

Downsizing Strategy for Cars, Beijing for People Not for Cars: Planning for People

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RESEARCH ARTICLE

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Abstract

Beijing, the capital of China, is increasing enormously relative to its economy, pollution, population and dependency on private vehicles. Most of the Chinese cities are built and being built as a car-centric city. Six million cars are registered in Beijing, and with passage of time the attraction of private vehicles increases. Increasing in infrastructure the selection towards private vehicle is boosting. Municipality of Beijing is busy to use the conventional ways to solve the congestion problem rather than the smart solution, what megacities need to adopt. Beijing is second-worst in length of commuting time. This paper addresses the traffic congestion problem in the central part of the Beijing by using "Mixed Use Small Block Concept", where the network of roads spreads like veins in a human body, and the accessibility around center is dependent on vehicle. The aim is to recover the areas from cars and give it to residential and improve their accessibility by changing the mode of travel from car to walking and cycling, and provide clear boundaries and redesign the area by using Small Block Mixed use concept. Combining the public transportation, urban planning design and Non-Motorized Transportation priority will lead the city towards livability. The right to access every building in the city by private motor-cars actually the right to destroy the city." Mumford.

Keywords

Places for People, Car Reduction Strategy, Mixed Use Small block, Public Space Street, Pedestrian Street, Beijing, China

1 Introduction

Developing countries like China are growing very rapidly. Beijing, the capital of China and second megacity of the country, has a population of 21.56 million (Beijing, 2015). Beijing has six ring roads, and the distance between these rings are quite short. Today the single-center layout is criticized for its association with high bottlenecks of traffic density and jams in urban area (Yang et al., 2013). Beijing offers diverse employment opportunities and has witnessed a surge in its inhabitants in recent times. In the last two decades city faces the problem with the rise of migration from rural to urban areas in Beijing, and still the capital city faces the problems of land scarcity, energy cost, climate change, noise, pollution, poor livability, and also financial constraints.

Beijing seeks ways to relieve congestion and jams problem, because it costs them \$11.3 billion yearly (ECNS, 2014). From 2008 and onwards, China beat United States in the race of leading markets for new vehicles. Second largest emergent economy, 145 million registered vehicle and being a largest energy user lead the china to become the major CO₂ emitter (Wang et al., 2016). The growth of travel distance in Beijing has led towards depending on private cars (Jifu et al., 2015). Rapid attraction and adoption of auto culture in Beijing, China leads the city towards fast urbanization which increases the problem like traffic jams, congestion, parking resource shortage and higher commute (Jifu et al., 2015).

This capital city faces one of the biggest problem of higher vehicle ownership (six million registered cars), as well as annual increase of 6.8% (Beijing, 2015). The vehicle and building of infrastructures are directly proportional variable, the increase of one element will increase another one (Sipos, 2017). The variable will be rises means that the demand to construct more and more Infrastructure will be increases that increase will never be enough for auto attracted society.

The system is hectic due to very high commuting time and traffic jams. The city needs to adopt feasible solutions to connect the people, reduce pollution, ensure safety, reduce noise, increase liveability and meet the inhabitant's demands. The core milestone of this research is to introduce strategies whose

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adoption is possible. This research will introduce the new methodology “Reshape Beijing” instead of re-planning. The methodology will mainly focus on “*Planning and Places for People*” to achieve better liveability in Beijing.

2 Literature Review

In 1949, at the starting of the socialist era, the rulers rejected many urban planning models, and suggested building Beijing according to the Soviet Russian model, where the block length was more than 1000m and interaction per kilometre square was very small, which increased the dependency on private vehicle (Sandoval, 2015). In the years 1985 till 1997. Under rapid development most of the housing was built beyond the 3rd ring road on fertile agriculture land, from over five million square meters of housing were built on the city outskirts every year (Junhua, 1997). The huge infrastructure priority in Beijing is measured in 1990, when the administration decided to enlarge the roads to combat the traffic congestion and increase the road network density; that was the turning point towards private vehicles. Furthermore in the old city plan it was clearly mentioned that the roads were six meters wide, but to combat congestion they also increased the capacity of the old constructed roads as well (Meyer, 2009).

