Blekinge Institute of Technology
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Reclaiming streets to pedestrians and cyclists in the Bund area, in Huangpu district, Shanghai

Equal, safe and pleasant streets for sustainable life

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Abstract

This paper is about the importance of a sustainable travel mode like walking and bicycling instead of car oriented traveling. As the urban population is growing and more people can afford the “dream” of a car - it puts a high prize on the cities as in means of safety, pollution, exclusion and unpleasantness. Research has shown that rapidly developing countries with the sudden car and motorbike invasion face all these problems. Research anticipates that if nothing changes these problems will only increase. The aim was to investigate how to make the streets easies, more pleasant and safer to walk and who should have the priority. The method used was a thematic literature review and similar metropolitan case examples and a on field qualitative and quantitative case study. A case study dealing with this issue was conducted in part of Huangpu district, Shanghai, China. A questionnaire was part of the case study to get some inside in the inhabitant thoughts. While on field studies examined the streets by the use, distribution and variety of obstacles. Numbers of people versus cars using the streets were counted and analysed. It was found that too little space with too many obstacles was given to the pedestrians. Bicycling was unpleasant and unsafe and bigger roads only invite more cars. Based on the findings a new proposal for the area was created. That included that a street was changed into a pedestrian street and new bicycle lanes were put on all the streets. The sidewalks were widened and more trees planted, to provide a safer and more comfortable walking. Although the new proposal covers a small area the design principles can be used for expansion.

Key words

Walkability, traffic safety, bicycling, pedestrian road, sustainable movement
本文主要论述了由人行交通和自行车交通代替汽车交通的可持续性交通模式的重要性。城市人口的增长和能实现“购车梦”人数的增多使得城市在安全、污染、排他和争执方面的问题突出。研究表明，机动车数量急剧增多的高速发展中家面临这些问题。如果不做出改变这些问题将愈加严重。本文调查研究的目的为如何使街道更舒适、更安全并且更易于行走和哪类人群应当具有优先权。使用的方法有查阅资料、类似的大都会地区实例列举和实地调研。一个旨在解决这些问题的个案研究在中国上海黄浦区的一部分地区进行了实施。为了获取居民内心的真实想法，发放调查问卷成为了研究的一部分。与此同时，实地调研检验了街道的功能、分区和障碍物的种类。反对机动车使用街道的市民的问卷被计数并分析。调查显示，步行街狭小的空间被设置过多的障碍物，在上面骑行自行车是不愉悦和不安全的。然而较宽的路上会存在更多的机动车。基于这些发现，一个针对这个地区的建议被提出。原本的街道被改变成步行街并且都设置有自行车道。加宽人行道和栽植更多的树木都是为了提供更加安全和舒适的步行体验。虽然这个新的提议只覆盖了很小的区域，但是它的设计原理可以被广泛运用。
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INTRODUCTION
Introduction

Shanghai is a fast growing and developing city, with high density. Its traditional way of traveling has always been by foot, bicycle or public transport. As Shanghai is so densely populated the inhabitants have always used the outdoor space thoroughly both for daily needs and leisure. But only 20 years ago everything started to change with the possibility to own a private car. The city started to promote the private car tendency, by building uncountable freeways and nonhuman scale streets for cars. In this process many things were negatively affected. The bicycle movement got deterred by not providing safe routes or banning them from the streets completely because they interfere with car traffic. Crossing streets and walking got more dangerous and unpleasant. Problems like noise and air pollution, traffic jams and traffic accident worsened year by year. Shanghai contributes to the world wide accident rate. Every year 1.2 million people in the world die in traffic accidents and 50 million people are injured, 90% of the accidents happen in middle-income countries even though they have less than half of the world’s vehicles. Half of the people killed are the “vulnerable road users” like pedestrians, cyclists and motorists, but most of the traffic safety measures are focused on saving car drivers, because the word “traffic accidents” suggests that it happens to car drivers and passengers. In 2007 China was the number one country for traffic death in the world. (World Health Organization, 2009) Cars are the main cause of traffic congestions, death and air and noise pollution on Shanghai streets. Health is a major issue and car dependent door-to-door people are more likely to become sedentary and harm their health. (Gehl, Cities for People, 2010) As we live in an era where we can’t ban cars from the city, it is necessary to recognize the need for controlling the amount of cars and give better and safer opportunities for sustainable travel like walking, cycling and public transport.

Demography, land and temperature

Shanghai is one of the world’s largest seaport cities and is located on the East China Sea between the Yangtze and the Hangzhou River. Shanghai municipality is 6430 km² in area and its population has grown from ~16.4 million in 2000 to ~23 million people in 2010. As the natural growth rate is low the majority of the population growth is due to migration from the rural areas. The population density in Huangpu district has decreased 25% from 57450 to 42990 persons per km2. (Shanghai Statistics, 2010) The average annual temperature is ~16 °C; the July maximum averages temperature is ~27 °C, and the January minimum average temperature is ~3 °C. (Britannica, 2012)

History

After the defeat in First Opium War in 1842 Shanghai was open to foreign trade. Before that the main Shanghai industry was cotton and silk production. Still nowadays we see the evidence of the foreigners by the old bank and commercial business buildings lining up the Bund in Huangpu district. (Britannica, 2012) This is one of the reasons that over the years Chinese leaders have tried to shift the center to another location in Shanghai trying to escape the foreign stamp and building their own modern Shanghai. (Campanella, 2008) None of the attempts developed, but a new symbol of Shanghai was obtained by building the Pudong skyscraper area.

Huangpu

Huangpu district is located in central Shanghai and is one of the most densely populated districts in the world; also it’s located next to the Huangpu River and the Bund - the viewing point to Pudong, the symbol of Shanghai and China. Nanjing pedestrian road that attracts people from all over China and the World is located in this district. This district and especially some major streets are crowded and unsafe all year long and non-walkable in the high seasons. A great deal of attention has to be put on the logistics for commerce and rescue services, as many of the streets are historically narrow and a great deal of people use them every day.
Problems and objectives

The two major problems in this over densely populated area is the narrow sidewalks which force people to walk on the street and the fact that in some parts bicycle traffic is forbidden in favor of cars. As the pollution and car problem in China are growing more and more it's wrong to ignore sustainable ways of movement and not provide enough space for their demands. The objective is to investigate and study how to make the streets easier and safer to walk and bike, and who should be prioritized on the streets for the greater good of the city and the majority of people. The objective is to analyse if things like widening some of the street sidewalks, making some streets pedestrian prioritized and continuing Nanjing road as a pedestrian road till the Bund and allowing cyclist movement through all Huangpu area could be the solution and to which level it could be realized.

Significance

It's important to have a pleasant walking environment in downtown areas. More sustainable downtown area can be achieved by focusing on walking and cycling instead of cars. Much of the attention in the world today is on walking and many planners and architected emphasis these things.

Jan Gehl is one of the main proponents of a pedestrian and bicycle friendly downtown not only in European cities but also in major Asian metropolises such as Shanghai.

