

Hurry-Slow: Automobility in Beijing, or a Resurrection of the Kingdom of Bicycles?

Glen Norcliffe (York University)

Boyang Gao (Central University of Finance and Economics, Beijing)

Abstract

During the Maoist era substantial sums were allocated to building infrastructure segregating bicycles and other slow moving vehicles from motorized vehicles in China's major cities. This was accompanied by the development of a large domestic bicycle manufacturing sector, the result being to create what has been dubbed the 'Kingdom of Bicycles'. Post-Maoist China has seen the rise of automobility, with rapid growth of car ownership, as well as a shift to collection and deliveries by motorized vehicles. Transport infrastructure in Beijing has not been able to keep pace with this rise of car ownership despite a huge investment in roads, expressways and urban transit systems, with the result that urban traffic is frequently congested and atmospheric pollution sometimes severe. Motorists have put pressure on cycling spaces including demands to convert cycling lanes for motor vehicles, and to exclude cycles from spaces to which they formerly had access. But congestion and pollution has forced planners to resist, and re-think the role of cycles. Recently there has been a rising interest in recreational riding, e-bikes have become very popular, bike-sharing has rapidly expanded on campuses and in the city, and bicycles and tricycles have found new commercial niches, including delivering on-line purchases and hot meals to working couples.

Key words: Bicycle, Automobility, Beijing, de-Bikification, Congestion, Transport.

In *A Sentimental Journey through France and Italy* Laurence Sterne's eighteenth century protagonist, Mr. Yorick, revels in the pleasures of travelling slowly.¹ Sterne's verbosity results in long digressions, but that is the point: Sterne was not hurried because he felt important associations are made with the people one encounters *en route*, and not by swiftly ticking off a list of the celebrated sites of the Grand Tour. "Sentimental," as used by Sterne, speaks for the leisurely stopovers along the way that foster convivial exchange. A century later another travel writer, Elizabeth Pennell, travelling on a tandem tricycle with her illustrator husband, Joseph, wrote that "the oft-regretted delights of travelling in days of coach and post-chaise, destroyed on

the coming of the railroad, were once more to be had by tricycle or bicycle.”² The title of the Pennells’ book,³ dedicated to Laurence Sterne, makes clear their journey was in the same spirit.⁴ For Sterne and for the Pennells, travelling slowly resulted in an experience profoundly different from that of fast travel.

The Pennells’ journeys by tricycle anticipated the great Western cycling boom of the 1890s, made possible by the advent of the safety bicycle. By 1900, the price of a bicycle, which had initially been high, had dropped dramatically, making it affordable to the average adult. At this point China was still under the rule of a decaying Qing dynasty resisting change – until finally obliged to recognize the forces of modernity underway elsewhere. By then the bicycle had entered the daily life of Europeans, whereas in China the delayed embrace of modernity led to cycling becoming an everyday event only in the Maoist era 1949-1976, a full half-century later than in Europe. Then, for a period in the mid to late twentieth century China took to cycling *en masse*, developing bicycle-friendly road infrastructure with little need for traffic lights because the bicycles simply flowed. From the 1960s the bicycle was the people’s customary mode of transport, thus earning China the title “The Kingdom of Bicycles.”⁵ Bicycle-use at that time was more functional and utilitarian than it was on the Pennells’ leisurely excursions, but cycles are not sealed-off bubbles: riders are exposed to humanity in ways that facilitate conversation and social interaction. For several decades the bicycle and tricycle were part of quotidian life in China, ferrying young children to school, journeying to work, shopping, delivering all sorts of goods, transporting agricultural products to market, and carrying the aged and infirm in pedicabs. And on public holidays bicycles were often used for recreation and social trips. Occasionally these were hurried trips if the rider was late for class or work, or

delivering an urgent item, but more generally cyclists go with the flow, which implies finding a comfortable cadence.

China's shift in late 1978 to an Open Doors agenda instigated by Deng Xiaoping saw the launching of programs designed to catch up to other industrialized countries. This required new infrastructure, the rapid growth of coal-fuelled heavy industries and utilities, and diversification into higher-value-added industries including an automobile industry with its elaborate supply chains. Social transformation accompanied these changes predicated on the principle of hurrying. China's twenty-first century transition into the world's leading manufacturing country has resulted in accelerated urbanization, massive migration from the countryside to cities, the rise of urban automobility, and extended periods of grim atmospheric pollution.

China's increasingly affluent society has embraced automobility while many have abandoned cycling. In this, China presents a case of the developmental state, intent on rapidly transforming itself into an advanced industrialized country (AIC) in per capita income, in technology, in housing, and in infrastructure. In transportation, China is in many respects a world leader. Measured in purchasing power parity, China's GDP has now surpassed that of the US.⁶ China has the world's most extensive high-speed rail network with over 20,000 km in operation and close to 1 billion passengers in 2015. It has approximately 250 commercial airports; civil aviation carried 436 million passengers in 2015, second only to the US (with 798 million passengers).⁷ Chinese cities have the most extensive mass-transit systems, with Beijing's network having nineteen subway lines extending 700 kilometres with 319 stations. By 2013 twenty Chinese cities had an operating subway system, with several more under construction. All large cities have ring roads and are connected by expressways. Beijing, with a total population close to 20 million, now has six ring roads (although the first is not strictly a ring

road). A seventh regional ring road some 940 km long is under construction with a 2017 completion date. Nine expressways radiate from Beijing in every major direction, forming part of what Lefebvre calls the *architecture of enjoyment*; millions of its citizens find pleasure behind the wheel of an automobile, despite traffic congestion.⁸ And in 2012 China was the world's largest new car market, recording 18m sales against 14.5m in the US.⁹

The adoption of modern culture and lifestyles has accompanied China's rapid industrialization and urban development in the major cities, but with a price in the form of problematic traffic jams and periods of air quality well below accepted international standards. The negative externalities resulting from the quest for speed have become sufficiently acute that city planners and administrators are taking steps to remedy them. Among the solutions is a revival of cycling as planners seek alternatives to rising automobility and the environmental problems that motor vehicles and industry create.¹⁰ And citizens themselves recognize that Beijing and other major cities have serious air quality issues urgently needing abatement. During periods of severe air pollution afflicting China's major cities, limits are placed on motor vehicle-use and coal-burning industries, and power stations are sometimes shut down.

China entered the twentieth century for the most part following the age-old rhythms and practices of the Middle Kingdom. Society was still predominantly rural and hierarchically organized. Life was conducted at a measured pace, not yet perturbed by the architectures of modernity – and hurry – designed to speed up movement, work and even play. One suspects that Laurence Sterne would have appreciated China's pre-modernity, little changed since the travels of Marco Polo. But the twentieth century saw it transform slowly, then open up to globalization in 1978 at an accelerating rate which culminated, by the twenty-first century, in a self-defeating quest for speed. The "hurry-slow" outcome arises in two senses: impatient drivers anxious to

floor the accelerator pedal of their Audis and BMWs soon come to a screeching halt; and the strict quotas now in place on purchasing a new vehicle is dramatically slowing the pace of vehicle acquisition. Recently, these circulatory embolisms have so severely hampered movement that serious consideration is now being given to a partial recovery of cycling, not as a reversion to the Kingdom of Bicycles but as a new more earth-friendly modulated lifestyle integrated with other forms of transport.

