Study of the leftover space in the city based on reutilization: Take the space under elevated road in Shanghai as an example

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abstract

Rapid urbanization process in China revealed many problems in urban development, urban space and its rich connotation also on economic growth, urban expansion and the construction, the nature of urban space is gradually disappearing, it has been forgotten under the level of simple and blind chase is compressed and erosion. China is in the process of rapid urbanization, the blind expansion and not standardized planning, and problems due to the legacy of the city terrain shapes caused by the increasing number of cities which produce relatively more marginal land, due to the complexity causes, in the form of a wide range of difficult to re-use and planning, forming an invisible wasted space. This research based on re-survey the urban space, focus on the "leftover space" concept, trying to build a new perspective on the current issues of urban space, urban development process and status, and how to take full advantage of reuse or modify "leftover spaces" were discussed.

Meanwhile in this article, I selected a few famous highway junction space worldwide transformation and utilization projects, such as the Chengdu people south overpass, and Wujiaochang Descented Square in Shanghai, as well as some successful projects all over the world, and would wild major urban planning forum summits and conferences, the latest discussion and research in the industry on this issue, as I choose Shanghai, for example, combined with the form of questionnaire about how we can reuse the space under highway, to have a reasonable guess there is a reasonable guess, we can have a clearly information of the current situation of the space under highway, to know whether the people satisfied with it or if not how much effect they would to do for an improving. by sending questionnaire thought a national famous forum to collect public opinion about how to reuse the space under the elevated road. with the objective of building a basic information for the future if we had the chance to modify the current law and normals about the management of elevated road. with the results of the questionnaire that we’ve received, we can certainly have the conclusion saying that most of the public consider that there is a necessity to change the use of the space, and thought the survey we have obtained several available options which cater to the rapid change of the development of urban traffic. such as the necessary of charging station for a large of number hybrid car. Although so far, the laws and regulations about the using of these spaces do not provide many options, but we hope that through this research can investigate the public opinion so that in the future there may be opportunities to have a better use the space under the bridge and this research might be a reference and to bring some new ideas to explore the reutilization of leftover spaces planning.

Key words: leftover spaces; elevated road; reutilization; social investigations
1 Introduction

1.1 Reason

1.1.1 Background

With China's economic development, the rapid development of all aspects of the city, the continuous expansion of the area, a significant increase in population, also the rapid development of transportation, but the urban infrastructure does not keep up the same level as large-scale urban construction. In order to solve traffic congestion, Shanghai, for decades has built nearly 200 kilometres of express ways in the city, these express ways have a majority of the elevated road. This will undoubtedly provide unprecedented convenience for the transportation of our city, but at the same time, a series of problems have cropped up, and the solution has not to keep up to the development, for example, today we can often see the following news in the newspaper reports:

1.1.2 Problems

"Yesterday morning, the reader Ms. Anke Called the hotline, reflecting under Pingyang Hongmei Elevated Road living a number of homeless people. They take the stove to cook at and also washing and drying clothes, affecting the condition of local amenity." (Liberation Network, Morning News)

Figure 1 space under the highway junction is full with garbage thought the reporter’s photo (JinLing Morning news)

Near the highway junction down the river and north outer ring intersection, neighbourhood. near lijiazhuang built illegal housing intended for rent. Flyover District Urban Administrative Law Enforcement Bureau has issued its notice to stop the construction, and administrative penalties, but now the site still in construction. (Qilu Evening News)
Dongfang Network Dec. 14 news: Yan'an Elevated become rubbish dumps. Hong Jing road actually is used as a waste yard. In the Hongqiao Airport segment, a pile of garbage has completely destroy the green landscape. The origin of this problem has exist for a long time, who will be given the public a satisfactory response? To Hongqiao International Airport from the downtown area along Yan'an Road, was originally a way full of beautiful views of the city. But recently, the reporter now took photos of the scarp heap on the green zone on this so called Shanghai’s “face”. (Sina)

As can be seen from the above information, with the expansion of the city, rapid growth of the traffic, the city has become involved in the elevated urban express ways as a factor that cannot be ignored. Elevated road and light rail because of its unique build approach, which the space under the bridge becomes more and more related to the cities and people who use it or live surrender it, but part of the space has restrictions, and has not enough attention from the public, its features are very unitary, relatively low utilization and the situation of spontaneous use of overhead road space under an increasing trend. Meanwhile, the relevant laws and regulations that the government introduced have different provisions, for this spontaneous use, we should be banned or should develop, and how the public’s opinion, this research will take the elevated road and light rail in centre city of Shanghai as an example, from space utilization analysis and an questionnaire survey to start. For the use of urban space under the elevated road in the central city to do some hypothetical discussion, as well as to analyse the possibility of providing some reference for future planning in the use of elevated space.

1.2 Definition of the research

1.2.1 Definition of elevated road or overpass (flyover)

Elevated includes elevated road (express ways, overpass)and elevated light rail line. An elevated highway is a controlled-access highway that is raised above grade for its entire length. Elevation is usually constructed as viaducts, typically a long pier bridge. Technically, the entire highway is a single bridge.

It improves transport efficiency, usually elevated road will appear on the original city roads, and sometimes above rivers or other urban lands, through different areas. Overpass is the solution, a more effective way to road intersection traffic congestion, to improve traffic flow.

Urban light rail line belongs to the rail transport, including the metro rail, light rail, trams and maglev trains, due to the amount of light rail locomotives and passenger weight are small, the quality of rail use is also small, only 50 kg per meter, the general quality of the tracks is 60 kg
per meter, thus the name "Light." With the support which built light rail construction is also upon the ground, so the light rail line and the elevated roads on the impact of urban space there is no essential difference.