“In Shanghai, China, and other major cities, more roads do indeed mean more traffic and more congestion.” (Gehl, Cities for People, 2010)

Shanghai started out as a walking city, and then came the bicycles; people were used to a sustainable travel mode. Then the government decided to prioritize the private cars as an economic growth method and spend enormous amounts of money on new highways neglecting and in some parts even banishing the bicycle movement. Although bicyclists right now are making the streets a bit chaotic, as do cars and motorbikes by not following the traffic rules, it can become a pleasant travel mode if the streets are equally and practically designed for all the street users. Also is the street users get comfortable travel options they will more likely stick to those, so making the streets safer and convenient to everybody. “Limited space, obstacles, noise, pollution, risk of accidents and generally disgraceful conditions are typical for city dwellers in most of the world’s cities.” Already 50 years ago Jane Jacobs claimed that the rapid increase in cars and planning ideologies will lead to a lifeless city. In developing countries people use outdoor space for many of their daily tasks, but now the car is concurrent for their space and worsens the pollution and noise level. (Gehl, Cities for People, 2010)

Research Questions

How to provide pedestrians and bicyclist friendly and safe environment in Huangpu district, Shanghai?

How to increase the walkability and ease of cycling in crowded streets and how to divide the street for different street user interests proportionally?

Opportunities

Implementing safer and more efficient streets can be done because the car traffic isn’t too heavy there yet, but with nothing done it will worsen, the problem is that the proportion of the street that is given to car use is not equal to the street proportion that is given to the pedestrian and cyclist demand. It has to be done because Shanghai already has major air and noise pollution as well as traffic accident problems, with no changes it won't get better. Also this area is a major tourist attraction as well as historically important location. The Shanghai city center was built as a walking city, and walking and cycling has been an everyday travel mode for the people of this city for years, so they are familiar with it, so it is easier to keep this travel mode just by giving them safer and better options, not like in cities were this travel mode has been dead
for years and has to be reintroduced from the beginning. Compared with other investments, making the city livable, safe, sustainable and healthy by having it in human scale and caring for pedestrians and cyclists is cheap and doable in every country. (Gehl, Cities for People, 2010)

Method

The first method used in this work is a thematic literature review, from which I get knowledge about the overall problems, how to deal with these problems and the different types of solutions, that will be implemented in the case study and new proposal. The next step is to find good examples of other metropolitan’s case studies to see an example how they dealt with similar problems and what has been the long term result afterwards. This part is more of an example to show that also developing and highly dense cities can have successful streets with car restrictions.

A qualitative and quantitative case study is used to investigate Huangpu district. A questionnaire with questions about the walkability and safety is conducted and the results are taken in to consideration when making the new proposal. A street analysis is made using Jan Gehl “Cities for people” and A. B. Jacobs “Great Streets” theory. The same theory is used to implement a new proposal.

Delimitation

Walkable streets consists of many things like connectivity, accessibility, mixed use, safety, livability, comfort, responsibility, and more. While I will comment on these things, this paper focuses on the physical aspects of the streets. Although the literature review can be applicable to all Shanghai, the theory is applied to a small part of central Shanghai, a part of Huangpu district.
Study Area

Study area

This map shows Huangpu district and my study area. It's located between the existing Nanjing Pedestrian Street and The Bund. Nanjing Pedestrian Street starts from People Square. Shanghai's Old Town is also located in Huangpu district.

The Bund and Nanjing Pedestrian Street are the 2 most active areas in Shanghai in terms of pedestrian activity, it is 2 of the main attractions in Shanghai, jet they areas are not well connected.

Map Nr. 2. Part of Huangpu District, Shanghai, China
Case study map

This map shows the limitation for the new proposal. This map was made by using Google Maps as well as manual measuring. Measurement were taken to find out the street and sidewalk width.
LITERATURE REVIEW
Literature review

A big part of Shanghai was planned during the 1950 – 1980 as a mostly walking and pedestrian oriented city. Most of the old roads in Huangpu are approximately 16m wide. So Shanghai center has only 9% of road surface, while for example London and Los Angeles have 25% and 40% of road surface. (Shen, 1997) Shanghai had an average of 25880 persons/km² in 2000 and 36310 persons/ km² in 2010, Huangpu district had 57450 persons/km² in 2000 and 42990 persons/km² in 2010 (Shanghai Statistics, 2010) so due to the density increasing the road surface is not a good option. After the 80s the work places started to be further from homes, shifted from centers to suburbs and people started to earn more money - the boom of bicycles arise. More and more people were bicycling and due to no street separations already then walking became more and more unpleasant. In 1994 the government decided that promoting motorized vehicles was the answer for economic growth. It promoted private cars and public transport instead of cycling. Cycling was seen as a poor mans way of transportation and so a step back from the modern development. It was seen as the disturbance of traffic flow and cause for traffic accidents. (Shen, 1997) From 2001-2006 bicycling has dropped 26%. (Campanella, 2008) That is no surprise considering that there are streets where bicycling is forbidden and most of the streets are now occupied by cars - leaving no bicycle lanes. And in those streets where there are bicycle lanes they are interrupted by parked cars, motorbikes or bicycles themselves. I need to mention that on Shanghai’s streets there is little respect between the street users. It feels like the one who is bigger can go first. That leads to much confusion, interruption and accidents. But if the streets were more clearly structured it would be easier to adapt and realize that by following the right way - the street movement would become better. Although the government was and is still promoting public transport it lacks to care for the pedestrians. But pedestrian friendly streets not only promote walking but also encourage the use of public transport. (Ewing, 1999) (Gehl, Cities for People, 2010) Nevertheless Shanghai is a city where people have used walking and bicycling as the main mode of traveling, this changed approximately 20 years ago when the cars became more accessible to the private users. As Shanghai now is a rapidly developing city people continue to afford more private vehicles. So more and more people are switching from walking and biking to using cars and electric motorbikes. See infographic Nr.1., paga nr. 12, of the Transport Development Path for Developing Countries. Shanghai’s central street infrastructure was made for mostly non-motorized travel, so now due to the dense and increasing population, increasing income and rapid motor vehicle incline the people of Shanghai face a big problem on the streets. (Shen, 1997) In Asia 1 person has 0.2 cars, so only every fifth inhabitant owns a car, that means this number will continue to grow and lead to severe problems not only for Asia but all the Worlds environment. See infographic Nr.3, page nr. 13.

(Robin Hickman, 2011) The car fleets in Asia are doubling every 5-7 years, and if no change is made China is one of the countries that will have the highest demand for private cars in the future. (Asian Development Bank, 2010)

Jan Gehl also argues that walking and bicycling has always been the main transportation in developing countries, but now when the motor vehicle becomes more accessible it makes it harder to travel by foot, cycling or public transport that runs on streets. For some people it is already impossible to find a pleasant way of movement. (2010) As the desire for a private car is understandable it can’t be accepted at the expense of sacrificing the traditional mode of transportation, like walking and cycling. The need for motorized and non-motorized traffic working side by side is crucial in developing countries and can be achieved with little funds. Developed countries like Denmark and Netherlands and developing cities like Bogota and Curitiba are proof that it can work. (Gehl, Cities for People, 2010) And as some may argue that those cities are different from Shanghai, Jan Gehl claims that for different cities around the world, the implementation of human scale in city planning is almost the same. (2010) The methods of dealing with these problems are similar as well, because humans have the same basic instincts of movement. (Gehl, Cities for People, 2010) Also walking is so much more than getting from A to B. It creates a public realm - and good streets can do good for the city and their inhabitants. (Jacobs, 1993)
Transport Development Path for Developing Countries

Infographic Nr.2. Total Vehicles and Motorization Index; Source: Robin Hickman, 2011 (ADB. 2009. Changing Course. A New Paradigm for Sustainable Urban Transport)

