solve its many pressing developmental issues along with its swift economic growth, which include restructuring of its economy, reducing overcapacity, degradation of the environment, improving social welfare of its people, and developing renewable energies and energy-based automotive industries<sup>11</sup>.

Despite the challenges in transiting through its complex policy-making processes, China managed to set up a decarbonizing plan<sup>12</sup>. The disparity between the consumption of coal and primary consumption of energy has manifested itself ever since 2011. In 2014, China arrived at the highest level of the consumption of coal, pointing towards a shift in the carbon-lowering energy sources. Also, it is pertinent to note that growth in energy consumption was decoupled from economic growth ever since 2005.

Along with the nation-wide reduction of carbon emissions, urban cities are also rapidly adopting low-carbon developmental trajectories that are more sustainable

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<sup>11</sup> Liu, Z., Guan, D., Crawford Brown, D., Zhang, Q., He, K., Liu, J. 2013. *A low carbon road map for China*. Nature: Nature 500 (7461), 143-145.

<sup>12</sup> Qi, Y., Liu, X., 2016. *Ride-sharing Business Report*. Caixin Weekly, 32nd, Beijing and Shanghai.

in the long run<sup>13</sup>. An analysis of interviews and essential planning policies displays that Shanghai is a pioneering in its transformation towards sustainability while, at the same time, China is pursuing its goals of reducing carbon emissions and making positive developments in the low-carbon industry.

### **Physical Constraints within the Nation**

Despite the gains that have been made in terms of sustainability, we must also consider the government role in such practices. In particular, China's authoritarian governmental structure requires the careful drafting of master plans to accurately define the goals for sustainable development<sup>14</sup>. With Shanghai's Master Plan that covers from 1999 to 2020, its goals of conserving the environment, developing renewable energy and instituting green spaces turned into its developmental goals. Yet, in the latest 2035 master plan that was released two years ago, the priority has veered towards improving efficiency to the control of land, population, environmental degradation, and the growth of energy sources.

The most pertinent idea of the 2035 Shanghai Master Plan is its focus on ecological constraints and its plan to strengthen governmental control to ensure that these physical constraints are not violated, which means not harming the existing ecological system. More contentiously, the 2035 plan demarcates a cap in the population for Shanghai to 25 million. It is critical to note that Shanghai now has a

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<sup>13</sup> Bai, X., Shi, P., Liu, Y. 2014. *Society: realizing China's urban dream*. Nature 509 (7499).

<sup>14</sup> Wu, F. 2015. *Planning for growth: urban and regional planning in China*. Electronic Resource. Routledge.

population of over 24 million. This shows the tenacity of the government to protect its environment that is under difficult physical constraints. The study of interviews with Shanghai's policymakers reaffirmed this perspective.<sup>15</sup>

### **Innovative and Green Development**

Along with understanding and working within its physical constraints, Shanghai also seeks to integrate its long-term aspirations for economic growth with the rising social sustainability and environmental aims. Not only does Shanghai seek become an international high-end innovative and financial hub, it also hopes to develop itself sustainably over the next few decades, including improving the environment and the wellbeing of its people. This goal emphasizes that maintaining a healthy urban environment is an essential component to the international competitiveness of Shanghai.

Five essential elements are being utilized to describe Shanghai's immediate developmental trajectory: integrative, innovative, open, green, and sharing. The stress on holistic sustainable development is an expansion from the previous plans. Similarly, the analysis of interview transcripts with Shanghai's policy makers confirms that sustainability has turned into a well-established core principle in Shanghai's knowledge system. In the interviews, the focus on the discussion is always on how to continue evolving the urban landscape and push for business innovations that promote sustainability and making sure the path to achieve this sustainability is in itself sustainable.<sup>16</sup>

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<sup>15</sup> Liu, Z., Guan, D., Crawford Brown, D., Zhang, Q., He, K., Liu, J. 2013. *A low carbon road map for China*. Nature: Nature 500 (7461), 143-145.

<sup>16</sup> Ibid.

### **Rapid Changing Socio-economic Relationships and Fairer, Cleaner Development**

As Shanghai seeks to move towards these goals, a complex set of factors emerge, as various sets of people have diverse and sometimes conflicting agendas. Within Shanghai, the major socio-economic relations primarily relate to the collaborations and tensions within and between three stakeholders—the corporations, the government, and the individuals. These three groups of players respond to one another using formal and informal rules, legislative frameworks, political customs, and local cultures.