RISE OF THE KINGDOM OF BICYCLES

Cycling in China was launched in the late 1860s by a report sent to the Imperial Court by members of a Chinese diplomatic mission visiting Paris.¹¹ They described the many modern developments they observed in France including the appearance of the velocipede. But even in the late 1890s when foreign diplomats, missionaries, and businessmen introduced a few bicycles to the major cities, they were regarded as a part of an alien culture¹²: wealthy Chinese travelled slowly and with dignity in sedan chairs and rickshaws. The first commercial imports were recorded in Shanghai in 1898 at about the time the bicycle was recognized in China as a practical means of transportation with military potential.¹³

With the development of an efficient and reliable safety bicycle early in the twentieth century young Chinese – particularly those returning from study overseas - began to take an interest in cycling. A range of modern western commodities from phonographs to bicycles became acceptable consumer items for upper class Chinese who dealt with the cultural dilemma of purchasing western equipment by proposing that Chinese knowledge lay behind the technology. But the bicycle hardly penetrated cities in the interior, where many citizens first saw bicycles only in the 1930s.¹⁴

The final collapse of the Qing dynasty in 1911, and the tentative modernization of major cities close to the coast (for instance by adopting the western calendar) led to wider adoption of the cycle for leisure and for work. By 1930 Shanghai had around 20,000 bicycles, used mainly by postmen, police, and the military. They were also increasingly used as a means of delivering small consignments of goods, indeed during the Japanese occupation considerable quantities of rice were smuggled from the countryside into cities on bicycle racks. In the early 1930s the major cycle importers in Tianjin, Shanghai and Shenyang began to assemble bicycles using imported components and then, by a process of import substitution, shifted to making the whole bicycle. Eesfehani reports that during the period 1937-1945 China's annual production was around 10,000 bicycles.¹⁵ By 1949 when the People's Republic was declared, China may have had half a million bicycles on the road, and the groundwork had been laid for the Kingdom of Bicycles.

The new Chinese government promoted the use of bicycles in five ways.¹⁶ First, many smaller makers were merged into larger manufacturers. The resulting greater volume yielded some economies of scale, such that prices fell. Second, bicycle makers were given preferential access to rationed materials. Third, bicycle lanes (shared with other slower vehicles) became part of the urban fabric. In 1957, Beijing's first *sān bān shì* (three-lane carriageway), Sanlihe Road, was built following a Soviet model, with two motorized vehicular lanes of fourteen meters each, and two bicycle lanes of four meters each, with a green separation strip. Fourth, commuting workers received priority for a bicycle buying ticket under the state rationing system, especially if they were blood donors, and they could also obtain financial subsidies when purchasing a bicycle.¹⁷ And fifth, during the pre-reform period the work unit system (with residential blocks located close to places of work) reduced travel demand and shortened travel

distance thereby favouring walking and cycling.¹⁸ The results were remarkable: by 1958 around a million bicycles a year were being manufactured, nearly all for the domestic market (compared to around 80 million today, of which two-thirds are exported).

From the 1950s to the 1970s under Mao, bicycles were one of the four “musts” (*sì-dà-jiàn*), along with a wristwatch, a radio, and a sewing machine (these were also known as “three spins, one sound”). The Changcheng Bicycle Works, built in Tianjin in 1936 by two Japanese army veterans, began by mass producing Anchor bicycles for the Chinese market. Converted to munitions production during the war, after the CPC takeover in 1949 this factory was re-converted to make Flying Pigeon (*Fēi Gē*) cycles which were, in practice, modelled on the 1932 British Raleigh roadster. Also founded in 1936 was Shanghai’s Tongchang Chehang Bicycle Works, making *Yǒng Jiǔ* (Forever) bicycles, and the Daxing Bicycle Works in Shenyang making *Bǎi Shān* (One Hundred Hills) bicycles.

By the 1960s and 1970s, with the large scale production of bicycles and tricycles by the “big four” makers, *Fēi Gē* and *Hóng Qí* (Red Flag) in Tianjin, and *Yǒng Jiǔ* and *Fèng Huáng* (Phoenix) in Shanghai, plus several other smaller makers, China could legitimately be heralded as the Kingdom of Bicycles. These bicycles were solidly built roadsters, with brand names intended to convey their durability (and, implicitly, the durability of the modern socialist nation promoting this industry) while also having patriotic undertones. As noted above, urban infrastructure was built to reflect this priority as bicycles became a major form of urban transport. On most city roads, dedicated rights-of-way (usually with a low barrier) were created for the thousands of slow moving bicycles, rickshaws and animal drawn vehicles, thereby separating them from motorised vehicles.¹⁹ Traffic in the bike lanes usually moved at 10-15 kph, and unlike the motor vehicle lanes, they were rarely blocked by jams. This bicycle-friendly

arrangement with slower traffic segregated from motor vehicles became institutionalized in China's cities during the 1950s, 1960s and 1970s.

Sturdy bicycles were used by men and women to travel to work, to study, to shop and to visit friends and relatives. A bicycle bestowed considerable kudos on its owner whose children might be seated at the front or behind the cyclist. Most trips were relatively short, with longer trips usually made by bus. Also in widespread use were other forms of wheeled conveyances. Tricycle rickshaws carried the elderly and infirm to markets, to medical centres, and even to bus stops and local railway stations. Working tricycles were ubiquitous, and sometimes incredibly overloaded carrying furniture, water, farm produce, coal, construction materials, and all sorts of other freight. They moved slowly but could be manoeuvred along the narrow backstreets and *hútòng*²⁰, between barriers on construction sites, and past parked motorized vehicles blocking other motorized vehicles. Operating as micro-enterprises, these working tricycles were the lifeblood of small retail markets, construction work, local fuel deliveries and recycling. Pedal tricycles were also used by thousands of municipal workers assigned to cleaning streets and maintaining parks.²¹

Riders of these cycles moved slowly, although often faster than cars do today.²² They shivered in winter, sweated in summer, and were soaked by the rain, but they were mostly convivial.²³ Sentiments of the moment, greeting other cyclists, waving to friends and family when passing them, or shouting at someone blocking the way, were all personal face-to-face communications. Occasionally riders were in a hurry, but the nature of cycling is to find a comfortable cadence that permits a pedaller to maintain a rhythm while engaging with his or her surroundings. At times they resembled the slow safaris acclaimed by Laurence Sterne. It is estimated that there are still 430 million bikes in China today, some handed down through

generations but increasingly they are being replaced by e-bikes and their use has declined dramatically.²⁴