PRC = People’s Republic of China, OECD = Organisation for Economic Co-operation and Development, v/1000 P = vehicles per 1,000 persons
It promotes face to face contact, health and livability -, and just because walking in the past wasn’t seen as a choice but the only way of transport, doesn’t mean that it wasn’t one of the best ways of travel. No matter if foot traffic is a choice or necessity - the streets have to be adequate for good, easy and pleasant walking. (Gehl, Cities for People, 2010) Knowing the benefits of walking and seeing the downside makes us understand the necessity in this travel mode and start to appreciate it. Because getting from the door step into the car and vice versa leads to health, environmental and city realm problems. Not having the option to walk and bike, because of lack of comfortable sidewalks and bicycle lanes is one of the reasons for choosing the car. Shanghai’s people don’t have to lose their walking and cycling, like it has happened before in other countries; just to realize afterwards that they need it back to once again become livable. Bicycling and walking now is a big trend in Europe and cities are doing everything to get it back. Shanghai has the advantage to still have this mode, and they just need to appreciate it and make the streets appropriate for it, without needing to convince people to bicycle but only offer a safe and pleasant way. As Jan Gehl reports it is all about respect for people. “It is cheap, simple, healthy and sustainable to build cities for people.” (Gehl, Cities for People, 2010) All people need walkable streets, even car drivers walk in the city. Not to forget that poverty in Asia’s urban areas is a big problem. 25% of all urban residents are poor and it’s predicted that the number will rise. (Asian Development Bank, 2010) That means it is important to provide good travel options for these people and concentrate on travel modes that are accessible for everyone. Another big problem in Shanghai is the air, and noise pollution. (Britannica, 2012) (Gehl, Cities for People, 2010) In China outdoor air pollution contributes to the yearly death of 3000 000 people. (Chinese Academy on Environmental Planning, 2012) Asia’s biggest cities have the biggest air pollution in the world and 80% of it is due to transport. When it comes to CO2 Asia is responsible for 19% of it in the world and it will grow to 31% by 2030. (Asian Development Bank, 2010)

Infographic Nr. 3. How Far Can I Travel on 1 Ton of CO2?
Source: Robin Hickman, 2011

Another bad thing that contributes to the noise pollution is the horn honking. It happens so often that it seems to have lost its purpose of warning but only contributes to a negative street environment and the need to say – here I come. All these things make being outdoors unpleasant, but many developing countries, because of their culture, climate and economics, rely on their outdoor
The fatality rate is 10 times higher in poorer neighborhoods than in the wealthier. And people with low education are more prone to bicycle accidents than people with higher education. Using helmets can significantly reduce the fatalities in traffic accidents, but that is not mandatory in China. (Li Yan-Hong, 2011) As helmets are important for safety its only helps curing the symptoms not the cause - unsafe streets. The biggest problem for the accidents is the fast growing motor traffic in Shanghai and the non-existing bicycle lanes. As many workers come to the city for work and are not used to motorized traffic in the streets, they don't know how to behave and are less cautious on the streets. Even the people who know the risks can't bicycle safely, so it is important that Shanghai develops a good and safe bicycle lane system to fight this big health problem. Cities all over the world try to fix their mistake by neglecting the human scale and people walking and cycling. (Gehl, Cities for People, 2010)
The traffic accident and death occurrence is very much related to the speed impact. If a car drives with approximately 30 km/h a pedestrian has a 95% chance to survive, it drops 9 times to 10% when the speed is twice as high – 60km/h. Increasing speed by 5% increases the risk of injuries by 10% and the risk of death by 20%. (Andres Duany, 2010) (World Health Organization, 2009) But to truly achieve safer roads there has to be a change in the behavior of drivers and street users. (Asian Development Bank, 2010)

Nowadays the prioritizing of cars starts to end in many cities all over the world, still Shanghai keep encouraging car traffic by building highways everywhere. (Norton, 2011) “Removing some of the pedestrians from a potentially unsafe street only makes it more dangerous.” (Andres Duany, 2010) Jan Gehl also argues that the more roads, the more cars there will be, and sooner or later the new roads will be congested, it is a vicious cycle that never ends. (2010) James Howard Kunstler claims that soon driving a car will be the privilege of rich people, like it was in the beginning of the car age, because it gets more and more costly to own a car. But till than cities need to respect the presence of humans and then the cars can easily coexist with people on the streets and in the future. (Kunstler, 1993)
Streets

City life was self-evident in older cities, now that has changed and the cities need to be planned carefully not to lose it. It’s even harder to plan for cities that already have lost their city life. (Gehl, Cities for People, 2010) There is a limit to how wide a street can be to still feel defined, after 23 meters it loses the sense of boundaries and feels more like a field, never mind how high the buildings are. Allan B. Jacobs addresses that human scale and street definition is not the same, because the distance and angle that are seen as maximums for a human and intimate scale are more correct when looking across the street not along one. (Jacobs, 1993) Jan Gehl also mentions the important distances for human scale and seeing movement and expressions, where the focus is on watching people. (Gehl, Cities for People, 2010) If a street ratio with an angle of 30 degrees on one side is 1:2, there is a strong street definition, if the ratio is 1:3.3 there seems to still be definition, but with a ratio 1:5 and smaller the street definition seems to disappear. Although it all can change when trees come in. Because trees can make new boundaries and impose the ratio. See image nr. 1. (Jacobs, 1993)

Allan B. Jacobs argues that the limit of the height of the buildings along the street is not so important to the street definition. The thing that the height does is interfere with natural aspects like sunlight, wind and temperature. Nevertheless he claims that none of the great street building height exceeds 30 meters. (Gehl, Cities for People, 2010) It’s important that the street network has multiple routes and has no dead-end streets. (Andres Duany, 2010) It gives variety when choosing the route and would benefit in crowded streets to spread the people - thus easing the journey. Thoroughfares should combine all users - cars, pedestrians and bicyclist, they should have slow traffic, trees, street furniture, lightning and nice building frontage. (Andres Duany, 2010) T-junctions are another thing that adds to wonderful streets and cities. It not only slows down the traffic but also provides a focal point and a goal for the eyes. Usually important buildings are located in these junctions. (Kunstler, 1993) Although Andres Duany advocate that these point should be reserved for nature and accessible features. (Andres Duany, 2010) Small alleys are nice and provide cheaper living for lower class, but because fire trucks cannot access small alleys they are forbidden. (Kunstler, 1993) Streets need edges where people can sit or stand with the back to the edge to feel safe and comfortable like in a room. Soft edges with lot of ground floor activities and possibility to linger are needed to achieve a livable city. Walking along a street with lots of ground floor activities are interesting and time seems to go faster, but walking along a wall or boring, closed facade feels long and boring. A study conducted in 2003 in Copenhagen found out that these facades have 7 time more people in front of them than others. (Gehl, Cities for People, 2010) There are moving activities and stationary activities. A good city can be recognized for how many standing activities it has, and they have to be by choice. Developing cities like Shanghai have an enormous number of standing activities, but most of them are by necessity. A place needs to have these conditions to invite a stay by choice: pleasant climate, good view, comfortable sitting, no noise and no pollution. While children and young people can sit everywhere and on anything, older people prefer more comfortable sitting opportunities. (Gehl, Cities for People, 2010) While outdoor cafes are a major attraction for people