The complex interplay of these interactions transforms is also influenced the dynamic economic and political circumstances of both Shanghai and China. For instance, the governmental-corporation ties have went through collaboration, disputes, and rent seeking at different intensities. Corporation and individual interactions also led to an improvement in the welfare as well as the reverse like the precariat<sup>17</sup>. For each stakeholder, there are also a plethora of embedded relationships and sub-categories. For instance, one of the interview respondents highlighted that Shanghai-China government ties may convolute or impede the evolution taking place within the city due to the differing and often antagonistic agendas<sup>18</sup>. Furthermore, people with differing behaviours and principles towards sustainability would also shape one another's views, contributing to either increasing opportunities or increasing

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<sup>17</sup> Ngai, P., Chan, J. 2012. *Global capital, the state, and Chinese workers*. *Modern China* 38 (4), pp. 383-410.

<sup>18</sup> Zheng, Y. 2006. *Explaining the sources of de facto federalism in reform china: Intergovernmental Decentralization, Globalization, and Central-Local Relations*. *JJ. Political Science Issue* 7 (02), pp. 101.



difficulties to transformation towards sustainability. Shanghai's authorities also display their vast worries about the increasing complicatedness of the socio-economic relations, and they attempt to solve it through improving the sharing and green developments. However, it is uncertain if the socio-economic tie is proceeding towards a more sustainable trajectory or not.

### **Industrial Transformation**

The automotive sharing industry has led to the arrival of a dynamic, innovative corporation ecosystem innovation. In response to the aforementioned physical constraints, partially following the national and international trend of constructing intelligent and digital urban landscapes, Shanghai has strategically developed its digital arenas to allow for increasing economic growth without compromising sustainability goals. Shanghai has managed to develop extensive information and communication technology (ICT) frameworks and encouraged the use of smartphones among its people<sup>19</sup>. China has the biggest base of netizens worldwide, where there are more than 1.3 billion Chinese using smart phones, and 90 per cent of them are surfing the net through their mobile phones<sup>20</sup>. Because of that, the digital economy continues to thrive in China even with the abating material economy. Not only does China have the biggest market in terms of e-commerce

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<sup>19</sup> EITC ShGov. 2015. *Economic and Information Technology Commission of Shanghai municipal People's government*. In: Annual Report on Shanghai Industry and Informatization Development: Smart City. Shanghai Scientific and Technological Literature Press, Shanghai.

<sup>20</sup> The Economist. 2016. *WeChat's World*. Retrieved from, <http://www.economist.com/news/business/21703428-chinas-wechat-show-way-social-medias-future-wechats-world>.

internationally, it also has the most rapidly developing online-to-online industry<sup>21</sup>.

The rapid development in the digital economy has given rise to an economic resource pool that enabled the growth of the first of automotive sharing systems. This included Uber China and Di Di Chu Xing, car-ride sharing services. Due to the burgeoning online-to-online market, particularly the growth of the sharing economy, investments in such start-ups are generating huge interest amongst venture capitalists. DiDi and Uber managed to clinch more than \$1 billion of funds, over several rounds of funding, to successfully incentivize people to consider their transport services over the traditional buses and trains. In a short period of time, these incentives and subsidies managed to transform societal behavior, leading to a merger in 2016. The disruptive technologies of the application-based ride-sharing service managed to transform the automotive industry in a short span of four years. Prior to 2012, urban citizens were reluctant to utilize their smartphones to plan their daily travels. But in 2016, over 80 per cent of urban dwellers are using application-based transportation options. As such, many of the corporations within the transportation sector have started to incorporate intelligent and sharing features into their services and have developed applications to compete against Uber and Didi.<sup>22</sup>

### **Industrial Feedback**

The arrival of big data as well as the internet of things helped to increase efficiency of the pre-existing industrial sectors which further brought about the

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<sup>21</sup> Zhang, W. 2015. *Behind China's Runaway Online-to-offline Commerce*. Mckinsey Quarterly. December.

<sup>22</sup> Cramer, J and Krueger, A. 2016. Disruptive change in the taxi business: the rise of uber. *Am. Econ. Rev.* 106 (5), pp. 177-182

industrial transformation of the automotive sector.<sup>23</sup> The transport sharing industries see themselves first as technological corporations, rather than transport companies. This is due to the fact that their competitive advantage lies within the application-based sharing service. For instance, Didi asserts that it has to process 70 TB of data for about 20 million transportation services every single day. It also subsequently started a Didi Research Institute, led by international top experts of machine learning and big data in 2016. The electric vehicle rental application system is also seen as their main asset. Even though EVCARD and Mobike also own physical assets such as the electric vehicles and bicycles, the technology behind the service is key.

