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Transportation Infrastructure and Land Use in China

Hu Muqin, sixty-three, was the third winner the other morning of a gleaming new \$15,000 Citroen—the top prize in the public lotteries that Beijing and many other Chinese Cities are holding all this week to raise money for victims of last years floods. “I’m so happy...I’ll give my car to my thirty-year old daughter, who is just learning to drive,” said Mr. Hu. “Everyone who comes here has just one goal, to win a car,” said Ling Xiaoping, a migrant from Southern China.

New York Times, 18 February 1999

Atlanta [Georgia, U.S.A.], 1999. Once a wilderness, it is now a thirteen-county eruption, one that has been called the fastest spreading human settlement in history...It consumes 500 acres of field and farmland every week. What it leaves behind is tract houses, access roads, strip malls, off ramps, industrial parks and billboards advertising more tract houses where the peach trees used to be.

Time Magazine, 22 March 1999

by Robert E. Paaswell, Ph.D., P.E.

That land use and transportation are inexorably linked is well known. Less well documented is the quantifiable nature of that link.¹ Land use concerns the distribution of activities, while transportation is the spatial link among these activities. The transportation links are characterized by costs including travel time, trip reliability, and the price of the trip to the user. The attractiveness of the activities and the costs of gaining access to them define the transportation—land-use interaction. What seems a simple relationship, has been for planners quite complex. For example, enhancing the attractiveness of a shopping area might increase the demand for such development but it simultaneously creates a crowded area. Conversely, increasing the cost of travel might decrease the attractiveness of an important development. Motorization has a great impact on the perceived costs of travel to the traveler, as well as to the developer. These costs shape the overall accessibility, which is a concept fundamental to land-use and transportation discussions. Accessibility is the cost, usually figured as travel time, in reaching a variety of locations. The greater time it takes to reach a location, the

lower the accessibility. Accessibility to an area is increased as the number of activities increases at a given location. To translate this term into a concrete example, imagine if an individual has thirty minutes to shop and there is a choice of using public transport or a car. In a car the individual can visit more stores more quickly than on public transport. A car therefore increases the individual’s accessibility to more locations.

The desire to travel quickly to many places (e.g., create greater accessibility) has shaped land-use and transportation decision-making and planning in the United States and other countries. The subsidization of housing costs combined with government subsidies for highway construction has, for example, dramatically changed the nature of American cities within two short decades. In 1940, most U.S. citizens resided in rural areas, but by the 1960s the majority of the population lived within urban areas. Since 1980, most of the urban population has moved to the suburbs with many commuting by auto to work. Households in the United States own, on average, more than one motor vehicle and in large states such as California there are actually more

motor vehicles than licensed drivers. To support these motor vehicles, the U.S. government has built more than 3.5 million miles of paved roadway—more than one paved mile per square mile of land area.² The United States started its process of motorization early in this century³ and institutionalized it by establishing the federal Bureau of Public Roads to deal with roads in 1916.

Car ownership and land-use trends in other industrialized countries have replicated those in the United States. For example, in both Western Europe and Japan car ownership and miles traveled have increased at a faster rate than population growth. In Europe, growing battles are being waged over the proliferation of mega-stores in suburban and rural areas. Similar to the developments in the United States, these new mega-stores are changing the patterns of shopping from town center to peripheral shopping center. The personal automobile is also being embraced as a symbol of wealth in developing countries with rapidly growing economies such as the People’s Republic of China.

While comparisons between countries are often difficult, examining the development of transportation in the United States could provide insights for countries like China that are in the earlier stages of developing this infrastructure. First, China and the United States are similar in size, but differ widely in terms of population size and concentrations. Each country has a contiguous land area of approximately 3.7 million square miles. The population of China, 1.2 billion people, is nearly five times the U.S. population of 272 million. The urbanized population of China (28.85 percent of the total population) is 346 million, which is greater than the entire population of the United States. Table 1 shows the

comparisons of several large urban areas in the United States and China and illustrates the great difference in density.

Second, the history of travel has been significantly different in the two countries. In the United States, mobility of people and the rate of trip making have always been high because of significant government infrastructure development. In contrast, prior to the economic reform era that began in 1978, mobility was not encouraged in China. In fact, Chinese citizens were required to obtain permission from their place of work to travel outside the area where they were registered. Third, and finally, there is the issue of differing levels of development of transportation infrastructure and motorization. In the United States, the preferred mode of travel has been the car and the structure of U.S. urban areas has changed significantly since 1950 to reflect these preferences. As noted, the U.S. population is predominantly suburban, but it has taken infrastructure investments over eighty years to create that situation. It is this investment which created the 833,600 miles (1,342,000 kilometers) of urban roads,⁴ which serve an urban population of 203 million people.⁵ In China, 65,100 miles (104,900 kilometers) of urban road serves a population of 346 million.⁶ In the United States there are now 206 million motor vehicles (with over two-thirds in urban areas) and nearly one private car for every two persons. In China, there are over five million motor vehicles in urban areas which translates to one motor vehicle for every seventy persons. In comparing the two countries, it is important to keep these differences in mind.