Image Nr. 1.
Street ratio 1:3 in a 30 degree angle; Modified by author; Source: (Jacobs, 1993)
Sidewalks

in many countries, they are just starting to come to Shanghai. Cities tend to forget children, or make them separate play grounds, but a good city must have the opportunity for expression and the best ones are the simplest ones. (Gehl, Cities for People, 2010) In Shanghai children are often around their parent while they are doing daily work in the city space, and there has to be a possibility for entertainment, but now there doesn’t seem much of it. Cities should have fixed, flexible and fleeting places. The magic number for a square seems to still be 40x80 meters. Most of the new cities and developments tend to overdo with the scale of places making them cold and unattractive. Too large space can be fixed by putting smaller spaces in, too wide streets benefit from rows of trees. (Gehl, Cities for People, 2010)

Sidewalks

Sidewalks that have 8 people per minute per meter walking on them are seen as ideal, as there are enough people around, but it is possible still to walk at every speed. Crowded streets are seen when there are more than 13 people per minute per meter and streets with less than 2 people per minute per meter are experienced as empty. (Jacobs, 1993) Studies in New York put the number up to 23 people, while in Copenhagen it is also 13 people per meter per minute. The amount of people on the streets is very important, because people go where people are. People attract people. (Gehl, 2010) So if one street is empty, but another is with people, most likely the majority of people will choose the street that already has people in it. In urban areas sidewalks shouldn’t be less than 3 meters, on streets with more activity even 4.5-7.5 meters. “Just as streets are scaled to vehicular traffic volumes, so should sidewalks be scaled to pedestrian traffic volumes. Sidewalks should be wide enough to accommodate pedestrian traffic without crowding, yet not be so wide as to appear empty most of the time.” (Ewing, 1999) Sidewalks consist of four parts, the curb zone, furnishing, walking zone and the frontage zone. (Andres Duany, 2010) Sidewalks should always be wide enough and with no obstacles that wouldn’t ever make the pedestrians walk outside on the street. There shouldn’t be railings along the sidewalk. Or sidewalk interruptions from minor streets or driveways into the back yard. (Gehl, 2010) It is fascinating to see that 20 times more people can travel on a sidewalk than cars on a car line. Two 3.5 meter wide sidewalks can handle 20 000 people per hour versus only 1 000 – 2 000 cars per hour on two way two line road. (Gehl, 2010) Infograph Nr.7 also shows that cars are in the last position when it comes in to the efficiency of transporting people given the same time and lane width. As Shanghai has many people this needs to be taken in consideration when planing for busiey streets. The average time to walk 500 meters is 5 minutes and that is the distance most of the people are willing to walk, nonetheless all the street quality requirements come into account. If there are many obstacles, too crowded or too long red light, the time increases and the walking mood decreases. (Gehl, 2010) The average walking speed is 5.4 km/h - 90 m/min, cycling 20 km/h - 330 m/min and car driving is 54 km/h - 900 m/min. People everywhere in the world, no matter what age like to cross the streets at the most convenient and fasted place. (Gehl, 2010) When people walk along a bit curving, livable, eye level streets the walks seems much shorter, than the same distance along a straight superblock. (Gehl, 2010)
are special requirement for sidewalks when it comes to disabled people. Blind or partly sighted people need special pavement that leads them, without any obstacles. People in wheelchairs need slopes from sidewalks and wide enough sidewalks to move along it without facing any obstacles.

Bicycle lanes

Cities that are striving to be sustainable, safe and healthy need to understand that supporting bicycling is the main ingredient. Few decades ago Chinese cities where known for extensive bicycling, now it has decreased a lot, some cities have lost their bicycling at all, in others it is unsafe and unpleasant to bike. However it’s the only way to travel and earn a living for many people. New policies are taking away bike space for car lanes and even banishing bicycling from roads. As Shanghai developed over the last 20 years it escaped the car invasion, but now there is evidence all over the world that excessive car traffic damages city life. Also humanity has reached the point where oil runs out and fuel gets more and more expensive. In many cities pollution is unbearable and health suffers under it. By banishing bicycles Shanghai still promotes the growth of car traffic with all the bad side effect. (Gehl, Cities for People, 2010) Copenhagen realized the problem of traffic in 1960 and since then has done everything to provide better conditions for pedestrians and bicycles. So now 37% of the people travel by bicycle, 31% by car, 28% by public transport and 3% walk. The most positive aspect is that the bicycle is used by everybody - parents, businessman, student, and worker - there is no limitation. (Gehl, Cities for People, 2010) The problem in China is that bicycling is seen as a poor people way of transport. Bicycle lanes should be clear and in the intersections the light for bicycles should turn green 6 seconds before cars to make a better visual contact and prevent accidents. Also cities should give the “green wave” to the bicyclists instead of the cars. And turning right on a red light is not acceptable to ensure a bicycling and pedestrian friendly city. The safest way for bicycles is between the sidewalk and cars, so the bicyclist has the highest safety. This method is called as “Copenhagen style bicycle lanes’. Bicycle lanes should be widened on busy streets to minimize congestions as well as provide an alternative or parallel route. On smaller streets bicycles can ride with fewer stops when passing small, unimportant streets. (Gehl, Cities for People, 2010) A 1 car parking place can offer 10 bicycle parking, and a bicycle lane can hold 5 times more traffic than a car lane. (Gehl, Cities for People, 2010) Many cities have good working rent bike systems that are usually used by tourists, but as Shanghai streets are dangerous, tourists wouldn’t use this even if there would be such an opportunity. That’s a shame considering Shanghai has a flat topography and a not too cold, almost snow free, climate, perfect for bicycling. On streets where there is little car traffic and the speed is limited to 15-30 km/h cars and bicycles can easily coexist with each other with no separate lanes. (Gehl, Cities for People, 2010) To take the bicycling to the next step – buses, metros and taxis should have the possibility to transport bicycles. (Gehl, Cities for People, 2010) Its seems as the high temperature is seen as an obstacle for bicycling in Asian cities, but the truth is that the average temperature is not much higher than in European cities in peak cycling times. Shade and ground materials that do not produce heat is a must. (Hook, 2003)

Motorbikes

A motorbike is the most affordable transport, so it has grown massively in Asian cities. Small motorbikes have replaced bicycles. (Gehl, Cities for People, 2010) Most electric bike users have been previous bike users. The shift to motorbikes has created more traffic problems because electric bikes are poor in safety, they interfere with other traffic due to fast maneuvering and small dimensions and are producing battery pollution. Electric bikes make Chinese streets more unsafe because they are becoming faster, heavier and completely silent. While the silence is reducing noise pollution, it increases traffic accidents. A study conducted in 2007 showed that people in Shanghai choose e-bikes mostly because they are a fast way of travel, only a few % chose it because the journey is too far for bicycling or it’s more comfortable than buses. Peoples Daily wrote that e-bikes are not welcome in China because they slow down car traffic.
Beijing had an e-bike ban till 2006. (Jonathan Weinert, 2007)

Car lanes

City planning influences the behavior of people very much. Cities have so much traffic as the road network allows. Build more car lanes and parking as a solution has never worked out, because sooner or later they become full and congested again. (Gehl, Cities for People, 2010) (Asian Development Bank, 2010) See infographic Nr. 8.