The mode of trip generation is changed in Beijing from cycling and walking to car and less part towards Public transportation (Darido et al., 2009). Environmental Protection Bureau of Beijing stated that “Beijing transportation emits one third locally caused PM 2.5 pollution (Eichhorst and Bongardt, 2015). The road widening campaign in Beijing played a great role in demolition of liveability of the city (Pan et al., 2009). Chinese megacities (Beijing, Dalian and Shanghai) are experiencing the annual increase rate of 20% to 25% in motorization (Cervero, 2004). Several Chinese cities including Beijing have undergone transformation of their dedicated cycle and pedestrian lanes in the widening of the road, to combat the congestion (USC, 2011). Many practices in the megacities proved that trying to solve the traffic congestion problem by conventional method only produces short-term congestion relief, which will attract more riders rather than solve the problem. During peak hours (7-10 AM) and (4-7PM) one-fifth of Beijing roads and intersections come to a standstill, and traffic speed is less than 5 kph (Ganshi, 1999). Document presented in World Bank discussion, by Chinese official, claimed that the reason behind traffic congestion and migration towards private vehicles is due to the lack of comprehensive transport development strategy, lack of coherent transport planning and chaos in transport management (Stephen and Liu, 1995). The inhabitants are feeling irritation from the massive traffic noise and also worry to the extent of not allowing their children to play outside (Charmes, 2010). Noise in megacities has become one of the prominent urban problems (Miedema, 2004), main source of the urban noise is traffic jams, congestion and vehicular traffic which seriously affect the inhabitants living in urban population (Lam et al., 2013).

The medical science research analysed, that when noise crosses the 65db threshold, then it seriously impacts the physical and mental health of the inhabitants living in the area (Berglund et al., 1999). The key challenge in most of the growing countries is increase in congestion, jams due to CO₂-emissions and unplanned growth of cities (Banister, 2008). Integrated planning play effective role to reduce traffic jams, can improve mobility, reduction on dependency and usage of cars, air pollution, noise and living conditions (Pagliara et al., 2017).

To increase the safety of road transport, the city need to further improve and focus on vehicle, human factor and infrastructure (Török and Pauer, 2017). The Beijing city need to reduce vehicle, by solving of traffic jams and congestion problems rather to build an infrastructure and training on patience and aggression (Human Factor). Infrastructural design play a vital role in the safety of road traffic, (Török, 2014) hence Chinese development is mainly based on further infrastructure rather to solve the problem by sustainable alternatives.

After the peak hours in Beijing 60db of sound is measured, which will not allow the inhabitants to sleep (Wang et al., 2014) Recent study shows that around 20% mortality could be forestalled each year by implementing the international recommendation standards to downsize the motorization transport and improve the non-motorized transport user (Muller et al., 2017). The 19th century was considered the car-centric planning era, but “the good days of the automobile are over”, now it’s time to downsize the car, and move towards smart mode of transportation (Gehl, 2016b). Now it’s time for transportation engineers, planners, and urbanists to reclaim the cities from cars for people. The time has come to think and address how to make the world, safe, better, healthy, sustainable and highly liveable (Gehl, 2010; 2011). Recent discussion on “Person Places Things” among Danish architect and planner Jan Gehl and New York Times Randy Cohen, a columnist, where Jan Gehl mentioned few points which are “Lack of planned community is just space filling up”. The best city is whose facilitate the people at age of 8 and 80 that’s the example of liveability. In Copenhagen, Denmark 45% of trips are done with the bicycle, and it’s the number one city in the world in the ranking of liveability (Gehl, 2016a).

The world had never before experienced the fastest urbanization occurring in China. Beijing urban expansion led to continuous accumulation of ring roads around old centre (Yuen and Kumssa, 2011; Wendell, 2010). The attentiveness of workplaces and moneymaking activities results in high concentration of vehicle use due to expanding road network to deal with (Yan and Crookes, 2010). Beijing is not a liveable city; pollution aside, the city has horrendous traffic, un-walkable neighbourhoods, in some areas pedestrian tracks do not exist at all, where the bus stop existed is on the footpath, and during the peak hour it’s difficult and dangerous to cross the footpath because of its poor urban planning (Beijing, 2012). Transportation is considered one of the key consumption source of energy, whereas

through block concept the vehicle moment will be limited in the pedestrian areas, (Lin et al., 2011; Wang et al., 2014).