The surfacing of application-based transport sharing platforms has revamped the transportation industry, bridging formerly parallel sectors like electric cars, fuel-powered cars, motorbikes, and bicycles into one automotive sharing corporation ecosystem. The technological innovations in this sector have removed the boundaries and challenges of various key modes of transport and have promoted the flow of production features from one sector to another. This includes information, financial capital, and people. For instance, the co-founder of Mobike was previously a senior employee at Ford Motors, a leading international automotive corporation. His initial foray into Mobike was due to his difficulties in starting a car-sharing service due to the complexities involved in working with governments and its target consumers. This required funding that is way beyond what a start-up has and can do. As such, he then tried to implement the same idea into a more affordable industry like bicycle sharing. It is less antagonistic to the various players in the automotive industry and it is less challenging to scale up the consumers. Nonetheless, some of the elements from the car industry were designed and implemented into the bicycles and use the same

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<sup>23</sup> Ibid.

idea of car sharing into bicycle sharing as an important role of smart sharing in urban cities. The other upper management of Mobike was also previously the Shanghai regional manager of Uber China before he entered the Mobike corporation. As such, this inter-connectedness of the automotive industry, sharing ideas and technological expertise was made possible with the transport sharing sector, turning into a corporation ecosystem. Even for the financial investors, there are various overlaps as a venture capitalist could invest in both Didi and Mobike, et cetera. An example is one of the technological and digital giant, Tencent, is an investor of both corporations. An important similarity of Tencent, Mobike, and Didi, is their intelligent technological platforms, including their GPS, use of big data, online payments, social media, application systems, and not the corporations' physical assets.

These disruptive technologies then caused a transformation in the transportation sector and built up a value network that is part of the new and emerging transport sharing corporation ecosystem, which no longer focuses on a single mobility mode. Instead, it is the intelligent-sharing arrangement that is fulfilled through digital technologies that operates as a value network. Such networks then appeal to more transport corporations and the related automobile and service corporations, like car rental businesses, and electric vehicle manufacturing corporations, entering the ecosystem either through assimilating the features of the transport sharing sector into their pre-existing corporation practices or totally reforming their business models to include these features. As a result, the disruptive technologies further compel and trigger robust industrial feedback to further improve the union of physical and social resource pools towards the transport-sharing sector.

### **Co-evolution**

Yet, there are limitations to this analysis. Despite holistically portraying the systemic explanations and results of sustainable development in China, particularly in Shanghai, we still lack pertinent information about how corporations and its stakeholders respond to and take part in structural alterations. On the other hand, a meso-level examination reveals that the swift and dynamic development of the transport sharing sector, as well as the evolution of the mobility sector from automotive industries into a single sharing mobility corporation ecosystem, represents a shift to a more sustainable and greener collaborative transportation and mobility consumerism. To address these weaknesses, I would argue that a co-evolution system, where both urban landscapes and business innovations are linked and advance together, needs to be expounded on by connecting the two frameworks to further explicate the observations of the three cases of these corporations.

### **Stringent Controls for Car ownership and the Lack of Public Transportation**

With a growing 24 million in Shanghai, the demand for transportation is a key indicator of the swift and changing socio-economic development. Each year, new additions of 200,000 brand new private consumer vehicles are on the roads. With a mean commute time of 51 minutes and 18.8 kilometers, the time and distances travelled for the residents in Shanghai is the highest in China<sup>24</sup>.

To deal with this problem, Shanghai is the first city in China to implement car ownership regulations. It also has been the most effective city to do so. Shanghai implemented that new car owners would have to participate in a bidding exercise for a Shanghai Car License to travel and use the highly congested Shanghai roads. This

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<sup>24</sup> ChinaNews. 2015. *50 Chinese cities urban commute report*. China News (online). Retrived from: <http://www.chinanews.com/sh/2015/01-26/7005909.shtml>.

policy has been proven effective in regulating the number of cars in Shanghai, and the growth rate of cars. Besides that, it also generates a significant amount of revenue for the government to further build its public transportation<sup>25</sup>. Researchers have also asserted that many times, car ownership in urban cities like Shanghai is seen as symbol of wealth rather than looked upon for convenience<sup>26</sup>. The new auction regulation then further reinforces this perspective as the price of owning a car becomes more of a luxury that the rich can afford.