If the space allows on-street parking is seen as a good option as it slows down the traffic, eliminates parking lots, contributes to sidewalk activity and works as a physical border from the street. (Andres Duany, 2010) (Kunstler, 1993) One way streets should be avoided, because they cause speeding, increases travel distances and spoils the effectiveness of the street network. (Andres Duany, 2010) The more walkable a place becomes, the more people want to drive to it from less lively places. “An emergent tourist on a day-tripper parking problem is a symptom of success and should not be the catalyst for more parking.” (Andres Duany, 2010) So walkable streets everywhere, not only in the popular places, would promote to leave the car at home and use the public transport. Free parking in crowded cities is not acceptable and the fee for parking should change according to the demand. The parking fee should be so high so there is always 15% free parking places. “In the end, it is the fate of every great urban environment to have a parking “problem””. (Andres Duany, 2010) In European and North American countries cars have been for a long time. Now people see how the increasing of cars has changes the city and peoples everyday lives. Other countries where cars are only starting to invade the city the result will be the same, so they should recognize the risks and learn from other mistakes. Building more and wider roads for the cars from the beginning will only make matters worse. (Gehl, Cities for People, 2010) Using traffic calming systems in urban centers would minimize the risk of death due to the lower speed. Now road traffic injuries are the 9th leading cause of death in the world, it has been predicted if nothing changes in 2030 it will be the 5th leading cause of death.

Higher death numbers will be only from diseases like ischemic heart diseases, cerebrovascular diseases, chronic obstructive pulmonary diseases and lower respiratory infections. Some of the diseases listed above like heart illness and respiratory illness may be linked directly with sedentary car driving life style by not getting enough physical activities. Also car caused air pollution is causing peoples health problems. (World Health Organization, 2009)

Infographic Nr. 8. The Vicious Circle of Transport; Source: Robin Hickman, 2011
Intersections

The car prioritizing in junctions is making the streets more dangerous and chaotic. Car drivers making the right turn at a red light look to the left for oncoming cars instead of looking out for pedestrians and bicyclists crossing the street. (Ewing, 1999) A corner radius is an important factor when it comes to street crossings. The narrower the radii the more the cars need to slow down to make the maneuver and the easier and faster the pedestrians can cross the street. (Ewing, 1999) Over the years the curb radii has become bigger and bigger, allowing the cars to go faster, hardening the crossing for pedestrians by making it longer and more dangerous. A curb radii of 5-15° is appropriate on most streets. It should be only so wide so the biggest car that uses the street regularly can turn normally. (Andres Duany, 2010) Proper building setbacks, that is not too wide and “room like streets” where buildings frame the street also can make the traffic slow down. The benefits are that people feel cozier and cars tend to slow down. (Ewing, 1999) Also the traffic light signals are regulated so that it is best for the cars, making pedestrians wait a long time for crossing and then not giving enough time to do so. (Gehl, Cities for People, 2010) Long waiting for crossing the street should be avoided; instead a balanced walking and waiting should be achieved. Pedestrian bridges and underpasses are the enemy for walkable cities, because people don’t like to use stairs and because they segregate the street life. There shouldn’t be a need for pressing a button to cross the street and the traffic lights should be with time information when it will change. And pedestrian islands make people feel unsafe and uncomfortable, being in the middle of fast flowing traffic on both sides. The corners should always be open for people. Street crossing shouldn’t be interrupted. Intersections should be simple without any “slip lanes”. (Gehl, Cities for People, 2010) In some cities waiting for the green light takes from 15% even up to 50% of the travel time, while in Copenhagen it’s an average of 3%. (Gehl, Cities for People, 2010)

Ground materials

Allan B. Jacobs argues that most of the time using difficult and unique paving is not worth the expense. (Jacobs, 1993) Ground materials should be chosen so they are easily accessible, preferably local, easy to maintain and replace. What’s more important is that the ground material is permeable so the trees can get water over a bigger area. (Andres Duany, 2010) Uneven cobblestones are nice for the eye but inappropriate for comfortable walking especially for baby carriage and disabled people as well as high heels that planers need to take into consideration as well. Even and non-slippery surfaces is the best choice, (Gehl, Cities for People, 2010)

Street furniture

It is undeniable that main streets need benches, where to rest, be social, watch and wait. The biggest argument that comes up with benches is that they attract homeless people. “...street design cannot be expected to solve or deny the existence of major social problems.” So this is not a matter that can decide whether to have or don’t have benches. (Jacobs, 1993) Especially in cities like Shanghai where there are many older people and where the outer space is used a lot, it should be possible to have enough sitting places. There are many more kinds of street furniture that can be used as sitting places, not only ordinary benches. (Gehl, 2010) (Jacobs, 1993) While most of the city furniture provide a great private place it can be hard to enjoy a conversation between more than 2 people. (Gehl, 2010)

Lighting

Street lights are essential for streets, but care must be taken when choosing it. There can be street light placed hanging on a wire between two buildings, or there can be light poles. Light poles shouldn’t be too high, as also Hausman has said - too high light poles don’t give enough light and too strong lights blind
Trees, Climate

Trees contribute to giving shade, calming wind, providing an ever-changing view. Trees should be placed between the street and the sidewalk. Ewing argues the trees shouldn’t be placed more than 10 meters from each other, to provide good shade. (1999)

The easiest and most significant way to improve a street is with trees, considering that there is a place for them and that they are placed close enough together. (Jacobs, 1993) If trees are placed close enough to each other they provide a sense of safety and comfort from the cars. They also make wider streets feel defined, so if a street has a ratio 1:7, with closely planted tree rows it is defined, like monument Avenue, in Richmond, Virginia. (Jacobs, 1993)

Trees also provide physical comfort by giving shade in the summer and acting like an umbrella in light rain. (Jacobs, 1993) Trees are an essential factor for good streets. As Shanghai is very hot in the summer time shade is a necessity for comfortable streets and trees are one of the things that can provide that. In winter they don’t have any leaves so the sun can shine through. Also trees are ever-changing thereby providing a different street view throughout the year. In the few weeks that the cherry blossom trees are blossoming in China, the streets are full of people enjoying this wonderful view. It’s almost like a street event without any organization, or advertisement. It is important to choose the right trees depending on the climate, soil and maintenance. In cities where it’s colder during the winter, it’s better to choose deciduous trees, as they allow sunlight during the winter and shade in the summer. In Allan B. Jacobs eyes to achieve a good canopy the streets should be placed approximately 8 meters apart, depending on the tree type and canopy diameter. See image Nr. 2. If the distance is wider there should be more than one row of trees to achieve the best outcome. (Jacobs, 1993)

Allan B. Jacobs is strictly against rules that make street trees end very far from intersections, claiming that the streets suffers tremendously under this. As well as that the tree line cannot be sacrificed for public building entrances, bust stops or anything else. Many street planners would argue with this due to the safety risk in intersection. But in the end green cities are always seen as more beautiful. Sadly due to road widening for cars or just bad maintenance many streets have lost their trees. (Gehl, Cities for People, 2010)

Climate

Climate is an important feature to take into consideration when planning cities and understanding people’s behavior in different situation. Good weather is always an advantage for city life, but in hot countries it can get unbearably hot, so the sunshine is not desired at all. In these situations shade opportunities have to be given, whether by trees, narrower streets or café umbrellas. Lots of asphalt roads, parking lots and other materials can make the streets even hotter. (Gehl, Cities for People, 2010) In Shanghai the hotness is not the only reason for hiding from the sun. Like many Europeans try to catch every sun light not only for the warmth, but also for esthetic reasons to get a tan, similarly
Chinese people try to avoid it also for aesthetic reasons, to not get tanner, as that is mostly seen as less beautiful it is also seen as a symbol of lover status, as it implies that the person had to work outside. Not to forget the health factors of the damaging UV rays. Buildings also can be seen as shade givers but high buildings create enormous wind problems, as it not only don’t slow it down, but because of the high and low pressure can make the wind even 4 times stronger. (Gehl, Cities for People, 2010)