1.2.2 Definition of leftover space

The leftover space is not a proper noun of architecture, there is no strict definition. In the "problem of the leftover spaces of Shanghai", the author Guo Lei of this article gave the definition to the leftover spaces as the space has not been fully utilized neither has no clear definition of function at this stage of development of the city. The leftover space is the so-called space the city could not be fully utilized, these spaces are often not as good as the city square space, street space that easily noticeable, but in a corner or unformed, usually refers to those who cannot play its part and having negativity urban space in the city. This kind of space is still under discussion, it is because they are not fully utilized and there is no clear definition of the characteristic function, so in order to be given the definition as "leftover spaces".

Simply is: in the development process of the city, due to various reasons over the terrain land and climate, cultural and political policies, economic development, etc., in the process to exploitation or spontaneous urban planning, not all of the land can be rational planed, utilized, and therefore between buildings, between the ground and the ground, the community and the community, in the middle of a different kind of action in the form of buildings will inevitably produce some waste of space. Cannot be taken advantage of the situation caused by any reason or could not be directly formed some land "scrap", and in the course of some the city's renovation, all the spaces that has it form and being wasted or being discarded before, but has the opportunity of being reformed and designed to has its function, , these spaces will be in the scope of discussed in this article.

In general, they cannot be fully utilized may be because:
1) Narrow irregular land between buildings
2) Contaminated land
3) Restrictions such as steep terrain
4) It was split by roads
5) Since the original facilities use changed

Leftover spaces could occur next to a planned development or along and under highways and railways, often stumbled upon but unnoticed, publicly owned or no man's land, land set aside for greening but not developed or the abandoned old building yards and dockyards. Leftover spaces have been defined in many ways such as ‘spaces of uncertainty’, ‘urban voids that are considered unutilized, unnoticed or meaningless by a large segment of community’ and could be old building yards, lanes, or casual passageways, evolving through an on-going informal use, the areas underneath the bridges are defined as undersigned, leftover spaces. Having a long list of definition, further defines leftover spaces based on various writers as stated:

‘Lacking officially assigned uses, leftover spaces and abandoned spaces lie outside the “rush and flow” as well as control regulations and surveillance that come with the established uses of planned urban public space. They are the negative or void to the city of named and fixed types of open space (park, plaza, street, sidewalk) — the “other” places, what Ignasi de Sola-Morales calls terrain vague.

Calling them “superfluous landscapes”, Nielsen sees abandon space as the “backside” of the designed, “primary” spaces of public life, which he sees as controlled and scripted, following the model of the theme park and the mall. Also called “no man’s land”, “indeterminate spaces”, and “free zone”, abandoned and leftover spaces, temporarily free of official planning and commoditization, are appropriate for other uses'.
1.2.3 Definition of urban areas of Shanghai

The elevated road discussed here, means the express ways in the Shanghai’s city center, now elevated and various forms of overpass that we called character “申”(shen) shaped elevated road network, the Inner Ring Road and Inner Ring range of Yan'an Elevated Road, the North-South Elevated sections. This research discusses the leftover space is urban space, not including overhead lines extending to the suburban space, here specifically refers to the Shanghai city centre area, including the inner ring, the Yan'an Elevated Road, Light Rail Line, the North-South elevated bridge space.

Figure 4 Shanghai Administrative Division
https://en.wikipedia.org/wiki/Shanghai

Figure 5 Shanghai center Administrative Division
https://en.wikipedia.org/wiki/Shanghai
In the officially public context, Shanghai downtown refers to the area within the outer ring of Shanghai, an area of about 660 square kilometers. Wherein the inner ring is the core area of the city center, an area of about 120 square kilometers. According to the Shanghai Urban Planning Ordinance, the center of Shanghai city range is determined by the overall planning, outside the city center in the range of suburbs. And the existing urban master plan defines the scope of the city center is within the Outer Ring Road.

**Chinese name**
Shanghai city center
Administrative categories
Shanghai
district belong to
China East China
Government resident
People's Square
Phone area code
021
Area
660 km2
Population
10 million
License code
沪 (except C)
1.3 objective and significance of the research

1.3.1 objective

To provide a theoretical basis and to explore the practices:

Elevated road as a product of urban development and urbanization process has already started in existence for several decades. Once, in order to ease traffic congestion they are extensively being built in the city. But with its development, the drawbacks are gradually exposed. Its prospects for development, although not to be optimistic, but as a more practical way, will still exist for a long time, and to remove them in a short time is unrealistic. As the memory of a generation, the elevated road carrying the mark of history, the research about it is still valuable. However, due to the volume and scale of the elevated road is unique, national and abroad research and literature specifically for the lower space of the elevated road reconstruction is very few, there is a need for further discussion of this issue, in order to provide a new basis to improve the urban space.

Change the status of the decline, and alleviate urban problems:

With the development of the elevated road, It has produced a series of negative issues, More and more people against the elevated road construction and support the demolition of it. Especially for the lower space of the elevated road, more citizens are complaining about it there are even more a number of security risks. This is not just urban problems, but rose to the level of social problems. In this study, we hoped that by analyzing the the current situation, to study the source of the problem. So that by the transformation of the elevated road; rational use of space below the elevated road to reduce or even eliminate these problems, and gave people a good living environment, improve the quality of life. This is exactly the social significance of this study.

Activate the urban space, and restore the vitality:

the elevated road’s huge volume, incompatible with the original scale urban space, the elevated road’s lower space due to lack of planning and supervision, over time, It has become a negative space, as part of the urban space, it loses its vitality. This study is precisely for these "dead" space, through effective way to re-inject vitality for them, revitalize urban space and make a better city.

