A CHINA ENVIRONMENTAL HEALTH PROJECT RESEARCH BRIEF

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Cars in China: Personal Vehicles Make Tracks

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On 17 August 2007, the Beijing municipal government undertook a four-day experiment to restrict more than one million cars from driving on the city's roads—the goal was to see if this temporary measure could limit air pollution during the 2008 Olympic Games. While international and Chinese experts debated the efficacy of this short-term measure—with most noting no short-term change in air quality—all can agree that auto emissions have become a major source of air pollution and a growing source of respiratory illnesses in Beijing and other large cities.[1] Less than a decade ago China was known as a kingdom of bicycles—now cities like Beijing are renowned as massive parking lots as car ownership has risen 300 percent in 6 years, pressing the capacity of roads and bridges.[2] Bicycle ownership dropped 35 percent between 1995 and 2005 nationwide as city governments closed bike lanes to appear more modern.[3] During that same time, private car ownership rose from 1.14 million to 13.84 million.[4] After announcing the auto industry as one of 7 pillar industries in 2001, China has become the third largest car producer and the second largest car market in the world. The expansion of cars in China is a growing international concern as China's demand for oil skyrockets along with its greenhouse gas emissions. Currently the world's second largest consumer of oil after the United States, China increased its oil imports by 12 percent in 2007.[5] Car sales rose 23.4 percent between 2006 and 2007 with 4.7 million cars sold in 2007. The number of cars sold might climb to near 10 million in 2008 and 140 million by 2020.[6,7,8] There are more than 10 million privately owned cars in China today. Although the number of cars per capita in China remains low—with only 18 cars per 1,000 people compared to the United States 940 per 1,000—the rate of expansion in both in size and quantity of cars in China has domestic environmental and human health impacts as well as global concerns.[9,10]

CARS SALES TRENDS AND CULTURE

Most Chinese are buying cars for the first time and there appears to be a growing preference for larger size vehicles. Reports indicate that sales of low-emission automobiles in China declined by 11.67 percent in the first part of 2007, with figures from one Beijing automaker revealing a 25 percent decline in low-emission auto sales in the capital city.[11] Although total sales of SUVs in China remain low, when SUV sales dropped by 22 percent in the United States in 2007, they rose by 40-45 percent in China.[12] Overall car sales only increased by 16 percent.[13]

Many new car owners in China display a surprising indifference to the price of a prospective vehicle, preferring to save longer in order to afford a better car rather than settling for the first car they can afford or buying a used car. In fact, there is a strong preference for foreign cars over local Chinese cars like Geely and Chery. China is responsible for one-third of global Mercedes sales.[14] Even with the overall car market growing by 20 percent a year, domestic car sales dropped in 2007.[15] Two phenomena drive these sales trends: (1) the change in performance expectations of Chinese drivers, who are now looking to make a social statement with the type of car they drive, and (2) a rise in personal income that compels ordinary Chinese people to engage in more extravagant expenditures.

Driving is also viewed as a health-conscious alternative to public transit. During the 2002 SARS outbreak that claimed approximately 350 lives in China, the public saw congested trains and buses as breeding ground for sickness. The SARS outbreak heavily influenced the perception of public transportation as dangerous and encouraged many Chinese to turn to cars instead.

INVESTMENT IN INFRASTRUCTURE AND URBAN DEVELOPMENT

In order to keep up with this booming level of demand for private cars, roads are expanding rapidly. Approximately 1,000 new cars take to Beijing's roads each day and the city has seen a tenfold increase in cars over the past decade. Over the past few years Beijing and other cities are beginning to make up for several decades of under funding of transport infrastructure. In 2004, the National Trunk Highway System connecting twelve major highways was completed at an estimated cost of $150 billion.[1] Funding for more remote regions is growing as well. In early 2007, the Guiyang Transport Project, which will help improve roads in one of China's poorest provinces, was approved to receive significant development funding from the World Bank.[16,2] In addition to central and international investment, some cities are taking it upon themselves to invest in their transport systems, one example being Chongqing, which has invested 8 billion Yuan ($967 million) to build roads and bridges as of 2005.