Block development will reduce the congestion and traffic delays by 25%, and make traffic flow more efficient (Sustainability, 2011). Beijing design for the car, the congestion and environmental reduced the economic output by 7.5% to 15% (Creutzig and He, 2009). The neighbouring municipality with Beijing name “Tianjin” associated 3.7% of GDP in terms of health cost in 2003 around 1.1 billion\$ (Zhou and Tol, 2005). To control the traffic noise is the major concern and research topic of many countries in the world, but in China traffic noise along with highest rate of mortality around 110,000 per year (Liren, 1996). In Beijing in 2000 (PM10) motor vehicles accounted for \$974 million of the health impact of air pollution (Deng, 2006); furthermore in 2005, the number of car accidents was quite alarming in Beijing around 1300 people died in car accidents and 5550 were injured (BTRS, 2007). According to IBM Survey conducted in 2011, Beijing stands second in commuter pain index in all over the world, and due to the huge gridlock like Beijing or Mexico City, the overall productivity of the city is reduced by 20% (Armonk, 2011).

3 Methodology

Beijing had already experienced the superblock model, but due to its long length and less interaction, it triggered heavy dependency on private vehicles. This research will address the superblock urban pattern (Grade-separated) with “Mixed Use Small block Concept”, and suggest reducing the length of block in half, not more than 400 meters, and limit vehicle accessibility to the residential areas. The central ring road is considered as a Case Study, which comprises the ring road, secondary road and local roads which provide accessibility inside each block. Due to long block lengths the inhabitants have no other options other than the private vehicle. Non-motorized transportation (NMT) facilities exist in Beijing; however, overall Beijing is not friendly towards these modes. Its immense size and traffic congestion make bicycling and pedestrian movement difficult (Renzenbrink and Zhou, 2015; Byrne, 2013).

When public transportation mode share increases in city, such city tends to have lower rate of traffic fatality (Bhalla et al., 2007). Public transport based on supply and demand have a positive impacts on quality of life, friendly mode of mobility, social integration, and activates in neighbouring (Pagliara et al., 2017). The hallmarks of smart solution “Mixed Use Small block Concept” as shown in Fig. 1 is the assurance of clean air, less congestion, increase and promote the NMT user, shift the modal split from car to public transport, reduce the dependency on private vehicles, increase community integration and generally lead the area towards being a high liveability city. This concept is based on redesign and reshaping of the areas, not completely re-planned, so this methodology can adopt to the weak superblock regions in Beijing.

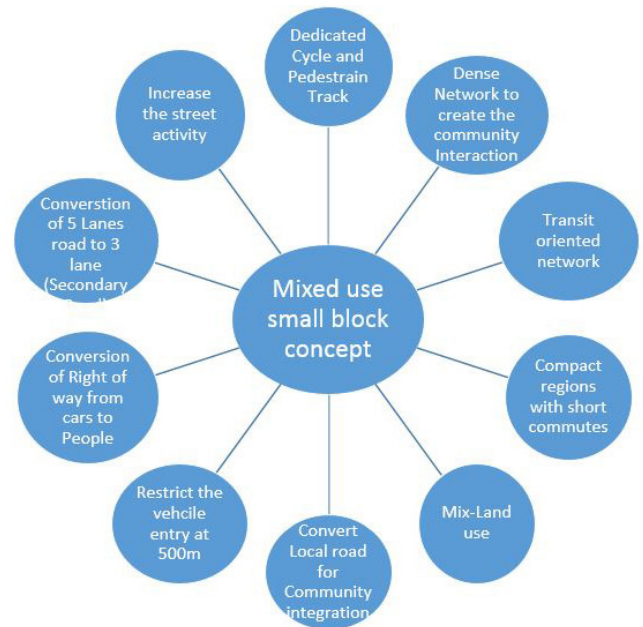


Fig. 1 Mixed Use-Small Block Model for Beijing, China

4 Mixed use small block concept

The central part of Beijing was considered in this case study. Beijing is surrounded with 6 ring roads around its centre, more than in any other city in the world. The system is surrounded, as when a small bird is confined in a small cage, and then the same cage put in another one but bigger.