This paper will discuss three general themes: (1) the transportation and land-use issues arising in major Chinese urban areas; (2) how the United States addresses land-use and

Table 1. Population Density and Urban Population in the United States and China

| City | Population Density Persons per sq. km. (Data for built-up or central area) | Population of Urbanized Area |
|---------------------|---|---------------------------------|
| Beijing | 13,200 | 10,510,000 |
| Shanghai | 20,700 | 12,950,000 |
| Guangzhou | 15,900 | 6,240,000 |
| National Average | 11,100 | |
| New York | 9,264 | 19,100,000 |
| Los Angeles | 843 | 14,621,000 |
| Chicago | 2,082 | 8,238,000 |
| National Average | 109 | |

Source for China: *China's Urban Transport Development Strategy*, S. Stares and Liu Zhi, eds., World Bank: Washington, D.C., 1996. Source for United States: R. Paaswell and J. Zupan, "Transportation Infrastructure and New York's Competitiveness," *Citizen's Budget Commission*, New York, 1999.

transportation issues; and (3) lessons learned in the United States that may be used to inform future development in China.

CHINA: THE INFLUENCE OF ACCESSIBILITY ON LAND USE AND TRANSPORTATION

Data from Chinese cities show that congestion has made non-motorized modes—cycling and walking—as competitive as public transport for distances under ten kilometers (six miles).⁷ In the United States, average travel speeds by auto of 33.6 miles per hour allow the driver in eleven minutes to travel the same ten kilometers that take a Beijing resident fifty minutes.⁸ In fifty minutes a U.S. driver can gain access to more than twenty times the activities of her Beijing cohort—or have the same number of activities dispersed over twenty times the land area. In the

United States, it is this accessibility by auto that has allowed and encouraged urban areas to become dispersed. When travel modes were slower, or more onerous, workers lived closer to their work and cities were denser and more compact. Urban cores were the heart of commercial activities. Today, with the exception of four or five cities, the concentration of activities at urban centers has decreased. More Americans commute between a suburban home and a suburban job than into the core, because the cost of travel, which includes time, reliability, convenience, and price, encourages it. Even in around New York City—world famous because of its Manhattan core of activities—more commutes are suburb to suburb than to the core.⁹ This dispersion occurs at high cost with potentially negative impacts on economic stability and environmental quality.

Understanding causes and impact of the decreased accessibility in

Table 2. Areas of Major Cities in China and the United States

| City | Metropolitan Area (square kilometers) | Metropolitan Area compared to New York |
|-------------|--|---|
| Beijing | 16,808 | .78 |
| Shanghai | 6,341 | .29 |
| Guangzhou | 7,434 | .34 |
| New York | 21,551 | 1.0 |
| Los Angeles | 87,972 | 4.1 |
| Chicago | 17,174 | .80 |

Source for China: S. Stares and Liu Zhi, eds. *China's Urban Transport Development Strategy*. Washington, D.C.: World Bank, 1996. Source for United States: R. Paaswell and J. Zupan. "Transportation Infrastructure and New York's Competitiveness." *Citizen's Budget Commission*. New York, 1999.

Chinese urban areas is important for it underlines the challenges China faces in balancing land-use and transportation issues. The first fact on accessibility is that Chinese cities are already dense (see Table 1) and have, compared to the United States, slow commute times under congested conditions. Even with extremely high densities of the central cities, extremely slow travel speed decreases accessibility, which in turn impedes the economic growth potential in Chinese cities.

Second, over the last two decades, China has undergone unprecedented economic growth, which has spurred growth in urban areas. Economic reforms freed many from work in the agricultural sector and these rural people have flocked to cities to seek employment. This has resulted in a massive increase in the number of "floating" populations in the large cities.¹⁰ For example, in Beijing, there are over three million floating workers—people with no permanent residence in Beijing—who must make the journey to work along with resident workers everyday. The daily influx and egress of these workers exacerbate the congestion that is already present.