**Buildings**

Although this paper is not concentrating so much on buildings along the streets, they have to be mentioned as they play a major roll on the streets appearance. The building appearance plays a significant role while walking along a streets, it is all the time in movement and observation. So the streets have to give something to watch. That’s where the buildings come into play. If the buildings are with lots of details, changing, letting the sun play with the façade it makes the walk interesting and the time passes faster. Building transparency is also an important factor. Shops with big windows to look in to attract the eye. Windows and doors to the street make people feel safe. But if there is a mega block building or a wall or supermarket with covered windows it makes the walk and street look dull and plain. Many buildings are always better then few, because they add diversity. (Jacobs, 1993) (Gehl, Cities for People, 2010) Jane Jacobs already observed and city planners agree that small blocks in cities are a big benefit. (Andres Duany, 2010) (Gehl, Cities for People, 2010) Block sizes are very crucial for walkability, because it gives more walking and crossing options, makes the trip shorter, disperses traffic, and makes the trip freer and more eventful.

**Quality and Maintenance**

Quality is the thing that can make or break a good street. There can be used all the necessities for a good street, but without quality in implementing it, the street won’t be god. “’Thin” materials-such as “brick” paving that is not really made of brick but a one-quarter-inch-thick made-to-look-like-brick substitute – almost always show.” After a street is made everything it has to be, the care for the streets continues by maintenance. Streets has to be clean, smooth and with no potholes. Although specific materials, exotic trees and rare elements can make the place unique, but if there is no plan for up keeping or it requires much effort it’s better to choose another option that can be maintained unbroken, and fresh. (Jacobs, 1993)

**Shared streets**

Allan B. Jacobs argues that in crowded and small streets it’s better to leave the curb out of the streets and mix cars with people to make cars go at people pace. (Jacobs, 1993) While Jan Gehl warns that theoretically shared streets supposed to combine all street users in slow and safe travel mood, but it only works if the pedestrian is set to be as the priority and all the other users have to go after. Otherwise the streets are not safe for children, elderly people and disabled people. (Gehl, Cities for People, 2010) In the past decades streets are designed wider, for their driving convenience so not to have slow downs and to get to the desired destination as fast as possible, that has caused the streets to become unpleasant for everybody else outside a private car. (Comission of Architecture and the Build Environment, 2008) While, for example, in the UK all the citizens have grown up with car dominated streets it’s not the case in Shanghai. So when it comes to shared streets the first ones will be more careful from both sides - the drivers and pedestrians, because it would be a new environment that requires caution. How would that work in cities where caution from pedestrians hasn’t been asked from childhood, but where shared space was a norm? And how would the driver react - who believe that streets are their property and pedestrians have no right to it? Research about shared streets and their safety is divided. Some believe that shared streets are the solution for speeding problems, accidents and the pleasant walk for pedestrians who can feel free and cross wherever they please. While others
argue that shared streets would never work for children, blind and partly sighted people, older people and people with mental diseases, because they don't have the same reaction and understanding for shared streets. (Commission of Architecture and the Built Environment, 2008)

**Nanjing Pedestrian Road**

In 1999 Nanjing Road was turned into a pedestrian street. Car and bicycle decrease was measured in a research conducted to find out the changes in traffic distribution through streets after changing Nanjing Road into a pedestrian road. The car volume dropped from 12 cars per minute to 9 and bicycles dropped from 24 per minute to 16. See infographic Nr. 9. After implementing the Pedestrian Road the traffic system was changed so that some streets where for only bicycles and some for cars to minimize the collisions. (Zacharias, 2002)

Picture below proofs that only 10 years ago some streets belong to bicycles where now almost all the streets are dominated by cars and the bicyclists are pushed out.

*Picture Nr. 1. Suzhou R. in 2001; Source: (Zacharias, 2002)*

*Infographic Nr. 9. Vehicle and bicycle flow after turning Nanjing Road into pedestrian road.*

*Source: (Zacharias, 2002)*
METROPOLITAN EXAMPLES
Curitiba, Brazil

Curitiba is one of the fastest growing cities in Brazil and a good example how cities in developing countries can implement successful land use planning to achieve a sustainable environment. From 1965 to 1990 the city’s population has tripled from 500,000 to 1,600,000. (Harry Smith, 1998) Curitiba has a density of 4159 persons per km². (Comons, 2008). Not like many other developing countries who focus on motor vehicle introduction, Curitiba has chosen another approach and serves as a good example for other cities to follow. Curitiba’s success started to become noticeable in the 90s with a good public transport system, thus moving forwards a sustainable city. But when the whole picture is taken in consideration J Macedo argues that there still are many other problems that are overlooked when calling Curitiba the model for other developing and even developed countries. Nevertheless the things that are good in Curitiba have been achieved only because politicians, professional planners and municipal administration all work together for the greater good. (Macedo, 2004) The fact that Curitiba has become livable and walkable is thanks to the land use restriction plan; the focus is on public transport even more on bus rapid transit and not on individual cars. Curitiba chose buses as the main public transport system to expand and improve, just because the city already had buses and the cost for underground and overground rail systems would been more expensive and time-consuming. This has led to streets that are livable and don’t allow cars to overtake the streets. Choosing the streets for an effective bus system should be prioritized before cars not otherwise. (Rabinovitch, 1996) Now in 2012 Curitiba has to upgrade the city further, because it has 3.2 million people in the metropolis and the buses in peak hour arrive with 30 second interval. While the buses on streets will keep people on the streets and cars away, they need to be maintained safe and pleasant and now the time is reached when a supportive public transport system like light rail is in order. (Lubow, 2007) Curitiba has become a city that makes their inhabitants want to live there, it has decreased cars by 30% in 20 year time, though the population has grown 3 times. (O’Hare, 2009)
Bogota, Colombia

Bogota has an area of 1587 km², population of more than 7,000,000 and density of 3914 per km². (Comons, 2008) Bogota started to improve the city movement 10 years ago by banning private cars from the center in peak hours (according to the last nr of their license plates), building a public transport system which will be 388 km long in 2015. As building a metro is much more expensive, Bogota has stayed with a bus system. A bicycle system was the next step and in 2002 Bogota had 112 km of bicycle lanes and was expanding further. The final step was to have some main streets reserved for bicyclist and pedestrians on Sunday mornings. (Skinner, 2004) Now Bogota has reached 300 km of bicycle lines. (Comons, 2008) Bogota recognized the car problem and proved that middle-income cities can achieve safer streets by prioritizing pedestrians and cyclists and providing safe and convenient ways of travel that don’t necessary involve private cars. By building pedestrian and cyclist only roads, excluding cars from the city center in rush hours and developing a rapid transit system Bogota reduced road traffic fatalities from 1387 in 1997 to 697 in 2002, that’s 50% in 5 year time. (World Health Organization, 2009) Now Bogota’s highest priority is maintaining safe streets for cyclist, it has car free street days that reduces CO2 and a rapid bus transit with possibility to pay before boarding, so saving time, and the buses can move with an average speed of 28 km/h, because they have separate lanes and the number of cars have been reduced by 40%. (Comons, 2008)

New York, USA

New York is a city with almost 20,000,000 residents, it covers an area of 1213 km² and the density is 10430 persons per km². (US, Census Bureau, 2010) New York has streets full of cars, but to convert itself into a sustainable city, it has built 700 km of new bicycle lanes from 2007-2009. As well as introduced summer and weekend car free streets in Par Avenue from Brookline Bridge to Central Park -that has turned out to be a success. People usually have more free time to go out on weekends and spend time with their families and the car traffic is less heavy. (Gehl, Cities for People, 2010) In some streets there was given only 11% space for vulnerable street users even thou they were almost 5 times more than cars. The street space distribution changed and the bicycle lanes doubled, the traffic injuries decreased by 63% and pedestrian injuries decreased 35%.