According to Fig. 2, the central ring of Beijing is 34 km which is separated through second ring road from the rest of the city. Inside this case study the area comprises 10 residential districts (Beixin bridge residential district, Andingmen residential district, Changqiao residential district, West Changan avenue residential district, Fiengsheng residential district, Chaoyangmen residential district, Jianguomen residential district, Xicheng residential district, Donghuamen residential district, Fusuijing residential district). All these districts are separated from each other by secondary roads (4 lane per direction). The Beijing historical and attraction places Mausoleum of Maozedong, Tiananman Square, Confous Temple, The place Museum and Peiking University also lie in the central district.

The study also analysed that the central ring is a car-oriented centre, and inside these blocks there are local roads every 100m, which make the residential district the worst community in the sense of neighbourhood. The study also analysed that after peak hours the noise level was around 61db at 23:00. The maximum block length (length*width) is 2.50km * 1.30km, and the smaller one is 1km * 1.3km.

This research will address the long block development in Beijing with a new suggested model name “Mixed Use Small Block, which will consist of two phases. The first phase will suggest to divide the block in 400-500m and the second phase will increase the community integration in residential area, which will be mainly based upon conversion of right of way from car to people.

As shown in Fig. 2, due dense network of local road (one lane/direction) in the street every 100m. This research will strongly recommend to reshape the current strategy for urban planning, and suggest the new reshape model where urban planning, public transportation under transit-oriented development approach and priority to non-motorized transportation will be mainly implemented within the new suggested urban model for the central part of Beijing, China.

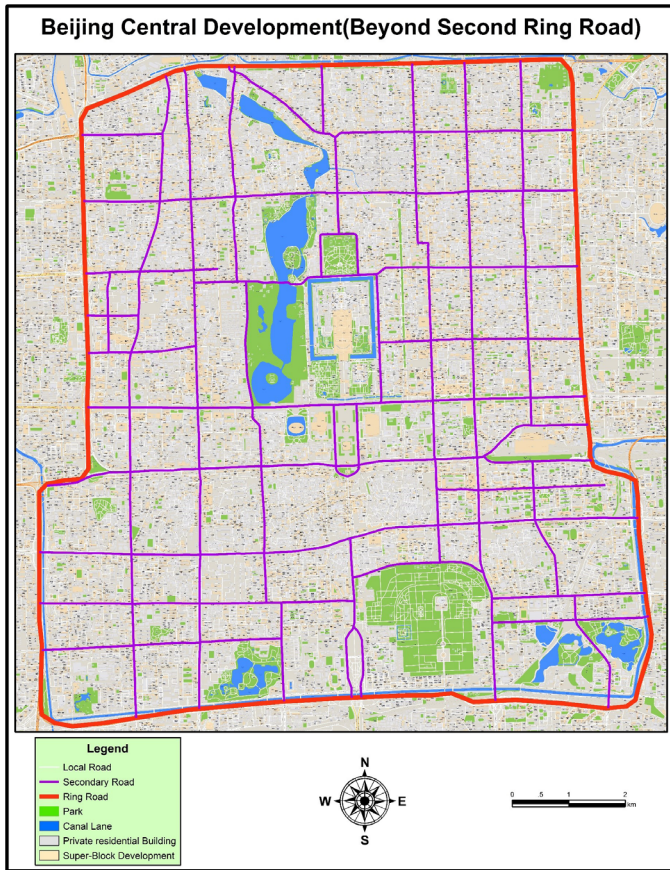


Fig. 2 Beijing Central Ring existing development structure

5 Mixed use small block outcomes

Beijing requires smart solutions which will be mainly based on mixed-use, which can guarantee access to amenities near enough each block to be within walking distance. When the need for a car is reduced by smart planning, then an urban planner can utilize the same land area for better urban habitat. This methodology will improve the socio-economic situation in the neighbourhood as well as increase the public spaces and vibrancy of peoples' activities. The social benefits, such as access to facilities, increase the community integration and activates, provide a place for people of all ages, creates user-friendly streets and the ecological or environmental impacts in the form of reduced emissions, a safe environment, improvement in air quality, cost-effective use of energy, less movement of and dependency on vehicles and economic impacts such as better neighbourhood, active block clubs, improved non-motorized transport (NMT) mobility and increase in inhabitants' satisfaction. All these

strategies will lead the city towards liveability. This strategy can be achieved by the following indicators; the proposed small block will create the dense and narrow network of paths and streets, where pedestrians and bicyclists will have priority. The block concept will play a vital role in the modal shift from cars towards pedestrian- friendly modes (NMT).