Third, the success of economic reforms has led to the growth in the number of large Chinese cities, with forty cities now larger than one million people. The primary modes of transportation in Chinese cities have been biking or walking. In Beijing, these modes encompass sixty-eight percent of trips; in Shanghai, sixty percent. The average distance traveled by bicycle is 3.9 kilometers. Because of the heavy dependence on bicycles, it has been more efficient in China to locate businesses near residences or vice-versa. Not surprisingly, these highly populated Chinese cities all have land areas that are small compared to large U.S. cities (See Table 2). Accessibility linked to slow travel speeds stimulates high densities; conversely, the ability to travel much further at speeds several times higher than their Chinese cohorts has led Americans to suburbanize and develop immense amounts of land. Suburbanization in the United States has been followed by demands for more highway building, which, by decreasing travel times, has increased accessibility.

Over the past twenty years, large Chinese cities, already congested from bicycle traffic and a growing

fleet of motorized vehicles, have become even more congested. Simply stated, the accessibility within these cities has decreased considerably. Two phenomena have emerged simultaneously. The first is the growth of congestion that creates the demand for relief. Two methods used to alleviate congestion are to either improve transportation by adding more capacity or to relocate activities to less congested areas, usually in the periphery. The second phenomenon is the quest for more luxury. As workers become more affluent, they have less tolerance for inconveniences such as buses crowded at more than eight persons per square meter; bicycle collisions; and the inability to walk freely in the streets. This desire for comfort has led to a tremendous growth of the taxi industry in China with more than 400,000 now in use. Because accessibility is cost, as the affluent workforce grows, they will create more demand for transport which is less costly in terms of time and comfort, reliability, and convenience, but are financially more personally expensive.

TRANSPORT AND CONGESTION

A great cause of congestion in Chinese cities is the inadequate capacity of the road network. A number of reasons explain this inadequacy. First, there are, by international comparison, too few kilometers of roadway per capita. Second, these roads are used by an incompatible mix of vehicular and non-vehicular traffic.¹¹ The inadequacy of the basic infrastructure and roads makes it difficult for public transit to serve the commuters any better than walking or bicycling. In Beijing, a bicycle trip of ten kilometers takes fifty-one minutes. The same distance is covered by bus in 48-51.5 minutes.¹² Increased road congestion has led to declines in both bus average speeds and over-

all motor vehicle average speeds in the Chinese cities in the last decade.

Building rail transit, an extremely expensive alternative to bus transit, is unlikely to ease current patterns of urban congestion. While rail is fast, it has a limited area of coverage, unless built as a dense network as in New York, Chicago, or London. All of these systems, now over 100 years old, were built as the cities grew and not imposed on existing development. Even if rail transit had room to be constructed, the demand for street space in Chinese cities is so high and their travel needs so great, that any traffic diverted to rail would quickly be replaced by other street traffic.

Adding to the congestion is the increasing rate of motorization in Chinese cities. The annual growth of the motor vehicle fleet is over fifteen percent, while road building to accommodate this growth increases at twelve percent per year.¹³ Trucks make up more than fifty percent of this motor fleet. These trucks serve businesses and distribute most goods because the over-taxed rail system cannot meet all the needs of moving products to market. As economic expansion continues, there will be great pressure for more trucks and for a greater reliability (e.g., just-in-time delivery) in these movements. New roads are needed to provide additional capacity for these expanded needs. With the increases in business and personally-owned motor vehicles in China there is simultaneously a great pressure on land development to decentralize and move both housing and businesses to suburban rings.

PLANNING IN CHINESE CITIES

Chinese cities are currently engaged in a formal planning process that should help alleviate the congestion problems discussed in the above

section. However, the growing wealth of individuals leads to an increase in demand for personal cars, which in turn creates constraints on the ability of government planners to achieve plan objectives.

Land use and transportation are issues “joined at the hip.” Yet planners have had a difficult time in constructing plans that lead to the implementation of transportation infrastructure and land development that totally complement each other. This is true in the United States, Europe, and without a shift in thinking, soon, it will be true in China. While planning in most countries starts with the establishment of long-term goals and objectives, political realities and investment needs often shift planning from these far-sighted ideals to planning and building to take care of immediate problems. Certainly, high on the list of these immediate problems in China are the growing costs of congestion, such as decreases in accessibility and declines in economic productivity as delivery of goods is slowed. It is the declining accessibility in the core of urban areas, due often to declining bus service, that leads to pressures to decentralize development. Currently, housing and businesses are rapidly moving to suburban rings outside Chinese cities. Below are several key planning objectives Chinese cities must meet to address urban congestion.

- Provide more road capacity to meet the tremendous need.
- Sustain and balance a transport system that includes bicycles as well as a growing motor vehicle fleet.
- Provide increased access to jobs and to homes (permanent or temporary). This need will often lead to finding new land on which to build.
- Decentralize activities away from

the core.

- Maintain strict zoning control over land in order to control development.