1.3.2 Significance

Elevated road is in the centre of the city, it has its own spatial nature, permanent, fixity so that it and its structures become an important part of the urban space that cannot be ignored, it influences and transforms the human living environment. The sunshine has been obscured by the structure of the overpass, means there is not enough sunshine to maintain growing plants or arrange other activities. Dust on the road also affects the space under the overpass. At the same time, automobile’s noisy, concussions, these affects much to the environment of the space beneath the overpass.

In addition, the form of construction affects much more than other conventional forms of building to the city subdivision.

In the meantime, the public’s desire for using this space is growing, for this part of the space, there is already unorganized spontaneous utilization status, causing many of the features
blindly "parasitic" under the elevated road, but because it has not been organized and the arbitrary of use, often exacerbated environment by using this part of the space and the negative impact to the urban space tends to bring more than the previous unused statue.

As a result, how to make this part of the space to play an active role is as a problem to be solved, on one hand, the active use of the leftover space under the elevated can beautify and enrich urban space, on the other hand, also to develop a comfortable, pleasant unique area for the public, and thus play a positive role in the development of urban public space.

1.4 Methodology

In this research, I take the reutilization of the leftover space and area in Shanghai China at present as a start point. Combined with its formation mechanism, spatial characteristics, elements, functional requirements, to find the existing problem of why it is difficult to reuse, and then to make elaborate of design principles and countermeasures.

Specific research methods are as follows: Scroll through to find and organize all types of research-related documents, to help define the context of the study, and the study provides adequate and sufficient empirical cases and data to try to be placed in the leftover space with associated to each system, from the whole consideration of the research. This research presents case studies to illustrate activities that took place under several cases and in all over the world and their positive activities. The studies will be reviewed in terms of the similarities and dissimilarities of activities that occur. By comparison method to comparative the research objects of the study, in order to summed up its development morphological characteristics. Through manner of a questionnaire survey, collect public opinion, with the popular demand to guide the planning and design, to investigate the possibility of the transformation and the better the situation. Through the analysis of questionnaires to obtain concrete data and get an analytical report for the possibility of implementing of Shanghai elevated road. From the perspective of some of the key issues of this problem, such as access to property rights, security, performance, supply system planning, where the priority is public opinion, obtained from the survey of the most specific problems of the situation. Finally, with summary, induction and reflection, and appropriate extended and expanded, focus on a specific problem and combined with China's national conditions and local culture to propose countermeasures appropriate for the operation implementation.
Closely related elevated road is the people living in the urban centers of the city, while commuting office workers has directly contact with it every day which is due to a defined area of the present study is the center of Shanghai City, so our target population will be living in Shanghai or scheduled It is previously lived in Shanghai for 18-60 year olds. Due to the limited size of the questionnaire, we will take the greatest possible results of the questionnaire were collected. the survey was sent through a nationwide famous football-themed community, the online community currently has more than 400,000 registered users, active users sixty thousand people, the community is open for nationwide enrollment, we do not know how many active users are Shanghai residents, or residents who live in Shanghai, so we will be given the results of a questionnaire about 250 parts, which says only for shanghai residency or people who live currently or lived in shanghai before .22 days after we issued questionnaires, 294 valid questionnaires were received, has reached the target number of questionnaires recovered.
2. Literature review

Louis Isadore Kahn said: "from the surrounding area of the Elevated building into the city, from this point of view, it must be more carefully constructed, and even spend some money, in order to make this place in the strategic centre of the city to have more respect. " As can be seen from this statement, Louis Isadore Kahn took the viaduct road in the city centre as a phenomenon of objective fact, and recommended that to make the overhead as a design, and to apart the elevated buildings in the city from those which are far from the city. And both should have a different design concepts, standards and landscape requirements, and not just to meet the transport economy and efficiency, elevated urban centres should be more concerned as it is also concerned about the activities of the Citizen. In 1950s, Teamlo Smiths Group representatives presented the concept of "Air Street" made in "Golden Lane" housing plan, the basic idea is to integrate the social life into the aerial trails. With the air trail roads, and it plays the role of a bridge similar connection, then it should ensure that they have a certain width, and aerial walkways and other urban elements fast road on both sides have a good convergence. Here, the same is elevated in the form of fast road trails and consider have (has) more convergence relationship with the surrounding city.

Early 20th century, the advent of new technologies for the construction of urban space played its part in pushing forward. En 1996 Barcelona 19th UIA Congress issued "Today and tomorrow the city's architecture," noted; densely populated city with rapid increase, we must not only strive to operate public open Spaces, but also to strive for Ecological open Space; and not only to fight for the floor space, but also for underground space, water space. It also reflects from one side the people's desire for space, simultaneously, to explore the possibility of greater use of various forms of open space, urban space can be expanded to meet the demand. →Andreas Sawides in in a paper discusses the traffic space with other urban functions combined with the history and development of practical case studies of both the current situation and the upper space of a few elevated track use starting from urban planning and projects that discussed before, but there is no specialized analysis of utilization of space under the elevated.

According to the point of the text : The first example about traffic and urban functions combined space is ponte vecchio, which built in the 14th century in Florence, Italy, as both sides of the bridge channel, built with rows of commercial stores. And with rail space-related instances is presented in Western countries after large-scale urban construction, such as New York City grand central terminal and park avenue project are construction works on the railway in central New York, this project was built in the early 20th century, is a US traffic space utilization instance.