As China makes room for more cars, drive-thru windows, paved parking lots, and gas stations, will proliferate through Chinese cities. McDonald's began opening its drive-thru windows to Chinese patrons back in December 2005.[17] In preparation for the summer 2008 Olympics, the fast food chain is doubling its stores; nearly half of these new stores are will install drive-thru windows and acquire more land for parking lots. The central government has also implemented measures to reduce parking problems by building parking garages and increasing parking fees to help accommodate the estimated 3.5 million automobiles projected to cruise the streets of Beijing by the summer of 2008.[18]

Such construction projects are literally paving the way for China to become a more motorized society, but this construction also exacerbates air pollution—particularly from China's notoriously energy-intensive and dirty cement industry. Chinese cement plants produce over 40 percent of total industrial particulate emissions, which are strongly correlated with significant respiratory illness and approximately 200,000 premature deaths in urban areas. Cement plants also contribute 6 to 8 percent of global carbon dioxide (CO_2) emissions and are collectively the third largest contributor to total mercury emissions in China. Several of these toxic emissions are very harmful to both humans and wildlife as they are persistent bioaccumulants and can be transported intercontinentally.[19]

ECOLOGICAL AND HUMAN COST

Air Pollution

The immediate human cost of a car boom in China is an increase in motor vehicle accidents: Shanghai alone recorded 1,171 traffic related deaths in 2007.[20] Long-term effects of air pollution from vehicles include brain damage, respiratory problems and infections, lung cancer and emphysema, among other health concerns.[21] A recent study indicates that vehicle emissions increase the risk of deep vein thrombosis, or blood clots in the legs.[22] One article by the *Associated Press* stated that the "residents of at least 400 Chinese cities will face health hazards from airborne sulfur by 2010 if pollution from cars is not brought under control."[23] In recent years, as industry has been pushed out of urban centers and car sales have risen, SO_2 pollution in urban areas has fallen while levels of carbon monoxide and ozone-forming nitrogen oxides have increased significantly.[24] Perhaps more subtle is the combination of a changing diet and cars. Since the turn of the century, China's

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[i] The National Trunk Highway System was originally to be a 35,000 km network composed of 12 major highways. There are five north-south corridors: Beijing-Fuzhou, Beijing-Zhuhai, Chongqing-Zhanjiang, Erlianhaote-Hekou, and Tongjiang-Sanya; and seven east-west corridors: Dandong-Lhasa, Hengyang-Kunming, Lianyungang-Huoerguosi, Qingdao-Yinchuan, Shanghai-Chengdu, Shanghai-Ruili, and Suifenhe-Manzhouli.

[ii] Roughly $100 million has already been committed and the total cost is estimated to be around three times that amount. The project is set to unite the southeastern municipality with the surrounding region while improving the flow of industry materials.

population has experienced a dramatic rise in obesity, diabetes and abnormal blood lipid levels. Within car owning families in China, the obesity rate is as much as 80 percent above average.[25]

Roads

As the United States has experienced, the increasing roads that these cars depend on also have a direct impact upon the environment, particularly on water quantity and quality. In Beijing alone, impervious road surface area increased 160 percent between 2000 and 2004.[26] Impervious surfaces prevent groundwater—on which the city depends for drinking water—from being replenished by rain and also increase rates of erosion and contaminated runoff. In the northern areas of the country, salt will need to be sprayed on roads to keep them from freezing, running off to further pollute surface and marine ecosystems.