The national government in China has put in place a planning process intended to address these issues.¹⁴ There remains, however, some obstacles to effectively execute these plans. For example, in urban areas, planners must deal with a number of conflicting situations simultaneously. They must address how major infrastructure improvements or land-use changes will impact current system behavior, accessibility, and the costs associated with travel. Urban planners must also examine how to make both needed capacity additions (e.g., new roadways, bus routes, and rail lines) and how to improve the capacity of the existing system (e.g., new signal controls, intersection capacity, bicycle streets, and parking controls).

At the national level, the State Council and the State Planning Commission set mandates for planning, including national economic policies and strategies. These planning mandates also may address motorization policy or conditions for new urban rail systems. These broad planning mandates are handed down to the Provincial Planning Bureaus and to the municipalities, where officials are more knowledgeable of local needs. Following the general central guidelines, concrete five-year plans are established by municipalities. The actual parameters for the plans originate from the agencies at the lowest levels—in townships and cities—and these plans work their way up to the municipal government, where balance among the various planning and implementing agencies should be found. After approval, the appropriate bureaus, in theory, carry out the plans. One significant gap in this planning process is that the central

government lacks significant financial power to impose sanctions or to create incentives to enforce these plans at the lower levels.

The planning function for public transport and road construction in Chinese urban areas falls under the auspices of the Municipal Construction Bureaus. The Municipal Bureaus of Public Security address safety and traffic control. Conflicting objectives among departments of these and other bureaus and problems of overlapping responsibility have hindered the optimal implementation of the plans. Moreover, once planning has been carried out and implementation of road and transit programs begin, there are no assurances that any coordination will take place between those bureaus responsible for street and road construction, traffic operations, transit operations, and bicycle and pedestrian circulation.

Another obstacle to effective planning is the lack of uniform regional planning in China. For example, in large municipal areas such as Shanghai and its surrounding environs, there might be a number of communities that carry out this planning process. There exists no requirement for a coordinated regional plan. This may lead to further conflict in infrastructure development and in land use. As the current momentum in Chinese cities is to add road capacity, undesired or unanticipated impacts on land, including undesired rates of decentralization, or difficult-to-support suburbanization might result. Throughout China many municipalities are now implementing road plans that impose ring roads, grid, or other road networks over the urban structure in an attempt to improve accessibility within the urban area and to stimulate motorization. These roads demand considerable land space and change the relationship between activity centers and the

roadways, much as they have in the United States. This parallel stems from the fact that the Chinese planners are borrowing pages from the U.S. practice of road building. The basic assumption is that accessibility increases will improve both the quality of urban life and the economic structure of the region. While levels of motorization are low—compared to European and U.S. levels—there might be some success in this effort. But, local planners are not having success controlling local land uses, ceding them to private economic markets, which tend to promote unregulated sprawl development outside of cities. This situation now arising in China is similar to the growth in sprawl development in the United States immediately after World War II. The United States has spent over eighty years addressing these concerns of planning and implementation; therefore, some overview of current transportation planning in the United States and its rationale will be explored below. Such experience may contain valuable lessons relevant to the development in China.

TRANSPORTATION AND LAND-USE POLICY IN THE UNITED STATES

The United States has evolved from a primarily rural country at the beginning of the century to a predominately urban one as we approach the year 2000. As noted above, nearly three-quarters of the U.S. population lives in urban areas, but more than one-half of this population lives in suburbs. As workers moved to the suburbs, so did their jobs, and the services that supported them. The primary commute in the United States today is single occupant vehicles travelling between suburbs instead of into the city centers. Public transit captures only four to five per-

cent of the transportation market; however, as Americans are extremely mobile, this market share is still nearly nine million trips per day.¹⁵

Over the last two decades, the impacts of motorization and suburban sprawl on the environment and on traffic congestion have become major concerns of city planners and citizens. Congestion is no longer a concern only of the peak hour commute to the city center, but an all-day concern on suburban roads that no longer have the capacity to meet the demand. Work trips, in fact, represent only eighteen percent of person trips taken and twenty-two percent of the miles traveled. Americans travel 4.2 trips per day, which is nearly double that of their Chinese urban counterpart. Americans make only six percent of their trips by walking or bicycling.

By the late 1980s, planners and government officials in the United States began to realize that the costs of suburbanization and the support infrastructure might be too great. The following list illustrates the broad range of these costly problems and provides insights for other countries such as China in the process of suburbanization.