The first mention of the modern city centre by highway "invasion" came from the early 20th century Italian and futurist movement sociology. En July of 1914, the young Italian architect Antonio Sant'Elia issued the "Declaration of architecture in the future ", the article said: the future of the city should have a big hotel, train station, a huge highway, harbour and shopping malls, bright gallery, straight road and building for monuments and ruins that still have values for us...... on coagulation, steel and glass, with no pictures and sculptures, only their natural body contour and give us the sense of beauty. Such a building would be rough as simple as the machine, no matter how much the height, how much the weight ...... much traffic in the city linked organically with metal walking trails and a hub of many fast conveyors. ...... Architecture must make human freely in harmony with his environment, that is, to make the material world to become a direct reflection of the spiritual world ...... absolute speed energy can break the barriers of time and space, mechanical , craft and engines are as new tools of soci-

They, they can manufactured cars, highways and a lot of traffic, as well as the industrial economy, these imaginary things are realized by architects and planners of industrial society, some of the Nordic and American design think that technology division can be used in the urban fabric, and lead to changes in society and the economy. It had been suggested that put all the streets of Manhattan into a double, and put walk side into a dedicated pedestrian boulevard of North America, while some cities during the process to solve the problem of urban traffic congestion in the extreme way, such as embarking combination the car with the existing modern skyscraper.3

In view of this, the planning authorities recommended to stop the high-speed road enter the community and the use light rail and a direct bus line to solve the traffic problem, Boston’s Southwest Corridor is an example, they used a new subway line in place of the city’s high-speed Road Extension, the Big Dig strategically covered the adjacent on both sides of the railway, and imposed greening on both sides to increase connecting. That was the famous Boston Big Dig.

" land use under the form of overhead space " this paper introduced downtown Tokyo elevated railway bridge within the scope of land space use form from different lines, construction time, a side road conditions, road conditions, the lateral angle,. Use detailed survey data to analysed the form of the system of elevated use within Tokyo city. We can see from the above data, the United States and Japan and other developed countries, for how traffic space and urban space coordination problems, they even has already begun to study it from the beginning of the modern city, And after the emergence of the modern highway, also tried to approach roads into the urban space, the main purpose is to make full use of urban space, and to solve the problem of the high-speed road fragmented urban space.

in the paper “the city, infrastructure, and leftover space: an architectural solution, creating continuity in a broken urban fabric” author: Aaron Peabody 2012. This thesis recognizes problems of using space under highway and proposed the use of leftover spaces as sites for the development of architecture and landscape in order to promote urban activity and a newly defined continuity within the urban fabric. With the question” Can the use of leftover spaces as new sites of architectural design stimulate urban activity to the level that new continuity can be defined within the broken urban fabric?” Aaron summarized frames as site and tectonics, and with field visit and observe, tried to analyse it thought the angle of architecture inspiration.

In the paper “Opportunity in Leftover Spaces: Activities under the flyovers of Kuala Lumpur” by Nurulhusana Qamaruz-Zaman, Zalina Samadi,Nik Farhanah Nik Azhari, 2013.4 They thought series analysis proposed several options for the reutilization for the space under highway in Kuala Lumpur. They defined the flyover to be used as food stalls, cafes, sports and recreational activities, business and services, evening market, and as cultural activities place thought two cases study to observe the activities of people with the flyover in Kuala Lumpur. Field observation that was carried out during day time and night time in both sites provides better understanding of possible activities that occurs in leftover spaces specifically under the flyovers in kuala lumpur.

In Rámon Irrizary’s paper “restructuring the spaces under elevated expressways: a case study of the spaces below the interstate-10 overpass at perkins road in baton rouge, Louisiana” he summarized a method to define if the utilization of the space around the high is suitable, which is according to physical, social and psychological, visual and environmental, land use, economic conditions, business population migration, security, special effects, these 8

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3 Manifesto of Futurist Architecture - Antonio Sant'Elia, 1914 - ABC
4 Under The Flyovers of Kuala Lumpur: User Centered Activities in Leftover Spaces
Nurulhusna Qamaruz-Zamana, Zalina Samadib and Nik Farhanah Nik Azharib
aFaculty of Architecture, Planning and Surveying,
bCentre for Environment-Behaviour Studies (cE-Bs), FAPS, Universiti Teknologi MARA, Malaysia
sections. Provided systematic assessment methods for the transformation of land under the highway.5

Currently specializing in this area is insufficient in china, but we already have related projects have begun to face such problems. some countries have a variety of different solutions that faced the problem of lacking available land, with the expansion of the city, three-dimensional transport, research caused be related project will play an active role. The following papers and books related to highway overpass and the using of such space brings us new visions and discussion.

Jason King in his article “a potential body of landscape urbanism-part 1”,(Portland state university,2010)thought the project that consists of three parts, the marsupial bridge, the urban plaza, and the brady street bus shelter. Wisconsin crossroads project, which he succinctly summed up as "A multi-part urban story that links transit-ways and neighbourhoods while creating something out of nothing." The firm who is responsible for this project has a mature thinking about people’s perception of the building, while creating a work which benefits for people’s emotions. He pointed out that the role of architecture is not only for the city services, it should also be concerned the emotion which will give to people around, the transformation of an old building, should not just be refurbished. But to meet the service's features on its periphery, and also services for human emotions.

Murashima Masahiko(村島 正彦 = ライター,2015) in his article, “bone frame in the container and the outside the construction of space beneath freeway.” According to his research, he indicated some new ideas from the angle of building mechanical structure for constructions specially for space under freeway. Provided a new possibility to be better reuse the space.6

"Yan'an Elevated Highway - a survey on urban space and human activity", The author Zhu Kai took Yan'an Elevated Road in Shanghai as the object, through a detailed field survey, quantitative analysis, to study the impact of presence existing Viaduct on the urban environment and human activities, also he proposed some countermeasures. Even for include some strategies and suggestions the construction of flyovers of ring road in the the future some strategies and suggestions. Among this article, the author indicated that after many years development of highway, the public opinion might not as our originally envisage. This also shows us the importance of doing research of public opinion about the current situation of space beneath freeway utilization in order to make better change in the future.