However, public transportation in Shanghai still fails to cater to the increasing demand. Even with a swift growth of public buses and trains, it is still insufficient in meeting the needs of its population. The 50,000 taxis that Shanghai possess saw marginal increment from 2003 to 2013 against the backdrop of the population growth. As a result, the expensive costs of car ownership, as well as the insufficient taxi numbers promoted a car-hailing black market.<sup>27</sup>

### **1. Disruptive Technological Innovations Altering Socio-economic Relations and Challenging Physical Limitations**

Shanghai, in order to meet the consumer needs and its growing population, has participated in various initiatives that we see in various cities in China. The introduction of the ride-sharing service has enabled a cheaper, more efficient, and

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<sup>25</sup> Chen, X. and Zhao, J. 2013. *Bidding to drive: car license auction policy in Shanghai and its public acceptance*. Trans. Pol. 27, pp. 39-52.

<sup>26</sup> Williams, M. and Arkaraprasertkul, N. 2016. *Mobility in a global city: making sense of Shanghai's growing automobile-dominated transport culture*. Urban Studies.

<sup>27</sup> Cramer, J and Krueger, A. 2016. Disruptive change in the taxi business: the case of uber. Am. Econ. Rev. 106 (5), pp. 177-182

convenient mode of transport in 2012. To establish the new market, ride-sharing corporations have high expenditure on their subsidies to attract passengers and drivers to sign up. Both Didi and Uber China spent close to 4.5 billion USD in subsidizing the drivers and passengers before they merged.

Such disruptive technologies then revived the resource pool for the automotive sharing corporation ecosystem to emerge later because of how it has already effected behavioral changes in consumers and at the same time questioned pre-existing socio-economic relations. For instance, Didi provides employment to more than 17 million drivers. About 2.4 million of them are underemployed or unemployed because of the Chinese financial restructuring. Research has also found that many of them were employed in other industries before the financial market slowdown. While this new automotive sharing industry has provided significant employment, the rise in flexible labor because of this ride-sharing corporation has also brought along its slew of concerns over a rising precariat<sup>28</sup>.

As for the physical limitations in China, the stringent control of growth has yet to be formalized; moreover, the control of China's booming rate of population growth and of environmental concerns have yet to be institutionalized. Therefore, even with the rapid rise of ride sharing bring forth more vehicles on the Chinese roads, the government did not manage to regulate or ban it. Instead, the government tried to approach it by having soft regulations that gave space for growth while at the same time still having certain laws over it. These ride-sharing corporations did not imbue the same green goals of the city during their start-up seasons, only doing so much later in their development.

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<sup>28</sup> Standing, G. 2016. *The Corruption of Capitalism: Why Rentiers Thrive and Work Does Not Pay*. London: Biteback.

Therefore, the first wave of the transport sharing industry has in fact placed more stress on the physical constraints of a city as it promotes more cars on the Chinese roads, attempted to address the pre-existing socio-economic relations with conflicting results, and had little impact on the urban cities' sustainable development.

## **2. Government Electric Vehicle Strategy as a Sustainable Solution**

While ride-sharing platforms have brought up new problems, other modes of transportation provide a better option. Lavish subsidies from the giant ride-sharing corporations had opened up new opportunities for more variety of transport sharing sector in Shanghai. In 2013, the government leveraged this occurrence and instigated its before underdeveloped electric vehicle promotion plans.

The electric vehicle industry was the key of three interlinked and pertinent points of emphasis for China environmental sustainability, energy security, and economic growth<sup>29</sup>. Ever since the 1980s, China had already wanted to grow its electric vehicle industry, while focusing on the research and development. As such, the development of low-carbon strategies became a national priority, and this has been linked to the development of the electric vehicle industry, which has accompanied the rising demands on the energy supply and public transportation system and been integrated into various large-scale plans. Policies then have tried to greatly subsidize consumers and place robust pressure on the local officials to buy electric vehicles. Yet, in terms of its electric vehicle readiness, this markets

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<sup>29</sup> Howell, S., Lee, H., Heal, A. 2014. *Leapfrogging or Stalling Out? Electric Vehicles in China*. Belfer Center for Science and International Affairs. Harvard Kennedy School.



continually trails behind other markets. Four years into the electric vehicle ownership subsidies program, spending over 37 billion yuan, the uptake of electric vehicles has fallen short of the targets and many of the electric vehicles on Chinese roads were publicly owned.<sup>30</sup>