OPEN DOORS, AUTOMOBILITY AND DE-BIKIFICATION

When the Cultural Revolution came to an end in 1978, cars were rarely seen in China outside major cities, and those in evidence were mainly Chinese Red Flag saloons and Soviet Ladas driven by Government officials. Private cars were rare: trips around the city were made by bus, by bicycle, or by walking. But the opening of China to foreign investment, trade and technology after December 1978 under Deng Xiaoping's Open Doors policy set in motion a phase of rapid industrial growth, initially in Special Economic Zones along the coast.²⁵

Importantly, this was not just an economic revolution but also a revolution in lifestyles as China evolved into the World's leading manufacturing and trading nation. A rapidly growing economy and rising incomes fostered a younger millennial generation – the *bā líng hòu* (born in the 80s) and the *jiǔ líng hòu* (born in the 90s) - that was interested in consumer goods, global developments, travel, new technologies and innovations that had been denied to their parents during the Cultural Revolution. Private ownership of cars, apartments and appliances, along with the consumption of exotic foods, music, electronic devices and their apps, were all part of this cultural change. Fast food in the shape of international and domestic chains made an appearance.

Even up to the mid 1980s only a few thousand cars were produced annually in China, but then private car ownership was declared acceptable, and taxis appeared in major cities. A flood of Japanese cars followed, making China the second most important export market for Japanese makers after the US. The resulting trade deficit led to a moratorium on imports and efforts to

boost local vehicle manufacture. But “the launch of the National Automobile Industry Policy in 1994 had a detrimental impact on bicycle use and marked the beginning of a dramatic decline in bicycle use in Beijing”.²⁶ In 1996 it was estimated that there were 9.2 million bicycles in Beijing for the 12.5 million residents (72 bicycles for every 100 people, or about 2.5 bicycles per household²⁷. But the actual use of bicycles was in steep decline as former cyclists who had purchased cars switched to using automobiles for most trips, while others, fearful of the growing vehicular traffic, switched to public transport. Following the launch in 2000 of China's Western Development Plan, major cities in the mid-west of China joined this new phase of industrialization. For instance the Chang'an Automobile group headquartered in Chongqing (which formerly made military equipment) now has partnerships with several western car makers.

Developments since 1990 included the opening a branch motor vehicle assembly plants by a number of European, American and East Asian car makers seeking to gain a slice of China's domestic car market, normally by creating a joint-venture with a state-owned corporation.²⁸ Thus the largest brand by sales (Volkswagen) is made in a joint-venture with FAW, a state-owned manufacturer headquartered in Changchun that also sells cars with its own brand names. Several domestic car makers also entered into this fight for market share in the World's fastest growing car market. Within 20 years private motor vehicles were jamming traffic in all major Chinese cities, and bicycles no longer ruled the streets. “In 1986, bicycles made up 63 per cent of transport on the roads. Last year (2014), they accounted for just 15 per cent”.²⁹

Even by the 1990s motorized vehicles had become a problem, not only on the streets but also in housing complexes that were designed with parking spaces for bicycles but not for cars. Beijing introduced a *Proof of Parking Certificate* in 1990 requiring that in order to purchase a

car you had to have a parking certificate. Alas, many of the certificates were forgeries, the system proved hard to police, and it was eventually abandoned. Shanghai's adoption of a lottery to reduce the growth of traffic in 1994 proved fairly successful. Beijing, on the other hand, did not implement its own vehicle quota system until 2010. And instead of Shanghai's revenue-generating licence auctioning, in 1990 Beijing adopted a random lottery system with no revenue (although it was more equitable).³⁰

Feng and Li report that "since China joined the World Trade Organization (WTO) in 2001, its automobile industry has expanded significantly. The output has risen from 2 million vehicles in 2000 to 18 million in 2010."³¹ In fact China is now producing nearly one quarter of the World's output and is the world's largest maker of cars. Older bicycles, on the other hand, have been abandoned by the thousand and lie in neglected piles outside apartment buildings and elsewhere. The tensions resulting from this switch to automobility will be examined in the context of Beijing.

The rise of automobility in Beijing has been documented, but the rise and decline of bicycle use has not been recorded very accurately. The modal split of journeys-to-work from 1986 to 2010 is shown in figure 1.³² It shows: a steady growth of subway ridership from 1% to 12%; bus ridership holding steady around 26-28%; bicycle use dropping rapidly from 63% to 17%; and private cars and taxis rising from 5% to 40%. As widely reported, cycling dropped dramatically by nearly three-quarters, bus transport was unchanged, following the expansion of the subway system rail trips rose twelve-fold, and motor vehicles (cars + taxis) rose eight-fold. Meanwhile the time taken for journeys-to-work has grown, although the data is somewhat contradictory with average daily journey times between 52 and 97 minutes recorded, but there is

consistent data indicating that Beijing workers have the longest average commute in China of 19.2 kilometers.³³

The number of vehicles registered in Beijing (see Table 1) more than doubled from 2.1m in 2005 to 5m in 2012 - or 63 private cars for every 100 households.³⁴ But the proportion of trips in vehicles rose only about a quarter between 2005 and 2010, in part because of attempts to reduce transport demand discussed below, and in part because many households have 2 cars to avoid one of the rules of transport demand management. Since 2005, a national public-transit-priority strategy has been promoted. Many cities invested heavily in building public transit infrastructure, and announced policies to encourage people to use buses and subways.

THE BEIJING OLYMPICS AND THE FIRST SLOWING

The 2008 Olympics put Beijing in the world's eye as never before. Well before the actual games, the *Bird's Nest* Olympic Stadium was receiving favourable coverage worldwide. But the reports came with a coda: thick pollution (CO₂ and airborne particulates) made the intricate structure hard to see much of the time. The citizens of Beijing had been living with this increase in pollution for quite some time, and the wearing of face masks had become commonplace. Urban planners in Beijing and other major cities were well aware of this problem, and discussions were already underway to curb pollution.³⁵ But the Olympics crystallized these rising concerns and the Municipality and the Central Government began to evaluate policies that would alleviate the problem. During the Olympics the short term solution was an almost total ban on the use of private cars by Beijing's residents. But since then vehicular pollution has continued to grow and the 5.6 million vehicles in Beijing in 2016 are estimated to have added 500,000 million tons of pollution to the atmosphere.³⁶ According to

Liu and Liu (2009) the most promising national strategies were to accelerate the up-grading of technologies, particularly by shifting industrial structure to cleaner higher value-added activities, reducing the fossil carbon component in the energy mix, and developing CDM (Clean Development Mechanism) projects (as defined in the Kyoto Protocol of 2007).