- Suburban sprawl created housing at extremely low densities, which in turn demanded increases in road building and suburban road capacity.
- The costs of maintaining the existing transportation infrastructure were often more than could be managed by local governments. Rapid deterioration of roads and bridges occurred because of poor maintenance and high loadings—both in volume and weight. The roads had not been designed for such high loadings.
- Public transit was losing market share, which exacerbated suburb-

anization, for as transit service worsened more people in urban cores relocated to suburban areas.

- Highways built for inter-city access were becoming congested due to increased use from suburb-to-suburb travel. Moreover, the percentage of major highways with severe congestion continued to increase.
- Suburbs were being constructed without consideration of densities to support public transit and often without a concern for activity centers that could be reached on foot or by bicycle.
- The increased congestion led to sub-standard air quality in most urban areas.

In a 1991 attempt to remedy these concerns, the federal government passed the Inter-modal Surface Transportation Efficiency Act (ISTEA). In 1998, a subsequent version of this Act became law—the Transportation Efficiency Act for the Twenty-first Century (TEA21). TEA21 continues the major elements of ISTEA. Notably, these two acts reintroduced previous federal planning and road support programs. Since 1916, the U.S. federal government has traditionally provided significant capital support for highways and transit systems. Beginning in the late 1970s, the federal government also created laws and regulations that mandated a formal regional planning process. Specifically, cities were required to set up a Metropolitan Planning Organization (MPO) to carry out long-range transportation planning. Moreover, the MPO was responsible for developing an annual list of projects to be carried out to accomplish the long-range plan. This annual plan, the Transportation Improvement Program (TIP) required federal government certification and

had to meet six major planning criteria, including land-use planning. These mandated Metropolitan Planning Organizations and Transportation Improvement Programs fell into disuse in the 1980s, but with the pas-

and transportation planning mandated in the TEA21. The first factor is the fragmentation of transportation planning bodies and operating bodies throughout various local government agencies.¹⁶ The second factor

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sage of the ISTEA and the TEA21 in the 1990s both the MPO and TIP were re-energized. TEA21 aims to ensure proper consideration of land use as transportation improvements and investments are made. For example, TEA21 demands that:

- no new capacity be developed to support single occupant vehicles;
- more powerful transit alternatives be developed;
- non-motorized vehicle alternatives must be considered;
- communities consider public transit-oriented design;
- transportation investments are to be designed to build sustainable communities; and,
- all transportation improvements must make positive improvements in air quality and relieve congestion.

To simplify program development, the federally-run TEA21 also provides flexibility by allowing funds to be shifted between highway construction and public transit projects. The ultimate success of land-use and transportation planning lies with the local-level government. However, there exist two factors that perpetuate the inability of local areas, unless they choose as part of expressed local policy, to achieve the national objectives concerning sustainable land-use

hindering sustainable transportation development is that all land use is controlled at the local level, down to the smallest town. The fact that development is often controlled by local zoning often means a community will not have to consider the impact of major development—such as a shopping plaza—on traffic generation away from the site, and certainly not on the next community.

ISTEA and TEA21 have changed transportation planning in the United States from highway-oriented to multi-modal planning. Yet, growing congestion during the period 1991-1998 have led to pressures to continue to improve roads, especially in suburban areas. In a study of U.S. urban growth patterns, Chinitz showed that no matter how much effort officials in central cities make in increasing their population, suburbs continue to grow at faster rates.¹⁷ During the period between 1980-1990, the average growth in U.S. central cities was 0.64 percent while growth in suburban areas was double that rate at 1.42 percent. Sustaining this move of population to the suburbs is the continued movement of jobs to the suburbs. Three-quarters of the New York region jobs are outside the five boroughs, even though work in New York is associated with the core of Manhattan. Rail transit in New York

makes it possible to achieve employment densities in excess of 200,000 persons per square mile in the core of Manhattan, yet a sophisticated network of 37,000 miles of roadway is necessary to support travel outside the core. New York, which has developed suburban satellites, must support highway infrastructure similar to most large U.S. cities; yet, to sustain its economic vitality, city officials must support a public transit infrastructure similar to Paris, London, and Tokyo. The cost to New Yorkers for this kind of support is \$72 per year/person for highways and \$81 per person per year for transit.¹⁸

Transportation development in New York holds insights for densely populated cities such as those in China, for New York has, as have London, Tokyo, and Paris, made a commitment to sustain high densities of employment at the core. This means that primary jobs and services to support the jobs (e.g., financial and legal) and workers (e.g., food, drug-gists, personal care shops, and gyms) must also be located in the core. Public transit, walking, and telecommuting represent options to deliver people to primary jobs and support services. This dependence on public transport and walking underlines the continued need for high density development in urban areas.