Under robust pressure to increase the sales of the locally produced electric vehicles, Shanghai's government owned corporation (International Automobile City) started EVCARD, an electric vehicle sharing system, to create a Chinese Autolib. With huge national support such as offering complimentary car licenses, heavily or even free electric vehicles, charging and parking stations for these vehicles, EVCARD managed to prepare its consumers for the application-based intelligent sharing platform to further develop this electric vehicle sharing idea. BAIC and GreenGo also followed suit, further responding to changing consumer behaviors.<sup>31</sup>

As compared to the first wave, EV-sharing has more advantages in trying to align its goals with the physical limitations of urban cities. It encourages greener modes of transport as well as more collaborative types and use of such transport. Yet its socio-economic effect is lower than that of ride-sharing. Since EV-sharing relies on its consumers to drive, social interactions between drivers and passengers are reduced. As such, the influence of EVCARD remains only within a small circle of urban commuters.

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<sup>30</sup> Cramer, J and Krueger, A. 2016. Disruptive change in the taxi business: the case of uber. *Am. Econ. Rev.* 106 (5), pp. 177-182

<sup>31</sup> Ibid.

### **3. Start-ups that Leverage the Sharing Mobility System and Align with Governmental Goals of Sustainable Development**

Other countries and regions have also adopted this practice and are building their policies around a focus on sustainability. On the international front, the United Kingdom and the European Union have long tried to encourage a sharing ecosystem to bring forth more job opportunities and economic growth, especially during an economic recession<sup>32</sup>. The sharing mobility industry was fast-tracked in 2015, which allowed for an assimilation of these concept of sharing into national policies for development by 2016. The salient reason for this shift in policies was also due to the slowing down of the Chinese financial markets and its embrace of producing low-carbon emissions. From 2010, China then went through a difficult transition from a manufacturing economy to a service economy.

Other than the economic outlook, the sharing economy was a way for China to realize its goals of developing a greener environment and to reduce carbon emissions. By enhancing the management and utilization of pre-existing assets, the sharing economy can potentially minimize the consumption of resources, minimize environmental harm and promote a more circular economy<sup>33</sup>. To formalize the sharing economy, Uber China and Didi both tried to align their goals with China's aim to reduce carbon emissions to offer brand new services that promotes green and collaborative consumerism.

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<sup>32</sup> Martin, C.J. 2016. *The sharing economy: a pathway to sustainability or a nightmarish form of neoliberal capitalism?* Ecol. Econ. 121, pp. 149-159.

<sup>33</sup> Zhang, Y and Zhang, Y. 2016. *Internet: Engine of Sharing Economy Development*. Guangming Daily. Beijing. 7 April 2016.

Application-based platforms also sought to utilize the opportunities granted such as Mobike launching bicycle-sharing systems to reduce fuel-based vehicles in the Chinese economy.

During this period, the government's response was swift and positive. For instance, Mobike managed to clinch a strategic partnership with the Yangpu government in Shanghai to encourage the last mile in an environmentally friendly transportation mode, which is a reference to the last distance that people travel from the train or bus station to their homes. It then manages to partner police stations, and several other local governments. By then, Shanghai's government then formalized the goal of targeting 80 per cent of its population to travel via bicycles or by foot.<sup>34</sup>

Yet these corporations have yet to achieve positive response at every level. For instance, stringent regulations have been implemented that require various qualifications for drivers who participate in various ride-sharing programs. This includes the fact that they need to be permanent residents of China. This then affected more than 90 per cent of DiDi drivers since many of them were low skill workers or foreigners who needed a job to survive. As such, even though these sharing systems were complementary to the goals of the government, other factors were considered in the implementation of ride-sharing across the country.<sup>35</sup>

Therefore, for each period, the sharing mobility has created a pertinent and positive effect on all three sustainability goals. It has enabled the physical landscape

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<sup>34</sup> Ibid.

<sup>35</sup> Williams, M. and Arkaraprasertkul, N. 2016. *Mobility in a global city: making sense of Shanghai's growing automobile-dominated transport culture*. Urban Studies.

to be increasingly sustainable through the encouragement of collaborative consumerism through bicycle-sharing, electric vehicle sharing, carpooling, and the use of public transportation on a wider scale. It has also compelled the enforcement of greener and sharing concepts into the system of knowledge via policies and public demonstrations. Further, the cooperation of the government with the automotive sharing industries have incentivized the move towards more sustainable development that can be regulated effectively in the urban cities.