In practice, Beijing's government pursued several solutions. First, a number of heavy industries and utilities (such as coal-burning power stations) occupying space close to the central city were moved out to the urban fringe.³⁷ This removed much (diesel) truck traffic from central Beijing.³⁸ Second, changes in power generation were initiated including a switch to nuclear power and cleaner fuels to reduce the carbon imprint. Between 2000 and 2008 China doubled its hydro-electric capacity, increased its wind generating capacity 30-fold, and its nuclear capacity fourfold, although coal still accounts for about 70% of generating capacity.³⁹ Third, the expansion of subway and commuter rail systems was accelerated so as to shift the modal split in favour of rail transport. And fourth, transport demand management (especially of vehicles) became a priority. Steps were taken to reduce vehicle traffic by offering cheaper fares on the extensive subway system, and by limiting vehicle use with restrictions according to licence plate numbers - plates with odd and even numbers could be used on different days of the week.⁴⁰ This policy was initially effective in that it was reported to reduce the number of cars on Beijing's roads by 700,000 and vehicle exhaust emissions were cut by 40%. This rule meant that a vehicle could only be used half of the time, so vehicle taxes were reduced - a concession that cost the Municipality ¥1.3 b. But in the longer term, those who could afford it bought a second vehicle with a licence plate showing the opposite number, with the result that the number of vehicles began to rise even as their use declined. Within 3 years the effects of this road rationing were reversed.

COUNTERING AUTOMOBILITY

Transport Demand Management did slow down growth of car ownership in Beijing, particularly after 2011. Due to quotas, the threshold of five million registered cars was hit in early 2012 – nearly a year later than expected. With a quota of 240,000 set in 2011, the number of new cars was one about third of the 2010 number (720,000).⁴¹ Road space rationing was taken further in 2012 when a lottery system was adopted for the purchase of small passenger cars: to be eligible to enter the monthly lottery, applicants had to have *hùkǒu* status in Beijing, have paid city taxes for more than 5 years, not already own a passenger car, and have a driving licence.⁴² On days with red alert smog levels, further restrictions were imposed on motor vehicle use, although electric cars were exempted. By November 2013 only 18,000 new vehicle licences were awarded in the monthly draw - and there were 1.74 million applicants. From 2014 through 2017, the number of new licences awarded has been reduced from 240,000 a year to 150,000.

The push for electric cars was taken further in May 2016 when 60,000 of the 150,000 annual new licence plates were reserved for electric cars. The city has pledged to provide the infrastructure needed for this shift to electric cars with 20,000 roadside vehicle chargers planned by 2020 (China as a whole had 49,000 public charging stations operating in 2015 compared to 32,000 in the US). Most of these electric cars are small and light two-seaters suited to urban travel (to work, to shop, and to socialize) and intended for use in bicycle lanes (they are not designed for long-distance travel).

There has also been change on the bicycle front as sales of e-bikes have grown rapidly since 1996 with an estimated 2.5 million electric bicycles and tricycles now operating in Beijing.⁴³ It is estimated that the number of e-bikes in China as a whole rose from 40,000 in

1998 to 10 million in 2005.⁴⁴ A major factor in the resurgence of e-bikes is the explosive growth of online retail sales which are estimated to have totalled 3.9 trillion yuan in 2015 (close to US\$580 billion). Efficient deliveries by couriers of messages and packets purchased on-line are growing rapidly, as has the delivery of pre-cooked meals, especially to working couples. Bicycles and tricycles are crucial to this e-commerce in two ways: first, the logistic costs of these sales are kept low (many of the delivery persons are rural migrants working for low wages); and second, purchasers want cheap quick deliveries, which e-bikes achieve because they are scarcely slowed down by traffic congestion. Many Beijing's cyclists have been eager to take advantage of battery technologies requiring less physical effort, especially as mass production has lowered unit production costs and lithium technology has increased battery efficiency. Also, rising real incomes make battery technologies affordable for many residents. But the spread of e-bikes has triggered a vocal clash between motorists and cyclists over priorities on the road: cars frequently drive in, or park in and block the lanes reserved for cyclists, while cyclists frequently ignore traffic lights and other road signs, sometimes travel in the lanes reserved for motor vehicles, travel in the wrong direction, and jostle with pedestrians on the sidewalk. Some motorists have demanded that controls – even a complete ban - be placed on delivery tricycles in some parts of the city.⁴⁵ Given, however, the recent shift to promoting electric cars and cycling in Beijing and the growing popularity of e-commerce, it seems likely that cyclists will survive “a smouldering class war”, pitting the rising middle class against the blue-collar worker, although with stricter enforcement and tighter regulation.⁴⁶ At present, limits to e-bike weight (40.8k), and speed (21 kph) are not enforced, so that many silently exceed speed limits, indeed machines with high powered batteries are capable of speeds up to 48 kph. The weight and speed of e-tricycles are also not much controlled. With bicycles and e-tricycles now banned from Chang'an

Avenue (Beijing's main downtown street used for major parades), tighter regulation is evidently coming, but a total ban would compromise travel to work, to study, to visit friends and family, and to shop, and delay essential deliveries for many.

There is also increasing realization, as Zacharias and Zhang, and Norcliffe stress, that working tricycles provide the bottom rung of one of the most efficient hierarchical recycling systems in the world.⁴⁷ Tricycles are able to wheel around *hútòngs*, alleyways and apartment buildings with narrow entrances designed to block cars, and follow mobile shops to gather waste at the neighbourhood level. These materials are then sorted at a local collection point and sent in large consignments to major recycling facilities.

The emphasis on modal splits in travel surveys overlooks the fact that trips can be multi-modal, and include bicycles.⁴⁸ Every train station in the Netherlands is surrounded by a vast bicycle park. And in Tokyo, by permitting folding bikes on commuter trains, commuters can bicycle from home to a station, and on leaving the train cycle again to their workplace. In Beijing there are many possibilities for multi-modal trips involving the bicycle at one or more stages that have yet to be pursued. For instance, there is a need for safe bicycle parking spaces in most of Beijing's buildings and transport hubs.

A NEW DAWN

“In 2010, a woman on a popular Chinese television programme sparked heated debate on materialism nationwide when she said she would rather cry in a BMW than smile on a bike”.⁴⁹ But shifts in attitudes to transport, to air pollution, and the cultural values that they reflect are clearly coming. On 5th March 2014 Premier Li Keqiang declared at the Annual People's Congress (China's Parliament) a formal *War on Pollution*.⁵⁰ He described pollution as "nature's

red-light warning against the model of inefficient and blind development", underscoring the broader message that China must not only shut down coal-fired furnaces, but shift to a different kind of development, requiring difficult structural adjustments.⁵¹ Pew Poll of October 2016 shows that 70% of Chinese are worried about the country's choking air pollution. A turning point may well turn out to be the prolonged period of choking smog that afflicted northern China for much of December 2016 into January 2017.