Infographic Nr. 12. Death by road users in Colombia 2006
Source: (World Health Organization, 2009)

Infographic Nr. 13. Trends in road traffic death in Colombia 2006
Source: (World Health Organization, 2009)
Infographic Nr. 14. Trends in road traffic death in USA 2006
Source: (World Health Organization, 2009)

Infographic Nr. 15. Death by road users in USA 2006
Source: (World Health Organization, 2009)

Image Nr. 3. Pilot project along Broadway Boulevard
Source: (Gehl, Gehl Architects, 2009)
New York

**Project along Broadway Boulevard**

A very successful project example design by Jan Gehl. He changed a car dominated street into a pleasant passing and lingering place for people. Minimized the car traffic dramatically and made more pleasant and increasing use for bicycling and pedestrians.

**Deliminations**

All the metropolitan cases are presented as good examples that pedestrian and bicycle prioritized streets work with good results both in developing and densely populated cities. Because an often argument is that these street principles can work well only in developed, low density cities like Copenhagen. The examples are not used to determine the street requirements for walking and cycling. That has been already done in the literature review.

*Image Nr. 4. Project along Broadway Boulevard, Source: (Gehl, Gehl Architects, 2009)*
After having an overall observation and understanding that the area has some problems and the first step in analysis was to conduct a questionnaire to see how the people who use this area feel about the surrounding. It’s very important to take into consideration the opinion of the people who actually use this area and take notice of their needs and desires. Of course the information should be analysed with caution, and the needs of the majority should be prioritized. The questionnaire was conducted on a sunny Sunday, May 25, from 11am till 2pm. The starting position was on Nanjing East Road between the pedestrian road and the Bund. There 30 questionnaires were filled out. But soon a street security guard came and questioned what was been done here. After explanation a questionnaire sheet was taken to report to their leaders about today’s ongoing and we were escorted to the pedestrian street and weren’t allowed to do the questionnaire on the sidewalk. The explanation was that we are interrupting the people flow and creating people congestion on the sidewalk. That was the first proof that the sidewalks are too crowded, if two people stopping can cause such big problems. Then on Wednesday afternoon, May 28, from 1pm till 5 pm 70 more questionnaires were filled out. Together the results are taken from 100 questionnaires.
Results

50 females and 50 males filled out the questionnaires, most of the respondents were between 18–40 years old.

Most of the people where heading for sightseeing, shopping and leisure and few where going either to work or home. That is explained by the fact that it was a weekend and one of the first really sunny days in the year 2012.

Where are you heading

- Home: 33%
- Work: 11%
- Shopping: 11%
- Leisure: 20%
- Sightseeing: 19%
- Others: 6%

Age

- <18: 3%
- 18-40: 69%
- 41-60: 19%
- 61-80: 9%
- >81: 1%
Most of the people (43%) were tourists visiting the place and only 6% of the respondents visit this area every day. The rest were divided equally between coming here a few times a week, once or less.

When it comes to the question if it's easy to walk, the answers are surprising because 63% answered yes and only 37% with no. This can be explained that Chinese people are used to walk off sidewalks and share the street with cars. Also do to the fact that there were only few cars on this particular road.

The other contradiction was that 74% or 25 of 34 people who answered that it's easy and safe to walk also checked the answer for one or more particular problem why it is not. So in the end 91% of all respondents had some discomfort on the streets even if 34% claimed it is easy to walk.

The average answer for the unease walk was first that there are too many people and then that there are too narrow sidewalks and too many obstacles.
People were divided in two groups when it came to the street space division.

Is it easy and safe to bike around here?

- 84% No
- 16% Yes

Is too much street space given to the cars?

- 50 Yes
- 50 No

The majority of the respondents didn't own a car.

Do you own a car?

- 80 No
- 20 Yes

Also the majority of respondents thought that the Nanjing East Pedestrian Road should be extended as a pedestrian road till the bund.

Should Nanjing Pedestrian rd. continue till the Bund as a pedestrian rd.?

- 82% No
- 18% Yes
Bicycles

It’s not easy or safe to bike in this area. Firstly, on some of the streets bicycling is forbidden or it stops at a dead end, while on others one lane is given for driving in both directions for both bicycles and motorbikes mixed together. This doesn’t encourage people to choose this travel mode. Another problem is that neither the bicyclist nor the motorbikes tend to stop at red lights or for pedestrians when they are crossing on green. Sometimes all the sidewalk is reserved for bicycle parking, forcing people to walk on the street, because the sidewalks are so narrow, that there is no room left. This can be done because these particular streets don’t have much car traffic. In no case this can’t be acceptable. Either there need to be on street parking or other parking solutions need to be found. More care needs to be given when dealing with new bicycle lane implementation. More pleasant movement conditions and prioritizing at intersections can be part of the solution. In many places in Shanghai intersections have special regulator guards who control the traffic and pedestrian flow, so change is on the way. Only the two biggest intersections have these guards in this study area.

Motorbikes

Motorbikes are forbidden on many streets just like bicycles. As it’s a cheap and fast travel mode, motorbikes are very popular in China, but cause many problems. They don’t follow traffic rules, but for example can choose to take the sidewalk to get farther faster. As most of the motorbikes are electric generating no motor sounds they are easy to be unnoticed as they suddenly appear from a blind spot thereby creating dangerous traffic situations for themselves and others. In some streets motorbikes share the same lane as bicycles making biking unpleasant and dangerous. Also motorbikes use sidewalks for parking, so to do that they drive on the sidewalks in between pedestrians making walking unpleasant and dangerous. As motorbikes are dangerous and contribute to the pollution, they can’t be put in the same category as bicycles just because of the similar size.

Cars

There are not too many cars in this area, nevertheless the majority of the street is given to car lanes. The cars hunk contributing to noise pollution, they are allowed to make the right turn when its red and they don’t stop for pedestrians when they are crossing on green. So making the walking harder as well as producing air pollution. As mentioned before two intersections have regulation guards who control the situation and hopefully in the future people will get used to not cross on red by them own.

As it can be seen clearer in map Nr. 5, most of the streets prioritize car movement.