Fuel Acquisition

Fuel is another major environmental health concern. In Beijing, there have been reports of polycyclic aromatic hydrocarbons (PAHs) leaking from improperly constructed underground storage tanks to enter groundwater and poison humans and animals.[27] China has vowed to increase production of biofuels (although the Ministry of Environmental Protection has instituted a moratorium on new grain-based projects in 2006) as global oil prices increase, but the country faces many ecological obstacles to biofuel reliance.[28]

Although touted as an environmentally sensitive fuel alternative, a recent Stanford study claims switching to ethanol (E85) could result in worsening ozone problems in urban areas, such as Los Angeles and the northeastern United States. Currently China does not have E85, but approximately 10 provinces are using E10.[29] If China's growing fleet of personal cars continues to rise at this rate, dependence on ethanol could result in high rates of ozone-related mortality, hospitalization, and asthma. Public health therefore cannot be used as a rationale for promoting the use of ethanol fuel, although the study concedes that there are other factors, such as greenhouse gas emissions, dependence on foreign oil, and the environmental and social impact of growing plants for fuel that can be considered benefits to ethanol use.[30] However, at least one of these factors—the effects of growing plants for fuel—could pose a threat to China's food security.

Since the 1990s, China has been producing biofuel from corn and wheat. Fuel produced from plants such as corn, soybeans, and sunflowers uses much more energy than it generates according to a Cornell and University of California-Berkeley study, due to its heavy reliance on petroleum-based fertilizers among other things—although production processes can determined whether the biofuel is carbon positive or negative.[31]

Developing land for biofuel production may also have a negative ecological impact. In January 2007, China's State Forestry Administration and the oil company PetroChina struck an agreement to develop biofuel plantations in Yunnan and Sichuan provinces, home to some of the country's largest remaining intact natural forests.[32] These forests are vital for maintaining the ecological and climactic balance of the region, and they are also a bastion of biodiversity, being home to approximately 6,000 plant species and over 1,000 animal species that the plantations will replace with monoculture crops. Although the central government issued a logging ban in 1998, these forests have already begun to shrink due to rampant illegal logging, and some fear that the rush to produce biofuels will bring about the ecological collapse of the region.[33] Although the biofuel plantations are purported to be built on degraded forestlands and croplands, it merits mentioning that it is not rare for local governments in China to engage in "black-box deeds," in which they sell off healthy forests to logging companies as "waste-forestlands."[34]

ACTION BY THE CHINESE GOVERNMENT AND MULTINATIONALS

Alarming trends towards larger personal vehicles are driven in part by subsidized oil kept artificially low (at roughly 20.5 Yuan ($2.90) per gallon).[35] Such subsidies, intended to protect industry and agriculture, provide a counterincentive to laudable government efforts to reduce the size of personal vehicles. One such effort has been to impose a vehicle tax ranging from 1 to 20 percent based on the vehicle's engine size.[36] Another requires vehicles to meet stringent standards for fuel-efficiency, with additional taxes of 5 to 15 percent imposed on models that fail to meet the standards.[37] Additional progressive top-down initiatives to curb environmental damage from cars abound, some of which are outlined below. The recent decision to promote its State Environmental Protection Administration (SEPA) to a ministry in March 2008 may catalyze increased compliance to progressive top-down polices to regulate highly polluting or fuel-inefficient private cars.

Transportation Appears on New Conservation Law

In 1997, the Chinese government, recognizing the need to make energy conservation a long-term national priority, passed the Energy Conservation Law. The original law, however, featured several major flaws: it failed to establish methods of enforcement and accountability and provided little regulation for the transportation and construction sectors.[38] The law was amended in 2007 to establish clearer lines of jurisdiction and stricter energy conservation in the construction, transportation, and government sectors. With regard to transportation, the amendment requires governments at both the local and higher levels to increase investment in public transportation as well as promote use of buses and trains.[39]

Grain-based Ethanol Suspended

From 2002 to 2006, China encouraged the development of grain-based ethanol as a more affordable alternative to oil. In 2006, however, Chinese decision-makers noticed that the use of grains for ethanol production was putting a strain on food reserves and spurring increases in food prices. Consequently, the National Development and Reform Commission (NDRC) and the Ministry of Finance jointly issued the *Notice Concerning Strengthening the Management of Bio-fuel Ethanol Projects and Promoting the Healthy Development of the Industry,* a moratorium on further development on ethanol plants, on December 18, 2006.[40] China now appears poised for rapid development of non grain-based ethanol production. China has approximately 525 million acres of wasteland that, "if properly cultivated with appropriate energy-producing plants, could produce the equivalent of 45 million tons per year of oil for every 10 million hectares of land used.[41] The main non-grain crops used in this production will be sweet potatoes and sweet sorghum due to their higher output and compatible growing areas.[42] The U.S. Department of Energy is also researching non-grain biofuels in the United States, which underscores a potentially fruitful area for bilateral cooperation.