6 Local Road Strategy

The small block concept will be applied in two phases; the first phase is the more intensive and ambitious phase. Local roads will be reshaped and restricted for vehicle movement, and access will exist for vehicles at every 400-500m in each block. According to the figure each block is separated through secondary road. A random block is selected for case study to see the real picture, and the block study is divided into "Case study A" and "Case study B".

"Study A" (Fig. 3) consists of 1.20*1.60 of block length and the local road availability is at every 100-120m. The local road network is quite dense, inasmuch as the existing scenario is quite drastic which pushes more riders into the area.

The proposed strategy of the same area is to divide the block into two parts, and block the road at every street; vehicle movement will be allowed only at regular intervals of 400 to 500m because the purpose to restrict the car entry into each block and reshape the local road and transform it to "Places for People" as shown in Fig. 3 in green.

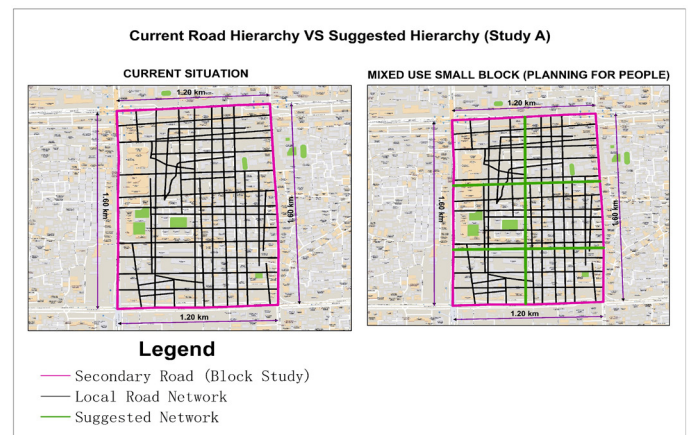


Fig. 3 "Study-A" Existed road VS Suggested road Hierarchy

"Study B, Fig. 4" Similarly another study is done, where the situation is worse and even to breathe without a car is barely possible. The block length was 3.2km and width of 1.4 km (Sum), the dense network was spread out as shown in figure relative to the existing scenario and dedicated with black lines. After almost every 70-100m interval there was provision of local road, then after analysing the researcher suggested to divide the block into 6 blocks at every 500m. The research team was keen not to construct or invest money again but this suggestion is based on local roads with further improvements as shown in Fig. 4.