On the first day of 2017 in Beijing, concentrations of tiny particles that penetrate deep into the lungs climbed as high as 24 times levels recommended by the World Health Organization. More than 100 flights were cancelled and all intercity buses were halted at the capital's airport ... Across northern China 24 cities issued red alerts on Friday (30th Dec) and Saturday (31st), while orange alerts persisted in 21 cities through the New Year holiday ... Decades of economic development have made acrid air a common occurrence in nearly all major Chinese cities, with government-owned coal burning power stations and heating plants and steel manufacturing concentrated in northern provinces the main source of pollution.⁵²

Planners and politicians share these concerns with the result that a series of initiatives have been launched.⁵³ First, ambitious electrification efforts are underway, including expanding the electrified subway system with a ridership that continues to grow as more and more trips are long distance – to study, to work, to airports, to mainline stations and to the Central Business District to shop or have a night out. The new lower-density suburbs of Beijing are car-friendly, but the switch to electric cars is rapidly changing the vehicle mix across the city.⁵⁴ And e-bike sales indicate a rapid switch to power-assisted cycling. Meanwhile working tricycles, that were

originally human-powered but modified to use small two-stroke engine around twenty years ago, are now mostly battery powered.

The recent rise of electric vehicles (EVs) is indicative of how a developmental state can move ahead of the market by anticipating major technical changes. Vanderklippe reports that several small firms have begun to manufacture small two-seater cars that resemble batteries with wheels. Enthusiasts see Beijing and Shenzhen replacing Detroit and Mannheim as the leading centres of innovation in automobile production. Western car makers are moving in the same direction, but China's efforts are "led in part by a government that has used every tool at its disposal to kick start an industry it sees as a future economic pillar".⁵⁵ It is estimated that between 2013 and 2015 various levels of Government in China have spent \$9.5 billion in subsidies supporting the infant industry, in addition to investments by a band of e-commerce billionaires looking for a new field in which to participate. BYD in Xi'an is in partnership with Daimler-Benz making luxury electric vehicles: they sold 62,000 EVs in 2015, so there are signs of results. In September 2016 the Chinese Government ratified the Paris climate agreement to mitigate greenhouse gas emissions, and has since actively promoted these new technologies.⁵⁶ But so far, private sales of EVs have been weak with 80% being institutional purchases. Also under construction in Beijing's Daxing district is China's largest research facility for new-energy vehicles - mostly electric cars.⁵⁷

Second, it is clear that Beijing's transportation is on the cusp of major technical and cultural changes. The future promises to be cleaner, quieter, and healthier. And since technology is socially and geographically constructed, culture and lifestyles in specific places have to be important to this transition. If life-styles do not change in Beijing, its residents will remain in a hurry by simply replacing the internal combustion engine with a battery to create a

world of EVs on congested ring roads. But there are signs that the new affluent younger generation who have travelled widely, seen other lifestyles, consume new things vicariously on the web, and enjoy films and exotic food are becoming nostalgic about an era they did not experience – the age of the Kingdom of Bicycles. They are different from the West's Y generation in that their parents did not enjoy a consumer boom, but rather, they experienced the intensification of heavy industry, the collectivisation of agriculture and the *cultural revolution*. After 1979 they mainly grew up as single children under the one child policy. And according to the Beijing Municipal Bureau of Human Resources and Social Security and the Bureau of Statistics in 2013 they enjoyed modest prosperity with the average annual salary of employees in Beijing (GDP per capita) being 69,521 yuan (\$11,130 USD).⁵⁸ But we are also witnessing a cultural shift with a new generation who enjoy the fun of recreational cycling including informal alley-cat races⁵⁹, weekend family outings, and MTB trail rides.

In 2012 Beijing implemented a public bicycle-sharing programme with some 40,000 bicycles made available for rent near subway and bus stations, following the example of many modern cities. The bike-share system took a while to take off, but by 2016 another 10,000 bikes were added. Tom Phillips envisages a big growth in bike-sharing:

From Shanghai to Sichuan, schemes are being rolled out to slash congestion, cut air pollution – and spin a profit. Even through Beijing's nicotine-tinged smog you can make out the multi-coloured frames, gliding through the pea soup towards a greener future. In recent months an unmissable fleet of fluorescent orange, canary yellow and ocean blue bicycles has hit the streets of urban China as part of a hi-tech bike-sharing boom that entrepreneurs hope will make them rich while simultaneously transforming the country's traffic-clogged cities ...

[A start-up company] Ofo, so named because of the word's resemblance to a bicycle, has put about 250,000 of its bright yellow bikes to work since late 2015 [under the Campus Bicycle Sharing Project], of which around 40,000-50,000 are in the capital. The ... company was founded by five students looking to improve transport options on university campuses. [It] has attracted about 3 million users in cities such as Beijing, Shanghai, Xiamen and Guangzhou. Its bicycles make about 1.5m trips each day between them.⁶⁰

But the bike sharing program had serious teething problems with many of the rental bikes stolen and left in heaps, probably the result of expanding the system too quickly without allowing for a learning curve. Besides, such programs are only a partial solution for one category of citizen. Recognizing this, a consortium consisting of the Dutch sustainability consultancy Ecofys, the China Academy of Transportation Science, and the Dutch design and project management firm Royal Haskoning DHV Engineering was formed to come up with a comprehensive plan for an overall sustainable transport system for Beijing. Their February 2016 report, *Beijing Bicycle Strategy and Policy*, which sought to reverse the decline in bicycle use, was presented to the Beijing Municipal Government and the Asian Development Bank, which funded the project. Their proposals include: extending the bike-sharing program; high-quality bicycle routes and parking facilities; placing more trip destinations within bike-able distances; and integrating cycling with a high-quality public transport system for commuting (i.e. planning for multimodal trips). In their report, they propose that: "Our plan identifies the need for an institutional setting that recognises cycling as an integral part of urban transport planning, with high-level officials promoting cycling with enthusiasm."⁶¹

Quite clearly, the recent rise of automobility in Beijing is unsustainable: the hurry-slow domain of automobiles is rapidly shifting to the slow side (figure 2). And public transit is only a partial answer since riders do not have the freedom to choose a route, stop and start on a whim, or change plan *en route*. Part of the solution lies in recovering the best parts of the *Bicycle Kingdom*, but now with electric-assist for those who need it, with bike sharing for convenience, with re-established safe bicycle lanes separating bicycles from motorised vehicles, with improved infrastructure including intermodal shifts, and stricter enforcement of road safety rules. But bicycles also offer a new arena for slow life as a recreational machine away from the cusp of modernity, one rooted not in global traditions but in a phase of China's unique recent past, and as a social and convivial machine that is responsive to human sensibilities.