"leftover space and its problem in shanghai," written by Wang Jian Feng en 2013. On the Case of Shanghai, there are a lot of underutilized space within cities, while the range is spreading out, and a part of them is the space below the highway, the author said in his article that Shanghai has its characteristic that is very different compared with others first tier cities in the world. So to use these space we must consider about our situation is always changing because we have a faster urban expansion and economic growth speed. Making plan to use these space must looking in advance decades later.

In the article that published in the magazine Urban Mass Transit “Investigation on Land Use under the Elevated Urban Railway” writer has compared the railway system inside the city in shanghai and in Japan, with the focus in land use. Both from land form to government policy. Made preliminary recommendations to land use patterns of space below elevated rail transit line in Shanghai. But the article did not analyse the surrounding environment and public opinion. However, this article has issued ten years, now we have many more changes waiting us to consider.

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5 Restructuring the Spaces under Elevated Expressways: A Case Study of the Spaces below the Interstate-10 Overpass at Perkins Road in Baton Rouge, Louisiana
6 「駅前だけ」ではなく、高架に沿って発電を広げる
中央ラインモールプロジェクト(1)
村島 正彦 = ライター
China has experienced a period obsessed for urban greening and beautifying. Excessive and unnecessary decorative greenery was all over the city. Not only increases the high cost and maintenance costs, Not only increased the high original cost and maintenance costs, while many plants were placed in inappropriate places, result that they cannot survive. The research” Reflections on the behaviour of forcibly greening viaduct bridge”, has indicated that greening is not the only way to use the remaining space in the city, and the forcibly greening also exist in decoration of the highway in city. This article has gave us some alert for decorative greenery.

Many article nowadays has proposed that the most practical propose for space under highway is to use it as parking. “Undefined Space in city, Research of Viaduct Bottom Space Transformation and Utilization” a research from ZheJiang University, “research on the management mechanism of fixed parking lots (garages) in shanghai” from Yu JunHao, published in city planning review, vol.39 no.4 Apr. 2015, has proved that de demand of parking area is much more than the city can offer. an article from shanghai municipal transport administration this year, planning, construction and management of shanghai public parking lot 2015, has showed some data that 2,723,000 total car ownership in Shanghai, till the end of 2014, the city has all kinds of civilian vehicles 2,718,600, an increase of 10.2 per cent over the previous year. Among them, private car 1,413,200, an increase of 17.8%. parking shortfall over 50 million total in the country.

So according to these researches, does turning space beneath highway into parking lot is the only way? The good news is that in practice many creative designers all over the world have carried out some exploration. Japan Shinjuku elevated Commercial Street, Seattle Freeway Park, Miami, over-town 9th Street promenade and Carrasco Square in Amsterdam, etc., have demonstrated the potential and charm of the space dominated by the viaduct. Of course, China's use of the viaduct space also experienced a idle, dining and entertainment, parking and greening after several stages, Gradually utilized the mode functionality combined with open green spaces and fundamental public parking. In recently years there has been some successful practice and exploration, such as: in 2002 Chengdu explored South Interchange and invested 8 million yuan, construction area 30,000 hectares, to made it into a heritage park with the theme of old ChengDu folk customs. 2003 in Jinan City, relying on the construction of the Yanshan overpass area 21.6 hectares, the city built one comprehensive green integrated equipment for sports and fitness, entertainment and landscape and other functions, Yanshan Square; while many big cities that led by Shanghai are in process of exploration for reuse of spaces under highway. These practices, although there are some reference to the efficient use of space in city, but due to the lack of in-depth research system, its universal significance is still very limited.
3. Case study

3.1 IT Activity Centre

Michael McCormick forum student activity centre of Illinois Institute of Technology is a combination of a very tight construction and elevated road tracks, the activity centre appears to be stuck under the track. There is a 100 years of history inner light rail went through from the base of the school which is located in the heart of Chicago. Trains passing on the light rail, there is a large area near the school that effected from the noise of the train, the steel pipes of the track near the activity centre has been wrapped up in order to reduce the noise, in this way, it is not only to protect the building, to solve the problem but also fundamentally reshape the entire environment. Without the noise, they can better explore the potential of this base. The "pipeline" track surround has become a vital part of the centre.

![Image of Illinois Institute of Technology](https://en.wikipedia.org/wiki/Illinois_Institute_of_Technology)

Because of this overhead is not built on city main road, so under the bridge land use was relatively easy. Each element of the building is linked to just right to respond to the relationship between the site and surrounding environment according to their particular position, re-organizing the interior space. Business, entertainment, college and practical facilities, parking and so on, based on the original function for the building partition.

Positive meaning: buildings are not separated from the overhead. instead of the separation, they combine the elevated road and its wrapped columns into an integral part of the building, at the same time to improve the surrounding environment.

The overhead space wrapped into building space under elevated to become a part of the internal space of the building, while the roof material implies that the elevated road’s presence.
Figure 8 Illinois Institute of Technology

Figure 9 Illinois Institute of Technology
https://www.aisc.org/content.aspx?id=24998

Figure 10 Illinois Institute of Technology
3.2 The A14 highway elevated road and control centre

The A14 highway control centre is located in France city of Nanterre, Contacting Paris and the suburbs at the cross road, both sides of the elevated are parks. Builders put the highway control centre and elevated bridge as a entirety to consider, "architectural style expresses the dynamic communication of the road, the metal of housing bottom and top of the signal tower mutual echo in appearance."