ACTIONS TO SLOW SPRAWL

In suburban areas workers face challenges of sprawl and more trips in the auto than their urban counterparts. Many communities in the United States, TEA21 notwithstanding, do not know how to cope with sprawl or are unwilling to address the issues of sprawl. In some progressive areas, however, actions to address the inefficiencies of land use and the environmental impacts of high levels of

auto use are being taken. In MPOs in California these planning bodies are charged with making transportation investments and land use development compatible. In Portland, Oregon, the MPO has the responsibility to insure that its transportation plans are compatible with its long-range growth plans. Portland also encourages in-fill, namely, building in denser areas of the urban core that are abandoned or unused. Growth limits create demands for smaller amounts of available land. Zoning at higher densities, however, must accompany these limits and transit must be put in place to support the higher densities. The decision of families to move to a higher density area means more trips can be satisfied without a car, and in ideal circumstances, household purchases of additional cars are delayed or put off altogether.

A recent and promising aggressive approach to address land use through transportation has occurred in Atlanta, Georgia where a regional transportation agency has been established by the state government to mitigate the urban-suburban problem of sprawl-related congestion. This agency has the power to deny infrastructure connections to new developments, to plan and build rail transit and bus lanes, and withhold local funding unless projects get appropriate approvals and meet congestion and air quality requirements. Despite the potential benefits, such state-wide initiatives are still few in the United States. Data suggest the traditional patterns of suburbanization are continuing, but in response to congestion and poor land use the national and local governments are taking actions to slow sprawl. Incentives and new services to relieve congestion are outlined below.

- Transit-oriented design. Suburban communities and activity

centers are built at densities that support transit between activity centers and walking within activity centers. Transit-oriented design can also be part of less dense urban areas. Here employment and residential areas can be mixed, access to transit can be made more direct, and corridors can be developed that support busways or light rail. In suburban transit-oriented design, the ability to do personal tasks, such as shopping, by walking in the neighborhood of the work site encourages transit use.

- Improved access to commuter rail. Local areas are being encouraged to provide bike access to commuter rail, as well as better transit access and park-and-ride facilities.
- Value-pricing. While not getting rid of the car, peak-period or demand-based pricing on highways can be used to mitigate congestion or stimulate mode switches.
- Reduced parking standards. Parking standards should be reduced in high-density areas in order to discourage car use. Parking should be priced to discourage using cars in congested urban areas.¹⁹
- Financial incentives. Subsidies to discourage private auto driving include transit passes or fare subsidies and ridesharing subsidies.
- Sustainable zoning. Zoning should be developed that examines land use and transportation simultaneously. For a proposed transit corridor, minimum density standards and mixed land uses could be specified.

These are just some of the initiatives being examined in the United States as planners begin to gain some control over land use, using transportation investment as the stimulus. The

pricing and zoning criteria work best in a community predisposed to put high values on environment and a quality of life based upon environmental considerations.

LESSONS LEARNED

The Chinese government is now investing heavily in motorization, particularly the building of highways to support the growing fleet of cars and trucks. In light of this policy priority, the crucial question is whether China can avoid the kind of sprawl and environmental damage that has been created by motor vehicles in the United States. Through trial and error, planners in the United States have learned some lessons on how to prevent and correct such problems. These institutional and technical actions outlined below may contain some insight for land-use and transportation planning in China. These points are then followed by a brief discussion of factors that potentially hinder the transferability of these lessons learned in the United States.

Institutional actions. There are two major institutional actions that can potentially be transferred from the United States to China: regional coordination and funding capability.

1. The first institutional action deals with overall regional coordination. In the United States, urban regions must establish Metropolitan Planning Organizations (MPO). These organizations cut across all local governments and agencies providing transportation within an urban area. The MPO demands coordination among these agencies as one of the basic tenets of planning. It also requires that regional projects be coordinated with

long-term regional objectives—including land-use and environmental objectives. Thus, a suburban government must coordinate road or transit projects with other suburbs and the major central city they serve. Such an organization would provide for more efficiency of project planning and implementation, plus address impacts of motorization and suburbanization within the context of a regional growth strategy.

2. The second institutional action encompasses institutional funding capability. The U.S. federal government provides a significant share of capital funding for urban highway and transit projects. Knowing the projected levels of financial support allows for a continuity of planning and enables state and county governments to set planning targets to available resources. In China, local areas, after they get the “green light” to build, must raise the currency themselves—often in competition with other regional projects. By keeping funding—although the major concern—aloof from the regional planning process, projects can be developed as part of regional systems, to which they eventually will belong. A project-by-project basis leads to competition among development sites and competition between road and transit. We have learned in the United States that this is not the most effective way to plan. One source of funding at the national government level can be an infrastructure bank. Here capital can be given as loans to be repaid. Repayment would come from economic value added to the region based on the infrastructure investment.