CONCLUSION

The value of the cultural turn in economic geography, certainly for the story told here, is illustrated by Wang Xiaoshuai's film *Beijing Bicycle*, a work in social realism. The key point is that two very different seventeen-year olds living in Beijing struggle over possession of one desirable stolen mountain bike used for deliveries. Li suggests that "the bicycle, while necessarily invoking nostalgia and being reminiscent of a bygone era, becomes a contested site where the relationship between the individual and society, globalization and tradition, upward mobility and social stratification, desire and dystopia, and belief and disillusion destabilizes and fluctuates".⁶² The deliveries could easily have been done on a Flying Pigeon, but the employer wanted to project a trendy image with the mountain bike a sign of social affluence. The implication is that a subtle cultural shift is making the bicycle a symbol for an environmentally-aware younger generation.

Laurence Stern and the Pennells would undoubtedly approve of a bicycle used for “coolness, fashion and freedom”, implying a convivial machine used in daily life. And this is happening in Beijing as the private Mobike bike-share system (launched on 1 September 2016) rapidly expands on the streets (the target is 2000 bicycles). With a GPS chip in them, a mobile phone can find the nearest available Mobike, and make the payment: after a 299 yuan deposit, the rental cost is only 1 yuan (15 cents US) for 30 minutes. Orange-wheeled Mobikes now have several rivals including the campus-based yellow Ofo bikes, Bluegogo, and Beijing’s public bike-sharing system.

These are pointers to a new cycling culture that avoids the frustrating hurry-slow movement that automobiles have brought to Beijing: bicycles generally flow. The sharing economy is sharing bicycles on the streets, around transport hubs, and on campuses. Booming E-commerce is efficiently delivering small packets and hot meals to apartment buildings on tricycles and bicycles. Teenagers find it cool to hang out on mountain bikes. Battery-powered e-bikes are taking much of the effort out of cycling. Folding bikes are slipped into the trunks of cars, safe bike parking facilities are appearing at stations and elsewhere, while an increasingly environmentally-conscious public is looking for ways to improve air quality. Politicians and planners accept that automobility has reached its limits and are investing heavily in EVs. Investors are jumping in: “Chinese investors, including the tech giants Didi Chuxing and Tencent, are throwing their weight behind the bike-sharing startups, pumping tens of millions of pounds into their operations since the autumn”.⁶³ And there are also signs of nostalgia for the days of the silent steed. Given the central role of the bicycle in China’s recent history and the intractable problems associated with automobility, a cycling renaissance seems imminent. And if this happens, Laurence Sterne and Elizabeth Pennell would surely be delighted to join a

leisurely weekend outing of the Beijing Flying Pigeon Club meandering around the back roads and parks of the city, avoiding the frustrations of automobile-bound citizens stalled in traffic jams on overcrowded city streets.

Table 1: Population and numbers of vehicles in Beijing 1953-2016

Year	Population of Beijing Municipality (millions)	Number of vehicles	Number of vehicles per 1000 persons	Bicycle Use HH= household
1953	2.7	n.a.	n.a.	n.a.
1964	7.6	n.a.	n.a.	753,000 bikes 48.5 bikes /100HH
1979	9.0	c.100,000	10	2.6m. c.70% of all trips
1986	10.3	267,000	26	62.8% of all trips
1990	10.8	389,000	36	c.60% of all trips
2000	13.6	1.507m	81	38.7% of all trips
2004	14.9	2.296m	111	32% of all trips
2005	15.4	2.583m	168	31% of all trips
2010	19.6	4.809m	245	16.7% of all trips 13 million bikes in use (some rarely)
2012	20.6	5.0m	243	14% of all trips
2016	21.7	5.6m	258	2.5m electric bikes

(Sources: Qiuning Wang (2012) op.cit; China Statistics Yearbooks; 60 Years of Beijing from 1940 to 1990; Beijing Statistical Bureau (1999); <http://www.cbsnews.com/news/there-are-9-million-stolen-bicycles-in-beijing/>; Phillips (2016).



Figure 1: Modal split of travel in Beijing 1986-2010.

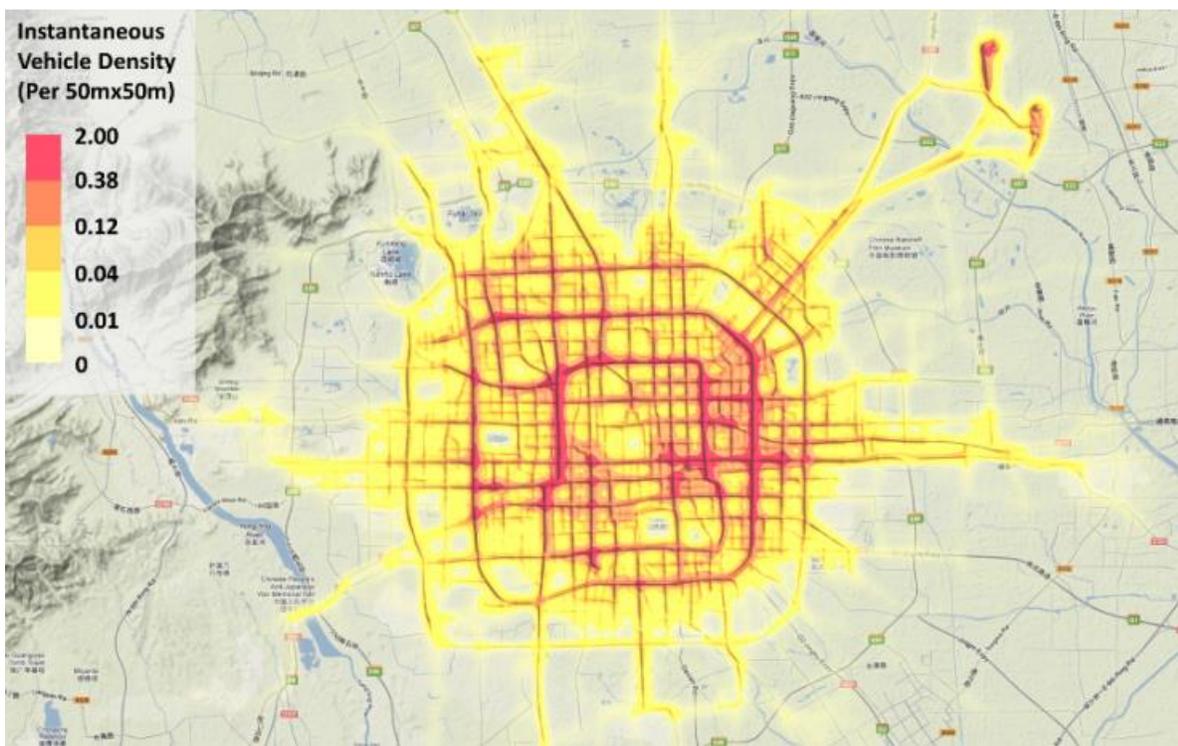


Figure 2: Congestion on Beijing's expressways and Ring Roads, 8 March 2009. Source: PKU Trajectory Visualization System