Impressive Vehicular Emissions Standards

China banned the production and consumption of leaded gasoline on July 1, 2000. The necessity of the ban was evident given a study that showed 70 percent of Beijing children had elevated levels of lead in their blood, which can lead to a variety of illnesses particularly in children. (See China Environmental Health Project research brief "Growing up in a Leaded Environment".) At the time of the ban, Beijing's auto emissions—aggravated by slow driving speeds and low vehicular emission standards—almost equaled emissions in Los Angeles, which has ten times the number of cars.[43,44] Despite the ban of leaded gasoline in 2000, inspectors have found that it was still being produced in factories as late as 2004 for use in older car models, according to the Ministry of Environmental Protection (formerly SEPA).[45]

China's effort to reduce air pollution from cars has been a growing priority for the past decade. At the turn of the century China began a bold mission to reduce auto emissions by adopting Euro I standards. Five years later, China tightened standards to the Euro II level; and again in July of 2007 to Euro III. Beijing recently increased its standards to Euro IV levels under the premise that the new

standards will significantly decrease harmful emissions from cars, namely CO, HC, NOx. To ensure compliance, the central government has vowed to ban vehicles that fail to meet the new standards.

Promoting Bike Use

As a result of increasing health and infrastructure challenges posed by personal vehicles, China's central government is now taking measures to encourage bike use. This includes calling on city governments to restore bike lanes and, within Beijing, sponsoring a private bike rental scheme that provides approximately 50,000 bikes to some 200 locations.[46] It must be noted, however, that these measures appear to be accepted in the capital—though they are unlike to affect private car ownership—and have not seen much success elsewhere.

Public Transportation Infrastructure

Public transit systems have also seen increased investment in recent years, as some consider convenient public transportation as an alternative to buying or at least commuting in private vehicles, thus alleviating some congestion and air pollution. According to the Worldwatch Institute, the Chinese central government provided over $160 million in 2007 to assist bus companies in Beijing lower fare prices.[47] Further discounts and incentives will be provided to students and other passengers in an effort to alleviate traffic congestion in the capital city. With support from international organizations, such as the Energy Foundation and the World Bank, Bus Rapid Transit (BRT)—buses with preferential light changes and right-of-way lanes—has also been instituted in Beijing, Kunming, and Nanjing as a speedy incentive to mitigate the dependence personal vehicles.[48] Private companies also have introduced cleaner technologies. Italy, for example, partnered with SEPA and others to provide some 330 high efficiency natural gas buses to Beijing. Within the Chinese auto industry, manufacturers such as Chery, BYD, Chang'an are on the verge of putting their hybrid vehicle prototypes into production, and the central government as approved 7 models to be put into production in 2008.[49]

As part of an effort to clean Beijing's air before the 2008 Olympics, Beijing initiated the "Blue Sky Program" demanding clean energy use in the Olympic village and involving a number of pilot transport projects.[50] China hopes to achieve its Olympic bid goal of converting 80 of percent buses and 70 percent of taxis to clean fuel (mainly clean natural gas) by 2008. Beijing also hopes to have 14 electric buses and 50 Lithium-powered ion buses on its streets and a fuel cell project is underway. Another notable transport project is the creation of a natural gas infrastructure between Qingdao and Beijing. Not only is this infrastructure expected to fuel 150 trucks traveling between the two cities by 2008, but China intends to use this project to catalyze construction of a natural-gas-based transport network to all of northeastern China. Light rail systems are also being improved across China and especially in Beijing, although Chongqing takes the lead with the development of its "Line 2" rail system with an investment of over $500 million.

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