Technical actions. These actions, which include aspects of design as well as implementation, address the types of facilities that could be created in China.

1. Transit-oriented design. The push for motorization is creating a demand for suburbanization in Chinese urban areas that will only grow with time. However, many mitigating designs can be applied in China. One is to make more extensive use of buses and bus connections through exclusive bus streets and busways. As new highways are built, bus lanes should be added, insuring that rapid transit access will follow communities designed for motor car access. To maximize use of busways, suburban communities should be designed at moderate densities, linked to activity centers easily reached by foot or bicycle. Transit terminals and transfer stations should be part of new community design.
2. Rail transit. Activities along rail corridors should be carefully planned. Rail provides high accessibility and affords the opportunity to cluster the highest densities near the stations. A variety of land uses can be integrated with the stations, including housing development. Access to a rail line by foot will keep both bicycles and motor vehicles off the road and will not add to poor air quality. It must be noted that while rail adds accessibility it does not reduce congestion.
3. Parking policies. Street space is a very valuable commodity and in American cities planners have learned how limiting spaces and increasing prices can discourage auto use. However, when auto use is restricted, adequate public

transit, including available taxis, must be provided. The auto user will look for a higher quality substitute for the current crowded buses. Rethinking the quality of public transit, an exercise now taking place in the United States, would be appropriate as a planning strategy to accompany new road construction. See Tilly Chang's article in this publication for current experimentation with public transit reforms in China.

4. Pricing. Road pricing has been, to date, very unpopular in the United States, but it can be used to differentiate among classes of vehicles and system use over selected periods of time. Correct pricing is a powerful tool and one that will become a standard part of regulating motor vehicles.

In addition to challenges in the existing urban infrastructure, there are financial and political factors that also potentially hinder the application of the above strategies in China. In terms of infrastructure, Chinese cities are much denser than those in the United States—only New York is comparable to the density of large Chinese cities. These densities in Chinese cities—which have historically occurred because work and travel were close together—pose challenges to incorporating new rail transit systems. This dense pattern of urban development has created broad networks of very small streets with only a small amount of roadway suitable for motor vehicles. Another complication for planners is that with the exception of the ring roads, most urban streets have to contend with mixes of motorized and non-motorized travel, which creates the worst of conditions for both types of travel. The speed at which ringroads and suburbs are expanding outside of cities also challenges Chinese planners

in designing transit and parking infrastructure.

Although Chinese planners are well trained and foreign experts are often brought in to provide advice, it is often the hindrances created by local governments that obstruct efficient execution of land-use and transportation plans. The decentralization of financial and administrative authority over the past twenty years in China has decreased the incentives for local governments to cooperate in regional planning issues. The central and provincial governments have lowered subsidies to local governments, which has reduced a key means to leverage cooperation from lower levels.

While the United States may provide useful lessons for Chinese planners, it is possible that the successful land-use and transportation development in Hong Kong could also be a valuable and more accessible model. The Hong Kong Regional government has been aggressive in pushing a balance between development and transportation infrastructure. Their main strategy has been to make the region attractive for development and push developers to finance infrastructure. For example, to accommodate the growing population they have planned new cities that will be located at new stops on a developing commuter rail line in the New Territories. This integrated planning will minimize the need for cars and maximize accessibility to the employment centers. There are conferences on development, environment, and infrastructure sponsored at the highest government levels in Hong Kong and such conferences could be repeated in dynamic growing cities in Mainland China such as Shanghai and Shenyang.

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Acknowledgments

I want to thank Eva Lerner-Lam for her useful discussions about planning in China and her overall thoughts concerning issues raised in this article. I would also like to thank Tilly Chang of the World Bank for her advice and comments. I assume all responsibility for errors that may be in this article.

ENDNOTES

¹A recent study provided an attempt to quantify some aspects of accessibility with land use and density. See Shunk, G. et al., *Land Use Modeling Conference Proceedings, Final Report*, United States Department of Transportation, DOT-T-96-09, Washington, D.C., February 1995.

² With the exception of Alaska and Hawaii.

³The U.S. Congress started formal support of the roads program as early as 1916 when it created the Bureau of Public Roads. Shortly thereafter (1918-1921) it began funding roads throughout the United States and required each state to begin a Department of Highways to receive and allocate funds. These programs, albeit in altered form are still in place today.

⁴"*Highway Statistics 1996*," U.S. Department of Transportation, FHWA-PL-98-003, 1998

⁵"Statistical Abstract of the United States, 1994." U.S. Department of Commerce, Bureau of the Census, 1994.