Map Nr. 6. Street Use
- Only Cars and Buses allowed
- Cars, Buses and one lane for bicycles and motorbikes both directions
- Mixes Bicycles with Motorbikes
Traffic density

The densest streets are crossing Nanjing Road, but as the crossing possibility will stay the same, the car amount and flow will stay the same as well. Now they have 60 cars per minute on 6 lanes, and that will change to 4 lanes. One lane will take 15 cars per minute. When it comes to Nanjing Road it serves only as a connection between these two previous roads, because both ends of the road end into a dead end, as marked with a red circle in map Nr. 9. All the movement coming from Nanjing Road is taken up by the two perpendicular big roads. After the road will be changed into a pedestrian street, the traffic will be divided into two and taken up by the parallel streets on both sides. These roads continue further as marked with a green circle in map nr. 9. Both of these streets are one way streets from the beginning. As these streets have a traffic flow of 4 cars per minute now, and Nanjing road has 12 cars per minute, the parallel street car amount will grow to 10 cars per minute causing no congestions.
Traffic flow

The traffic on the two main roads that cross Nanjing Road goes mostly straight, so the amount of cars going actually on Nanjing Road is very small. And as the two roads are not planned to be interrupted, implementing a Pedestrian street will bring no traffic flow difficulties. These numbers were calculated after counting how many cars choose which way in both intersections. For detailed numbers see appendices on page nr. 78.

Public transport

It is possible to commute from and to Nanjing east Road area by Metro or bus. In the end of Nanjing Pedestrian Road is a metro station and most of the people that are going to the Bund are starting from there. So this link between the station and the bund is very important. Also busses are running to and through this area, most of them along the two bigger roads and only one or two lines on the smaller roads. Tourist usually will use the metro because it’s clearer and faster.
Pedestrians

Many of the pedestrians on Nanjing Road are tourists. The other streets are more used by people going to work or passing through. As there are more official and commercial buildings than residential buildings, the area invites workers and tourists. Not so much other street activities can be found around the area. Map Nr. 14. shows the most walked streets. Nanjing Road is the most crowded one, but all other streets still have people walking along them. Nanjing Road is always crowded, and as the sidewalk width changes from block to block it has from 22 people per minute per meter till 33 per minute per meter. (For detailed numbers see appendices on page nr. 77.) And this nr is on a regular day. On holidays this number goes up much higher. While in the same time Nanjing pedestrian road has four lanes for cars and only 3 cars per lane per minute or 1 car per meter per minute. Other roads have from 5 to 12 people per meter per minute what is seen as the norm.

Obstacles

Sidewalks in this area are either too narrow, with too many obstacles or too crowded. Even on streets where there is not too much movement - walking is hard due to the obstacles: poles, parked bicycles and motorbikes. Even if the sidewalks have special pavement for blind people, often it ends in some kind of obstacle. Some of the streets have fences between the sidewalk and the driving lanes. The streets lack trees, both for shade and esthetical purposes. The majority of the trees that are there are newly planted, so still very small. A nice and quite street intersection block is used for parking excluding bicycling and almost all kind of pedestrian movement. Pedestrians don’t hesitate to walk on the streets if there are obstacles or the sidewalks are too crowded, but that makes the travel unsafe and uncomfortable. All these things are a problem and need to be dealt with. See map Nr. 12. for detailed obstacle illustration.
Obstacles

Huangpu Case Study

Map Nr. 13.
Street Obstacles

- Tees
- Bicycle parking
- Car parking
- Bus parking
- Sidewalk obstacles
- Fences
Building functions

Although walking along the smaller streets closer to the bund may suggest that the area is only business, the analysis shows that many different functions can be found. Map Nr. 14. Shows the official land use plan and map Nr. 15 shows the more detailed, land use plan, created from observation.
**Henan Middle Road**

In the existing street section there are 7 car lanes, 3 one way and 4 in the other. Bicycles are forbidden. Henan Middle Road crosses Nanjing Road where the pedestrian road ends. In every 50 second green light 60 cars cross the intersection. At the same time in only 25 seconds of green light more than 200 people cross Henan Middle Road while continuing the walk on Nanjing Road. This car amount is small enough to be able to give some room for bicyclists and more trees. The newly proposed street will have 4 cars lanes, 2 in both directions, plus one bicycle lane also in both directions as well as make room for two rows of trees along the bicycle lane providing shade for the pedestrians and bicyclists, and making the street greener and more attractive.
Jiu Jiang Road

Jiu Jiang Road is one way street with two lanes for cars in the direction to the Bund. It has one mixed bicycle and motorbike lane that can be driven both directions, but after Henan Middle Road the bicycle lane disappears and they are forbidden to continue. The sidewalks are less than 1,5 meters wide and have extreme obstacles along the way. On a week day, early mid-day every minute approximately 20 people walk along this section, while at the same time only 4 cars drive by. The bicycle lane is also almost empty, because the street is between streets on which bicycle movement is forbidden, so the cyclist have nowhere to go. The proposed street should widen the sidewalks to 2 meters. The street will get 2 bicycle lanes sacrificing one of the car lanes, but as the traffic is not so high and bicycling should be the first choice of movement anyways it is completely justifiable.
Nanjing East Road

Now this part of Nanjing Road has two car lanes every direction. The sidewalk width varies from less than 1.5 meters to 4.5 meters and in one part even 8 meters. Nevertheless the sidewalks are crowded and any stopping ends in people congestions. As these 3 street blocks are between two major tourist attractions as well as a metro stop, the street is and will always be very crowded. As even on a normal week day every minute 200 people pass the section versus only 10-12 cars, the new proposal is to convert this street in continuing Pedestrian Street.
Zhong Shang Dong Road

Zhong Shang Dong Road goes along The Bund and has already faced many changes. Starting off as a smaller street than transforming into a 11 car lane street and now having a wide pedestrian walking area along Huangpu River and keeping 6 car lanes. This street has a big pedestrian area but bicycling movement has been forbidden. As the observations have shown that most part of the day the two lanes next to the sidewalks are not used for driving, but only for random short car stops they are perfect candidates to be turned into bicycle lanes not changing the flow of cars.
Ground Materials

Ground materials

There are several different ground materials in the study area. In some places up to 3 different materials. See pictures below.

Nanjing Pedestrian Road Ground Materials

Henan Middle Road Ground Materials

Nanjing East Road Ground Materials

Other Ground Materials
Street Furniture, Way Finding

Street furniture

Nanjing Pedestrian Road and The Bund has street furniture. And shade plays a big role if it is used or not. In days without strong sun most of the benches are used, but in very hot and sunny days people mostly use only sitting places in the shade. The street furniture on Nanjing Pedestrian Road is made from granite, so it’s easy to clean and its long lasting with no needs for repairs or other maintenance. On other streets where there are no sitting places stairs are used for this purpose.

Way Finding

There are clear way finding signs along the Bund but not so much around the whole area. Another map is showing a way to a WC. While I was conducting the questionnaire many people asked for directions. This indicates that way finding is a problem there. Mostly in the end of Nanjing Pedestrian Road people wanted to know where the Bund is and which way to take for other tourist attractions.
Trees

There are some trees in the study area, and the streets with them are much more cosy and pleasant to walk. Not all streets can have trees, because of the narrow sidewalks. Nanjing Road between the Pedestrian Road and The Bund has some older trees; these trees will be kept after turning the road in a pedestrian road. The new design will be based on incorporating the existing trees and adding more.

Street Light

Most of the streets have big lighting poles. Which not only disturb the street view but also act like obstacles for pedestrians. Street with narrow sidewalks will change from light poles to wire hanging lights.

Existing Trees

Existing Street Lights
Huangpu Case Studies

Shadow plan

Nanjing Road has morning and evening shadows, but during mid-day it’s direct sunlight.

Morning sun

Afternoon sun

Before noon sun

Evening sun