## **Conclusion**

As these previous three sections have demonstrated, the new and rising automotive sharing corporation ecosystem in Shanghai is paving the way for a change in the physical landscape, socio-economic relations, and the system of knowledge that will turn urban cities into increasingly sustainable places. Yet, the advancement pathway is not linear. Instead, it displays an upward spiral trajectory, with many oscillations, towards an increasingly sustainable development. Between close relations and interactions with corporation ecosystem inventions, the rise of a sustainable low carbon development goal has created a co-evolution mechanism.

Firstly, utilizing pre-existing physical information and a communication technology infrastructure, economic venture capitalists for funding, and the social resources within urban cities, technological and other companies have contributed towards industrial transformation and the creation of an all-new corporation ecosystem.

Moreover, the disruptive technologies of the various automotive sharing platforms revealed the physical limitations of the urban regions to a large scale, which

runs contradictory to the goal of lowering carbon emissions and improving sustainable development. The effect on the socio-economic relations of cities has also been mixed. Thus, even with the evolutionary features for the corporation ecosystem, the initial phase of the disruptive technologies could not have been sustained without the various large-scale reforms and support from the other key players and the government.

Secondly, the pre-existing and rapid development of the low carbon emissions goal and system of knowledge of urban cities, along with the increased acknowledgement of physical limitations that restrict urban development, have compelled the government to work on creating and using refreshed pool of resources to help achieve its goals for sustainable development. Considerable governmental support (for instance, EVCARD), along with additional support from corporations that encourage diversity in the market, helped to form a value network around the application-based intelligent-sharing system that occurred during the age of disruptive technological innovation. The government has also made efforts to respond positively and actively to this all new corporation ecosystem, through providing a clear preference for greener modes of transportation over other petrol-fueled vehicles.

Thirdly, government support and industrial feedback related to the automotive sharing industry has led to positive impacts, such as an increased number of entrepreneurs, start-ups, and greater economic, social, and political efforts to lend their resources towards greener and transport sharing inventions. In view of these support from all fronts, the macro-level urban government, as well as the meso level corporation ecosystem has paved the way for urban cities' sustainable development goals.

Therefore, the rise of the co-evolution mechanism displays a circling dynamic which does not go along a linear trajectory and requires several back and forth feedback loops towards sustainable development. The pre-existing and transforming sustainable systems of knowledge, physical limitations, and socio-economic relations have interconnected roles that help move the corporation ecosystem towards sustainability.

### **Limitations and Future research**

As this research is limited to only one urban scenario, Shanghai, and only one industry, the transport-sharing sector, that is still expanding and leading to maturity, it is necessary to further evaluate the study through the lens of other scenarios and cases. Nonetheless, this is an important study that evaluates the major dimensions of the culture and environment and the extent to which they have promoted or constrained the evolutionary outcomes of sustainability through a difficult period in the industry's initial development.

Firstly, financial capital's role is both pertinent and problematic. Since the transport sharing corporations are technological corporations, their financial trends depend greatly on venture capitalists, who may have extensive shares in these start-ups with various investment rounds, which may usurp sustainability goals and decision-making processes from the original brainchild. Further research is also required to find out how start-ups come to terms with the short-term goals for profit seeking and personalities of venture capitalists with the required long-term strategies for sustainable transformation, which may not necessarily bring forth immediate advantages.

Secondly, it is challenging to regulate the quality of service and the consumers' behavior in the transport sharing economy, particularly if one considers the complex and uncontrolled relations between the owners of the various platforms and the government. Often, we face a crucial decision: whether to regulate the actions of these corporations by the government or to employ a more flexible or indirect approach of management of these corporations, overseeing their services and products to ensure they meet industry standards for quality, labor conditions, and environmental impacts, among others.

Thirdly, the increasing power and authority of these transport sharing corporations need to be looked at. Since the market leans towards a winner-take-all approach where one of the corporation will eventually acquire its competitors, this problem of monopoly is another issue that needs to be uncovered and resolved.

Finally, this research argues that increased acknowledgement and systemic governmental control of the developmental and co-evolution synergies between the corporation ecosystem and the important socio-ecological boundaries in urban cities will enhance the success rate as cities move toward sustainability. As such, another question arises: how will these synergies be fostered toward improving sustainability within and across each large and diverse urban city within a particular region or country?

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