⁶Zhou Ganshi, "Urban Transport Problems in Chinese Cities," in *China's Urban Transport Development Strategy*, S. Stares and Liu Zhi, eds., Washington, D.C.: World Bank, 1996.

⁷A. Wellman, C. Louiss, and D. Ligtermoet, "Bicycles in Cities," in *China's Urban Transport Development Strategy*, S. Stares and Liu Zhi, eds., Washington, D.C.: World Bank, 1996.

⁸United States Department of Transportation, *Our Nation's Travel: 1995*

NPTS Early Results, 1997.

⁹R. Paaswell and J. Zupan, *Transportation Infrastructure and New York's Competitiveness*, Citizen's Budget Commission, New York, 1999.

¹⁰L. Xiaojiang and Yu Li, "Land Use and Transport Planning in China," in *China's Urban Transport Development Strategy*, S. Stares and Liu Zhi, eds., World Bank, Washington, D.C., 1996.

¹¹R. Paaswell, *Transport Issues: Beijing, Shanghai, Shenyang*, University Transportation Center, University of Illinois, Chicago, 1986.

¹²A. Wellman, C. Louiss and D. Ligtermoet, "Bicycles in Cities," in *China's Urban Transport Development Strategy*, S. Stares and Liu Zhi, eds., World Bank, Washington, D.C., 1996.

¹³Zhou Ganshi, "Urban Transport Problems in Chinese Cities," in *China's Urban Transport Development Strategy*, S. Stares and Liu Zhi, eds., World Bank, Washington, D.C., 1996.

¹⁴L. Xiaojiang and Yu Li, "Land Use and Transport Planning in China," in

China's Urban Transport Development Strategy, S. Stares and Liu Zhi, eds., World Bank, Washington, D.C., 1996. In addition, the author had a number of discussions with Eva Lerner-Lam, who provided great insight into the planning process.

¹⁵Travel times to work on these commutes, driving at thirty miles per hour, average less than twenty-five minutes, with longer commutes in the largest urban areas. For example, travel time in New York averages more than thirty minutes.

¹⁶New York City (e.g., the five Boroughs) provides a classic example of this fragmentation of authority in that local roads are the concern of the City Department of Transportation while major roads are under the State Department of Planning. Although the responsibility for transport services falls under the jurisdiction of the Metropolitan Transit Authority (MTA) the management for different areas of transport are separated into different units. For example, under the MTA the NYC Transit operates the subways

and buses while the commuter rail is managed by the Long Island Railroad. The bridges and tunnels are under separate authorities and each possesses the power to set tolls. Lastly, it is the Police Department that oversees adherence to traffic laws. Coordinating land-use and transportation planning among all of these agencies is a challenging task.

¹⁷B. Chinitz, "Urban Growth Patterns," in *The Land Use, Transportation, Air Quality Connection. Resource Manual*, Lincoln Institute of Land Policy, Cambridge, MA, 1994.

¹⁸R. Paaswell and J. Zupan, "Transportation Infrastructure and New York's Competitiveness", Citizen's Budget Commission, New York, 1999.

¹⁹Both of these strategies—value pricing and parking pricing—illustrate that pricing can be an incentive influencing mode choice.

CHINABRIEF

The publication *Chinabrief* was founded in 1996 and its goal is to improve information flows to and between international agencies funding or implementing development projects in China, with particular emphasis on the work of nongovernmental organizations. The *Chinabrief* aims to share this information with Chinese government agencies and non-profit organizations, as well as promote the development of a more independent communications culture in China. Issues of *Chinabrief* (zhongguo fazhan jianbao) are twin publications in English and Chinese, reporting from Mainland China on international aid to the country—international aid to China currently totals U.S. \$5 billion per annum. The publications include regular coverage of environmental projects, with an emphasis on sustainable community development and rural livelihoods. Examples of specific publications include:

- A thirty-six page, quarterly English language publication containing sectoral analyses, project digests, news, and features covering social development, rural development, poverty alleviation, and environmental protection projects in China
- A sixteen page, quarterly Chinese language companion to each English edition, distributed free on request to mainland Chinese organizations. This contains original articles and information, tailored to the information needs of a Chinese readership.
- A *Directory of International NGOs Supporting Work in China* was compiled and published October 1999.

The founder of *Chinabrief*, Nick Young, has lived in China since 1996, having previously worked in Latin America and Africa for a variety of internationally recognized media, including *The Scotsman*, *The Financial Times*, *The Economist*, and BBC World Service. There are currently three Chinese and one other international member on the *Chinabrief* staff. Subscription sales and grants from ActionAid India, Kadoorie Charitable Foundations, the Ford Foundation, Save the Children (UK) and the Trace Foundation support *Chinabrief*.

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