Endnotes

-
- ¹ Lawrence Sterne, *A Sentimental Journey Through France and Italy* (Reprinted in New York by Golden Cockerel Press (1928[1768])).
- ² Dave Buchanan, “Pilgrims on wheels: the Pennells, F.W.Bockett, and Literary Cycle Travels,” In *Culture on Two Wheels: the Bicycle in Literature and Film*, Jeremy Withers and Daniel Shea, eds. (Lincoln, NA: University of Nebraska Press, 2016), 26.
- ³ Joseph Pennell and Elizabeth Robins Pennell, *Our Sentimental Journey through France and Italy* (London: T Fisher Unwin, 1893).
- ⁴ Dave Buchanan, *A Canterbury Pilgrimage/ An Italian Pilgrimage by Joseph Pennell and Elizabeth Robins Pennell*, ed. with Introduction (Edmonton, Alberta: University of Alberta Press, 2015).
- ⁵ The origin of this term - *zì xíng chē wáng guó* in Pinyin – has not been traced, but it probably first appeared in a journal in the 1960s.
- ⁶ Michael Dunford and Liu Weidong, eds, *The Geographical Transformation of China*. (Routledge: Abingdon, Oxford, 2017)
- ⁷ “Air Transport, Passengers Carried,” *World Bank Database* (Accessed 23 June 2017) <http://data.worldbank.org/indicator/IS.AIR.PSGR>
- ⁸ Henri Lefebvre, *Towards an Architecture of Enjoyment*, Łukasz Stanek, ed (Minneapolis: University of Minnesota Press, 2014).
- ⁹ Tania Branigan, “China and Cars: A Love Story,” *The Guardian*, 14 December 2012 (Accessed 15 September 2015) <https://www.theguardian.com/world/2012/dec/14/china-worlds-biggest-new-car-market>
- ¹⁰ Mimi Sheller and John Urry, “The City and the Car,” *International Journal of Urban and Regional Research* 24 (2000): 737-757.
- ¹¹ Amir Moghaddaas Eesfehani, “The Bicycle’s Long Way in China: The Appropriation of Cycling as a Foreign Cultural Technique 1860-1940,” *Cycle History 13: Proceedings of the 13th International Cycle History Conference*, Nick Clayton and Andrew Ritchie eds (San Francisco: Cycle Publishing, 2003), 94-102.
- ¹² J. Min, “Early History of Bicycle in China” 中国自行车早期历史. *Yanhuangchunqiu*, 2 (2003). Retrieved from <http://news.163.com/09/0624/15/5CJ81VOS00011247.html>
- ¹³ Qiuning Wang, *A Shrinking Path for Bicycles: A Historical Review of Bicycle use in Beijing*. (Unpublished MA Thesis, Department of Community and Regional Planning, University of British Columbia, 2012).
- ¹⁴ Eesfehani, “The Bicycle’s Long Way in China.”
- ¹⁵ Ibid.
- ¹⁶ Lixia Mei and Jici Wang, “The changing geography of Chinese bicycle industry: the case of Tianjin bicycle cluster and its evolutionary trajectory,” Paper presented at the Annual General Meeting, Association of American Geographers, Boston, MA, April 22-27, 2008; Eesfehani, “The Bicycle’s Long Way in China,” op. cit.
- ¹⁷ Nathan Jones, “Life on Two Wheels: The Bicycle Kingdom,” *CCTV* (2006) (Accessed 23 June 2017) <http://www.bicyclekingdom.com/bicycle/Bicyclekingdom1.htm>
- ¹⁸ J. Allaire, “China and Bicycle: the End of the Story?” *Structure*, 7 (2007) (Accessed 10 September 2016) http://webu2.upmf-grenoble.fr/iepe/textes/JA_poster-Velocity-June2007.pdf
- ¹⁹ John Zacharias, “Bicycle in Shanghai: Movement Patterns, Cyclist Attitudes and the Impact of Traffic Separation,” *Transport Reviews* 22 (2002): 309-322.
- ²⁰ Hútòng are traditional narrow streets found in northern Chinese cities, especially Beijing, forming residential communities served (historically) by a water well.
- ²¹ See chapter 10, “Neoliberal Mobility and Its Discontents: Working Tricycles in China’s Cities,” in Glen Norcliffe, *Critical Geographies of Cycling: History, Political Economy and Culture*. (London: Routledge, 2016).
- ²² Gwynn Guilford “A Big Reason Beijing is Polluted: The Average Car goes 7.5 Miles Per Hour” (12.1 kilometers per hour), *Quartz* 3 January 2014 (Accessed 21 November 2016) <https://qz.com/163178/>. This compares with 15.5 mph for vehicles in New York. Another estimate is 9 mph, slower than a bicycle (Sintana Vergara, “From One Billion Cars to One Billion Bicycles,” *Sustainable Cities*, 28 June 2012 (Accessed 21 November, 2016) <http://blogs.worldbank.org/sustainablecities/from-one-billion-cars-to-a-billion-bicycles>
- ²³ Ivan Illich, *Tools for Conviviality* (New York: Harper and Row, 1973).
- ²⁴ Fabiowzgogo, “China Bicycle,” *China Travel.com* (Accessed 23 June, 2017) <http://www.chinatravel.com/facts/china-bicycle.htm>