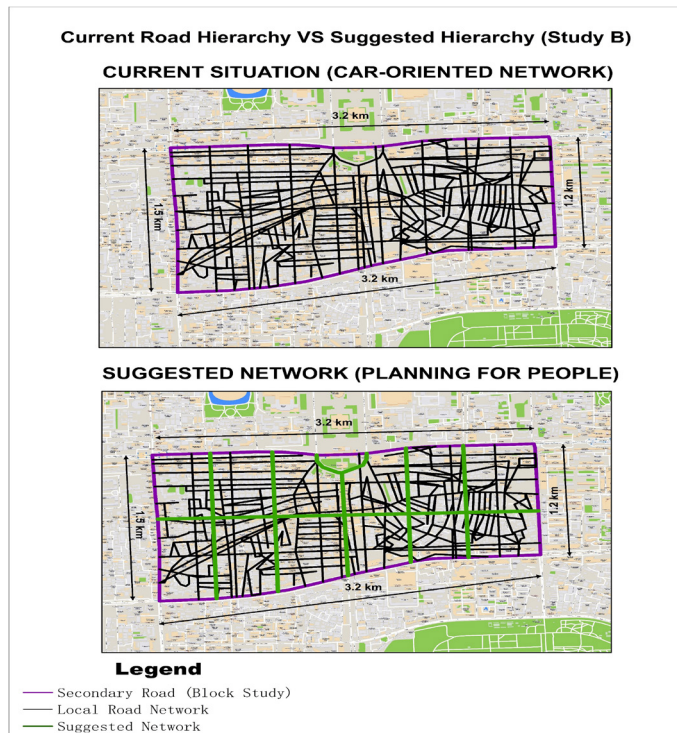


Fig. 4 “Study-B” Large block VS Suggested Mixed Block

The next phase of mix-use block is to transform the area into NMT (increase in the width of pedestrian track, provision of a bicycle track, add convenient seating at streets, and also reshape the area with plants and green belt. The next step of the strategy will transform the local roads to public spaces, such as pedestrian track, user-friendly street, add seating, street widening, green block, bicycle track etc. The aim of this second strategy is to convert the car-oriented places to “Places for People” to increase the people movement and interaction.

Next, the second phase will deal with local roads by maintaining the one-lane-per-direction policy with the strict speed limit of 30km/h (Tempo 30 Road). This local road will be connected with an underground parking lot. The survey revealed that in central district parking is available almost at every street corner, so these corners need reshaping to increase overall parking capacity.

7 Secondary Road Strategy (Planning for People)

Secondary roads usually provide three to five lanes per direction in the region; these roads typically separate the neighbourhoods. The vehicle speed (70km/h) is also quite alarmingly high. During interviews with in the residential areas, it’s documented that people are frightened and do not allow their children to play outside, even within blocks. From such surveys we also measured that during peak hours there are high emissions contribution to dirty air, and excessive noise until even 23:00 or 24:00 hours. The scenario is quite hectic for these residents; the second part of our strategy will

explain how we can arrive at a solution. The district is also connected with metro service but the station is far distant than most people preferred to drive in their own car/vehicle.

The wise thinking is to combat the congestion, and rapid construction for congestion to increase the capacity is one of the wrong and outdated mentality. The question is why people need to drive their own vehicles, if a typical trip can be facilitated with local public transportation in preference to their own car being stalled so long in the traffic congestion. Relative to the rate of people driving themselves versus using public transport Beijing is the second-worst city in the world.

For the secondary road study, after analysing the street network from survey and with the help of Google Map, the total area beyond the second ring road is 34 km², where the length of the secondary road (three to five lanes per direction) is 108.80km.

In the secondary road strategy the conversion of land to pedestrian or cycle track is recommended by the research team, to change the modal shift. Along with the modal shift the transit-oriented development (TOD) approach is important to be re-addressed, in the five-lane road, three lanes will be open to general traffic and one lane will be dedicated to buses. A cycle track and pedestrian path will also be separate from the street traffic for the safe movement of people. Where TOD concept explain the provision of transportation service either subway or bus which are the main modes of local public transport in Beijing, China. The secondary road strategy will improve the economic situation, e.g., by reduced health cost, reduced congestion, more attractive land, and increased liveability (Fig. 5).

The strategy will further reduce the pollution, reduce carbon emissions, and increase traffic safety, all of which will drastically change the modal shift of Beijing. Jan Gehl, in a recent interview, said that when you plan for cars, you will get cars, and when you plan for pedestrians and bicycles you will get the liveable environment (Gehl, 2016). He further explain that the city is considered liveable which facilitates and cares about the people at ages 8 and 80, whereas in the recent study we documented that Beijing only caters to the car users by construction and investing more and more money in roads and bridges.

8 Proposed Strategy for Future Planning outcomes

According to Figs. 6, 7 and 8 shows “views from above” of a rejuvenated city reclaimed from privately owned automobiles and the vast expanses of concrete needed not only to drive them, but also to park them.

They illustrate the benefits of adding green space, providing for pedestrians and bicyclists, and introducing traffic-calming measures. Additionally, they depict the benefits of innovative land-use policies which enable people to live near not only their workplace, but also near typical destinations appropriate to recreation and leisure-time hobbies.