Project: Motorway bridge and control centre
Location: Nanterre, Hauts-de-Seine (France)
Architects: Odile Decq and Benoît Cornette
Design: RFR Consulting Engineers
Client: Etablissement Public pour l'Aménagement de la Défense
Builder: Quillery
Construction date: 1994-1996
Structures: Ove Arup & Partners
Length: 250m
Bays: 7x c. 35m
Overpass thickness: 1.5m
Construction: 1996
Figure 12 The A14 highway control centre
http://zhan.renren.com/youarebeautiful?gid=3602888498025741564&checked=true

Figure 13 The A14 highway control centre
http://zhan.renren.com/youarebeautiful?gid=3602888498025741564&checked=true

Figure 14 structure of the A14 highway control centre
http://zhan.renren.com/youarebeautiful?gid=3602888498025741564&checked=true
The original plan was to reflect a transition conception highway to the city of Paris, the transition from dark to light, from ethereal to heavy, static to dynamic, the transition from the north to the south, and from the tunnel to the bridge. Therefore, this building under the elevated road had to fully consider the integration with the surrounding environment, as well as parks and highway bridge connecting form. May be due to the high-speed road reflects the speed and vigor characteristic, Cross section of the bridge is formed from streamlined based from aerodynamic. Similarly, the architectural form also has a strong dynamic, very eye-catching red arches, office part of the building as transparent as glass box hanging on the red arches, in fact, the whole building there is another 2/3 the area was designed in the underground, so the ethereal and Conciseness of body maintains the park on both sides of the maximum continuous, Seen from a distance, the building looks like a striking cursor on this large-scale line the elevated road. has its positive effects to the park landscape, Although from a structural point of view, the structure of the building and elevated in fact interrelated. However, in the view of form the building doesn’t occupied the space beneath the elevated road, but has exploited the space under the overhead in the way of hanging below it.

Figure 15 structure of the A14 highway control centre
http://zhan.renren.com/youarebeautiful?gid=360288498025741564&checked=true

Positive significance: municipal outbuildings, the construction and the elevated road to become one part, using the structure of the construction, to make the building a part of the overhead and increase its beauty. In order to contact both sides of the park to be not blocked by the elevated road, buildings have not contact the floor, strengthening its volley dynamic.

1. to combine with the structure of the elevated road
2. eye-catching colors construction
3. transparent light modeling.

1. directly linked to human activity
2. The use of elevated construction, use elevated joint as a whole part
3. iconic buildings, eye-catching colors
3.3 Wujiaochang Descented Square

The decoration of Wujiaochang Circle Interchange aka descanted Square landscape worked be young artist Zhongsong, who was the artistic supervision and responsible for overall design. The late visual artist Chen Yifei served as artistic advisor. The whole project is a major axis of 100 meters and a minor axis of 80 meters, oval-shaped, with five underpasses, nine floor entrance is connected to the surrounding roads and commercial plaza. Square from inside to the outside and so the centre of the map is arranged as, the central plaza, landscaping, pool, water curtain and Huanlang. Wujiaochang is located in Xiangyin, Huangxing, Siping Road, Handan Road, Shanghai Road and Songhu five roads converge, planned to form a "roundabout area"Wujiaochang over a longer period of time before all existence as a transportation hub, without the formation of the business district, the main reason for this was in the following areas:
1. insufficient supply of commercial facilities
2. had not formed a traffic interchange system, human activity is excluded from the traffic around.
3. The entire area was spatially dismemberment five roads, the lack of agglomeration conditions.

Figure 16 Wujiaochang Descented Square under construction
http://culture.ifeng.com/gundong/detail_2014_04/18/35865784_0.shtml
Figure 17 Wujiachang Square in 1926
source 上海千年发展手册 photo captured from the book by author

Figure 18 Wujiachang Square in 1984
source 上海千年发展手册 photo captured from the book by author
But at the same time, here there are very good conditions for development: First of all the plots in the ring because of the construction, rail transportation and other factors, the flow of people will be great, daily flow reaches of 400 500 000, so the guide from commercial retail market demand is very strong, according to the relevant survey FCPG, the city center district Wujiaochang commercial area occupancy rate above 75%; in addition, Yangpu District, 17 colleges and universities to bring their own excellent cultural and technological resources for the Wujiaochang area.

After the completion of the three-dimensional organization of transportation around the island center from five directions: the combination of a motor vehicle tunnel, three-dimensional separation of traffic flow, both to ensure the smooth flow of traffic, but also to strengthen the integrity of the business district space, make full use of the sinking as a pedestrian plaza Contact circle the elements of the bond, which will significantly strengthen the combined effect of ring-type commercial center, in line with people's shopping habits. Sinking of the plaza effective traffic flow and stratification, which is a contrast with the pedestrian overpass in the form of man's activities on the ground level, to avoid the overhead pedestrian bridges to compete with each other over the closing scene of the road, reaching better visual effects and a better image of the city.
The descented square effectively stratify people and traffic, which is a contrast with the pedestrian overpass in the form of the human activity on the ground level, to avoid the overhead pedestrian bridges to compete with each other over the closing scene of the road, reaching better visual effects and a better image of the city.

Positive:
1. in the shape of the parcel overpass, forming a large volume of markers. Become a symbol of the sub-centre.
2. To dig the space beneath the overpass thought a descanted square to organize the underground commercial space by sides of the street mall. Resolved the human activities and transportation hub two conflicting functions by using three-dimensional elevation, so that the space under the overpass can be vibrant.
3. Thought developing more underground space to achieve more clear height, to artificially pull away the distance between the overpass and people’s sight, in order not to make the space under the overpass to be felt that stressful.