- ²⁵ George Lin, *Developing China: Land, Politics and Social Conditions* (London: Routledge, 2009).
- ²⁶ Debra Bruno, "The De-bikification of Beijing," *The Atlantic Citylab*, 9 April 2012 (Accessed 28 September, 2016) <http://www.citylab.com/commute/2012/04/de-bikification-beijing/1681/>; Wang, *A Shrinking Path for Bicycles*, ii.
- ²⁷ Beijing Statistics Yearbook, 1996, *National Bureau of Statistics* (Accessed 28 September 2106) https://www.google.ca/?gws_rd=ssl#q=beijing+statistical+yearbook+1996
- ²⁸ Liu Weidong and Peter Dicken, "Transnational Corporations and 'Obligated Embeddedness': Foreign Direct Investment in China's Automobile Industry," *Environment and Planning A*, 38 (2006): 1229-1247; Liu Weidong and Henry Yeung "China's Dynamic Industrial Sector: The Automobile Industry." *Eurasian Geography and Economics* 49 (2008): 523-548.
- ²⁹ Anne Renzenbrink "Bid in Beijing to Bring Back 'Kingdom of Bikes'," *South China Morning Post* 27/7/2015 (Accessed 15 October, 2015) Document SCMP000020150726eb7r0003p
- ³⁰ Yang Jun, Liu Ying, Qin Ping and Liu Antung, "Review of Beijing's vehicle registration lottery: Short-term effects on vehicle growth and fuel consumption." *Energy Policy* 75 (2014): 157-166.
- ³¹ Suwei Feng and Qiang Li, "Car Ownership Control in Chinese Mega Cities: Shanghai, Beijing and Guangzhou", *Journeys* September (2013): 40-49 (Accessed 28 September 2016) https://www.lta.gov.sg/ltaacademy/doc/13Sep040-Feng_CarOwnershipControl.pdf
- ³² These data were documented by the Beijing Transportation Research Centre and illustrated by Wang, *Shrinking Path for Bicycles*.
- ³³ Stephen Chen, "Beijing Workers Have Longest Daily Commute in China at 52 Minutes Each Way," *South China Morning Post*, 27 January 2015 (Accessed 15 July 2016) <http://www.scmp.com/news/china/article/1692839/beijingers-lead-chinas-pack-longest-daily-commute>; Du Juan, "Beijing Likes Shared Bicycles – However ..." *China Daily*, 2 May 2017 (Accessed 23 June 2017) http://africa.chinadaily.com.cn/china/2017-05/02/content_29159877.htm
- ³⁴ Renzenbrink op.cit.
- ³⁵ Hongguang Liu and Weidong Liu, "Decomposition of Energy-induced CO2 Emissions in Industry of China." *Progress in Geography* 2 (2009): 285-292.
- ³⁶ Tom Phillips, "Bike-sharing revolution aims to put China back on two wheels." *The Guardian* 28 December 2016 (Accessed 28 December 2016) <https://www.theguardian.com/world/2016/dec/28/bike-sharing-revolution-aims-to-put-china-back-on-two-wheels>
- ³⁷ Boyang Gao, Liu Weidong and Michael Dunford, "State land policy, land markets and geographies of manufacturing: the case of Beijing, China," *Land Use Policy* 36 (2014): 1-12.
- ³⁸ Trucks delivering coal to Beijing's power stations from Inner Mongolia on the Beijing-Tibet expressway undergoing road works created the world's worst traffic jam in 2010 – a 60 mile back-up that lasted 12 days.
- ³⁹ Robert Dreyfuss, "The Nation: China: A Kingdom of Bicycles No Longer," *National Public Radio* (Accessed 25/11/ 2009) <http://www.npr.org/templates/story/story.php?storyId=120811453>.
- ⁴⁰ Nick Mulvenney "Beijing to launch Olympic odd-even car ban." *Reuters* 20 June 2008 (Accessed 15 November 2015) <http://uk.reuters.com/article/beijing-car-ban-idUKNOA03972720080620>
- ⁴¹ Suwei Feng and Qiang Li, op.cit.
- ⁴² Hùkǒu is a form of residential regulation with origins in China's imperial age. A family is granted a permit to live in a specific place with rights to social services in that place. Assigning rural versus urban hùkǒu status is particularly important to urban and economic development.
- ⁴³ Anonymous, "Beijing's Electric Bikes, The Wheels of e-Commerce Face Traffic Backlash," *Today*, 1 June 2016 (Accessed 15 November, 2016) <http://www.todayonline.com/china/china/beijings-electric-bikes-wheels-e-commerce-face-traffic-backlash>; Jonathan Weinert, Chaktan Ma, and Christopher Cherry, "The Transition to Electric Bikes in China: History and Key Reasons for Rapid Growth," *Transportation* 34 (2007): 301-318.
- ⁴⁴ Lin Lin, "Bicycles in China: The Lost of the Kingdom of Bicycles" (Accessed 5 April 2017). https://www.google.ca/?gws_rd=ssl#q=faculty.washington.edu/abassok/bikeurb/resources/presentations/lin.pdf
- ⁴⁵ John Zacharias and Zhang Bingjie, "Local distribution and collection for environmental and social sustainability– tricycles in central Beijing." *Journal of Transport Geography*, 49 (2015): 9-15.
- ⁴⁶ Anonymous, op. cit.
- ⁴⁷ John Zacharias and J-M Zhang, "Estimating the shift from bicycle to metro in Tianjin." *International Development Planning Review* 30 (2008): 93-111; Norcliffe, *Critical Geographies of Cycling*.
- ⁴⁸ Haixiao Pan, Qing Shen, and Song Xue, "Intermodal transfer between bicycles and rail transit in Shanghai, China. *Transportation Research Record* 2144 (2010): 181-188.

-
- ⁴⁹ Renzenbrink, op. cit.
- ⁵⁰ Tania Branigan, "Chinese Premier Declares War on Pollution in Economic Overhaul," *The Guardian*, 5 March 2014 (Accessed 23 June, 2017) <https://www.theguardian.com/world/2014/mar/05/china-pollution-economic-reform-growth-target>.
- ⁵¹ Tania Branigan, op. cit.
- ⁵² Benjamin Haas "China Smog: Millions Start New Year Shrouded by Health Alerts and Travel Chaos," *The Guardian*, 2 January 2017 (Accessed June 23, 2017) <https://www.theguardian.com/world/2017/jan/02/china-smog-millions-start-new-year-shrouded-by-health-alerts-and-travel-chaos>. *The Guardian* 1 January 2017.
- ⁵³ Benjamin Haas "China Smog: Millions Start New Year Shrouded by Health Alerts and Travel Chaos"
- ⁵⁴ Pengjun Zhao, "Sustainable Urban Expansion and Transportation in a Growing Megacity: Consequences of Urban Sprawl for Mobility on the Urban Fringe of Beijing," *Habitat International* 34 (2010): 236-243.
- ⁵⁵ Nathan Vanderklippe "Electric Cars Drive China's Superpower Zeal," *Globe and Mail* (Toronto) 10 September 2016: B9.
- ⁵⁶ "Greening the Dragon: China's Search for a Sustainable Future." *Green Futures Magazine* September (2006) Department for Environment, Food and Rural Affairs (Accessed 15 November 2015) https://www.forumforthefuture.org/sites/default/files/images/GreenFutures/Greening_the_dragon.
- ⁵⁷ <http://www.ebeijing.gov.cn/BeijingInformation/BeijingNewsUpdate/t1455559.htm>.
- ⁵⁸ On 26 February 2016 the BBC announced that Beijing had overtaken New York as the city with the most billionaires, with 100 to New York's 95.
- ⁵⁹ "Beijing Hosts Alley Cat Bicycle Race," *China.Org.CN* (Accessed 5 April, 2017). http://www.china.org.cn/video/2012-03/23/content_24967527.htm
- ⁶⁰ Phillips, op. cit. The classic example of this is National Taiwan University's large campus in Taipei where students travel mostly on bicycles. The centre of the University is a large bicycle repair shop.
- ⁶¹ Wim van der Wijk, *Beijing Bicycle Strategy and Policy: The Way Back to "Bicycle Capital of the World"* (Royal Haskoning DHV Engineering, Ecofys, China Academy of Transport Science, and Asian Development Bank, 2016).
- ⁶² Li Jinhua, "Beijing Bicycle: Desire, Identity and the Wheels," In *Culture on Two Wheels: The Bicycle in Literature and Film*, Jeremy Withers and Daniel Shewa, eds (Lincoln, NA: University of Nebraska Press, 2016), 281-2.
- ⁶³ Phillips, op. cit.