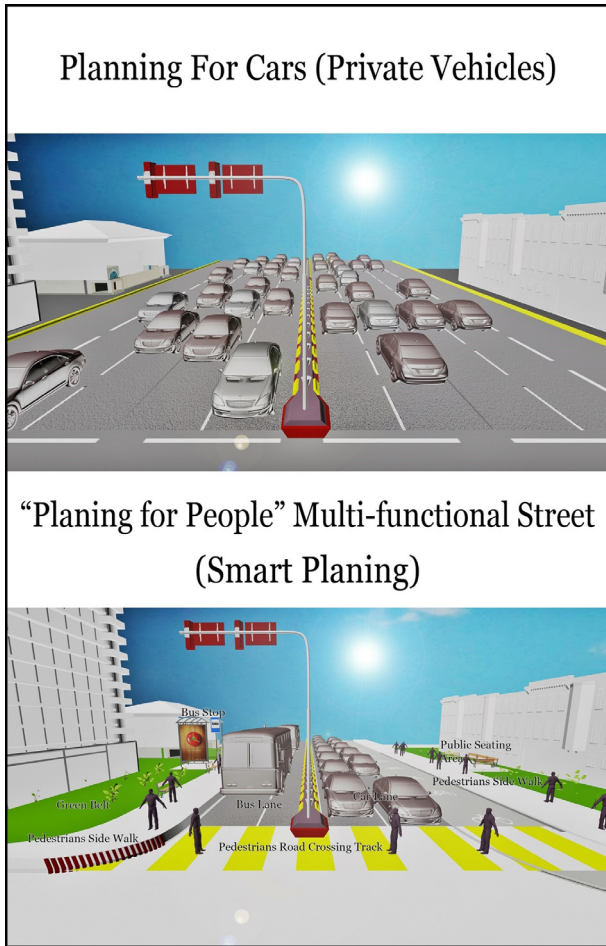


Fig. 5 Planning for Cars VS Planning for People

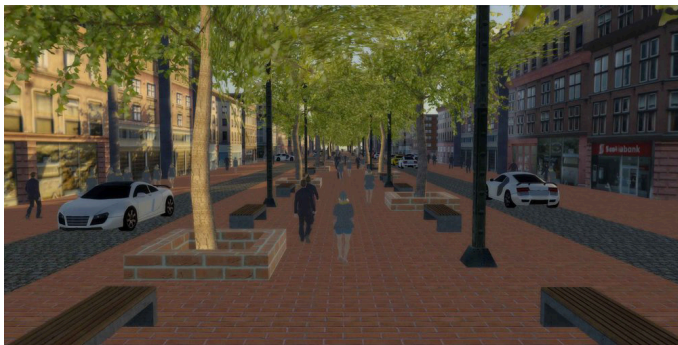


Fig. 6 Planning for People



Beijing, China Places for People Proposed Plan

Fig. 7 Proposed Future Plan for Beijing

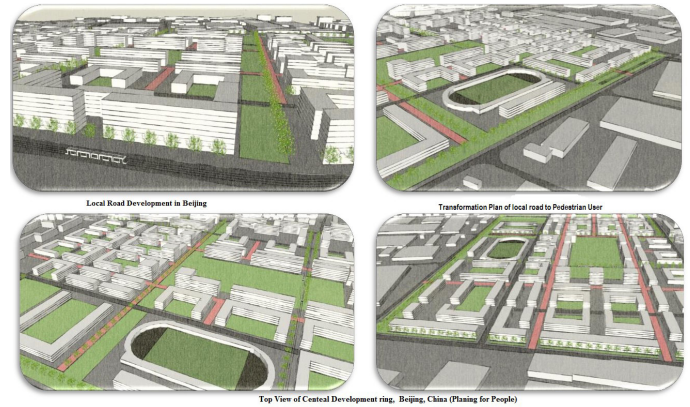


Fig. 8 Multi-functional development model proposed research study

9 Conclusion

As a cynic might say, the world’s largest megacities, such as Beijing, have already become nice places for a motor vehicle to live, yet well-nigh unlivable for humans. This lack of livability stems from multiple causes, such as traffic congestion, noise, pollution, and chronic danger to those daring to be pedestrians or bicyclists. By implementing these measure such as mixed use small block concept, local road strategy (Places for people), secondary road strategy (Planning for people) that will encourage mode share of NMT. For smart, sustainable development Beijing need to launch such a pilot project before that the area hijacked completely by conventional planner which solve the problem by an increase in infrastructure. This paper has presented an integrated variety of synergistic strategies to “return the city to its inhabitants.” These strategies embody ideas of land use planning, provision for reliable and frequent public transport, strict enforcement of wisely chosen laws for drivers of private vehicles, and recognition of the needs of pedestrians and bicyclists.

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