3.4 Chengdu people south overpass

Chengdu people south park started the construction in August of 2001, it was the first theme park constructed using urban space overpass. The designer cleverly used the space which is sight transparent and also can be a shelter over the elevated road, which was designed as a show of old Chengdu folk culture theme and leisure park.

Above the bridge there is modern city and heavy traffic, but under the bridge is an olde school culture leisure park.
Located in the overpass of Renmin Nan road and Rennan junction road. Started the construction in August 2001, and officially opened in January of 2002. This is the first in Chengdu, even in the entire country theme park constructed in the space under overpass. It is divided into six regions: Chengdu Old Bridge Street arts and cultural district, Chengdu folk culture sculpture recreation area, the old city neighbourhood recreation area, fitness area, water garden lounge and public parking area.

Its positive affection is that without the affection of side ramp, the landscape will coordinate the activities of people, and with fully used the form of the elevated road which can be a shelter for the rain and in the same time can be a sidewalk. With all these features it formed as a
leisure place also for display local traditional culture.

3.5 yanshan squera

As a case of space under the overpass reconstruction project in China, Jinan Yanshan overpass fitness Square Greenbelt Planning and Design Introduction is as follow:
item Location: downtown Jinan Jingshi Road and east Second Ring Road intersection
Project Area; 3.6 ha
Completion: May 2004

Yanshan overpass’s design philosophy is to connect with the Second Ring Road by ten transport hub, east beltway Jinan International Airport and 309 State Road, west of the main road urban stuff - Jingshi Road, covers an area of more than 20 ha, the plaza project officially put into use on May 1, 2004. Green bridge built set fitness, leisure, travel tours sightseeing in one city square. Yanshan fitness Square in a “people-oriented, return to nature” design purpose, green, natural, fitness throughout the entire construction concept Square. Fitness Square for the public to create a marketplace to avoid the hustle and bustle, get quiet and cozy comfortable leisure space.

the Square from east to west 1500m, difference of height 4m, north to south 1100m, difference of height 40m, area under bridge of large-scale interchange system which occupies 21.6 Square hundred meters(hm²), green area of the square occupied 80.1% of total area of the whole project, various types of evergreen and deciduous trees and shrubs planted 80 varie-
ties of about 490,000 trees, planting white clover, bluegrass, Radix lawn 17 Square hundred meters (hm2), built fitness trails 2850 meters.

The central portion of the bridge is an area of approximately 1000m2, with the shape like Chinese character “井” but the center is surrounded by open plains, is Yanshan highway junction’s “heart.”

Bridge deck is the commanding heights of the entire junction, connecting each direction. There are 18 bridge bridge deck support columns, are all the densest overpass pillar system, this part of the process is very difficult. But it is most attractive place of the whole landscape.

In the Square building process, they also made several supporting facilities: parking, shops, toilets, seats, management room, disabled Accessible path, lighting facilities and other necessities. Each event space in accordance with the needs of people at different levels reasonable layout. Small square, fitness equipment venues 9 0-160m2 of varying sizes, all with colored concrete floor surfaces, Non-slip, rich ground color, each site has 4-5 entrances, to access or evacuate is very convenient.
In this way, the originally junction as the “polluted” changed to an "Oasis" in the downtown area of the city, as the "lung", leisure and fitness venues.

Our current plan might not have paid enough attention to the leftover spaces, with less and less land available for development in the city, to make the city more "fine" instead of "big" will be the the subject, So, this is valuable for the future of Chinese cities in the hope that there will be more answer.

4 Utilization Value and Behavior

For the analysis of the value of reusing the space under the overpass, on the one hand is from the angle of the development of the city, for a better development and operation, we should consider to re-utilize the city’s leftover spaces. On the other hand is from the angle of the necessarily of the citizen, there is a phenomenon of more and more spontaneous behaviour of occupying the public space include the space under overpass. This unorganized blindly utilization could lead negative impact for the elevated road itself, in addition the citizen could not get a suitable living environment.

4.1 Characteristics of the leftover space under the elevated road

The leftover space under the elevated road compared with other urban space, has its own characteristics, from the role of urban development, it has its the positive side, From its cause, it has the inevitability. Because of the diverse possibilities of space utilization and adjusting regulations, it is dynamic, from objective factors of space itself exists in the form of space, and it also has availability.

4.1.1 Positivity

The leftover space is generally believed to easily break the image of the city’s beauty, the leftover space under elevated road separated the original urban fabric. So that both sides of the street can not to be connected. Or change the original spatial scales, to exclude human activities, resulting in the decline of the quality of urban space, which will hinder the development of the city. Therefore, the drawbacks of the leftover space under the elevated road It is mainly reflected in the waste of urban space, separate block contact, as well as obstacles to urban development aspects.

But the leftover space is not entirely useless, it also has some positive significant. The possibility of utilizing it is to be integrated to provide a resilient urban functions, Second, the urban space with Clearance arrangements are necessary. the leftover space on the definition of urban space planned development can avoid aimlessly to some extent, the relatively concentrated parts of urban space can be obtained more fully utilized. The positivity about it is mainly in the definition of the scope of urban space, and the elasticity of space utilization, these two aspects.

4.1.2 Inevitability

"City is like a living organism, it is necessary to ensure that his individual performance to be functioning properly, if it wants a normal, healthy growth, so its body function cannot be in a full load operation. If it has been operating at full capacity, then it cannot be a model of sus-
taneous development, it is impossible to survive in the cruel nature of survival of the fittest.”

The development of the city cannot always be in a perfect control over the state during the development process, it is inevitably take place that space could not be fully used. Due to the leftover space that produced by the reason of differential land, differences in economic development, the transfer of industrial, so we would have a reason to pay attention to this type of leftover space during the planning, to control them remain within an appropriate range. Therefore, from the point of the view of the city, the leftover space is an inevitable product that generated in the process of urban development, from an elevated construction itself, the leftover space is generated inevitably by the Large-scale development of elevated road.

Similarly, the leftover space as a part of space that could not operate at full, this part is on the one hand has its own initiative, and in order to become a factor in maintaining the functioning of the city, one the other hand, not all urban space are full of functions, but are in constantly turnover process, therefore, there will always be vacant, abandoned, idle space temporary presence. For the leftover space under the elevated road, there is the presence of elevated road, elevated structure itself forms a certain space with the support column and the top surface, the lower space will produced inevitably, and is bound to have the question of utilization.

4.1.3 Dynamic

The leftover space as a type of space within the city, and it is combined dynamically together with various factors of the city, so it is not a static thing, factors that generated leftover space are closely linked with urban spatial structure, economy, planning, and the leftover space under these factors is bound to be in a state variable. For example, if the focal point of the city development will change with the government's planning and priorities shift, also with the shift of economic focus and metastasis. Changing these factors will affect the transfer and conversion of the leftover space in the inner city. This uncertainty is the dynamic nature of the leftover space behind the driving force. So the using state of the space underneath the elevated road is not static, but according to the needs of the community and the surrounding environment or conversion.

4.1.4 Applicability

the leftover space is the space not being fully utilized, especially when it occurs in part of the space has a high land value areas, the more it has the potential to be exploited, we also need them to be integrated and optimized. We can use them to improve the performance of the overall effectiveness of our city. Therefore, they are potential urban space could be developed. the availability of the leftover space is also an important feature, according to this feature, we have the opportunity to discuss the question of utilization.

4.2 The influence of the space beneath the elevated road to the city

From the point of view of the enthusiasm of the leftover space, its existence has affect, if it is all occupied without regard of the specific circumstances, it certainly brings corresponding issues and influences, these issues and impact are in the following aspects:

4.2.1 to the urban traffic

Due to the reduction of distance of commuting, make it become possible to develop a number of energy saving mode of transportation, bicycles and walking will be accepted from a large extent by the city. But to use the leftover space may also cause problems, as it is necessary to mare lines to aid traffic flow, the flow lines of the new generation will interact with the city itself flow lines, and even urban roads would interfere with the flow line. This is also how to
use the leftover space and spatial reuse design put forward higher requirements.

4.2.2 Influence of spatial comfortability

How to control space in a suitable comfort range is a problem in that should be noted use when we are thinking about to reutilize the leftover space in the city. If the urban space is fully used, relatively it is certain that the density increases, human activity in a certain region also increases. The per capita space become smaller, the city became crowded, the comfort of human activity is reduced, the final result could be worse than the state before using. This requires us to pay attention on the relation between human activity and comfortability when we reutilizing the urban space, and not just the leftover space, not blindly pursue density while ignoring how the people feel, It also shows that the use of the leftover space is not a process that blindly pursuit of land conservation and increase urban density while ignoring the process of comfortability.

4.2.3 consideration of reserve land

Urban leftover space is also a necessary part of the performance of the city itself, as the mentioned metaphor of the human body, The relationship between comfortability and the same attitude towards the use of leftover space should not be seen as simply the use of available resources to fill, to keep a certain amount of the leftover space to be in the state of unused is the necessary to run the city. this large urban complex needs to have set aside land for further development, in order to open space, green areas and other means, this requires us to discuss the applicability of use profoundly before we already curtailed about its necessity of re-use.

4.2.4 analysis of human behaviour under elevated road in Shanghai area

"Urban theme is always human activity." Space under the elevated road normally extreme reject pedestrian. And appears as a dark lifeless space, but due to the geographical nature, especially when the environment was handled appropriately, people would involve in the activity. Therefore, the research to explore the space must related to human behaviour.

4.3 Existing Problems

In fact, the amount of construction in the social stricture, its purpose is commercial and political services. If the commercial value is not high, it is difficult to progress academically. These bits and pieces of lots of buildings are facing several problems, land area is small, the shape is not complete, functional limitation, the commercial value is very small. While there may be high maintenance costs, the actual operability is not strong. Secondly, these lots of unknown Jurisdiction, because many of these public space with cross ownership which is very confusing, there are a lot of blurred area in the political-economic factors, while planning, ownership, cost, and maintenance of these rights and obligations are very vague.

4.3.1 Policy

in Shanghai according to the Notice on Further Strengthening the management of the implementation of the space under highway in the city issued by Municipal Council forwarded the City Transportation Commission, (沪府办〔2015〕91号): ⑦ space under highway and bridge open-
ing may only be used complying with the requirements of public facilities. In accordance with the relevant provisions, the using is restricted to temporarily setting the greening or space for put iquimpent for maintaining the greening, setting as collecting rooms for sanitation workers also as or for park vehicles. Basically on these two facts, it leads to the death penalty to a commercial building. This is also the common problem of China. The highest authority of public facilities belongs to the government. Besides in some urban planning regulations stipulated in the mentioned development mode is not conventional.

Figure 31 collecting rooms under the highway.
http://news.ifeng.com/gundong/detail_2010_10/12/2757161_0.shtml

Figure 32 space under the highway used as parking for confiscated vehicles from FengHuang network
http://finance.ifeng.com/a/20150615/13777043_0.shtml#p=1

4.3.2 architecture(structure)

General requirements for the planning of each piece of land not suppose are not to be very small. It is too small then it only can be applied to special treatment. In fact, the first thing that we concern is the rural corners of arable land, the best option is to incorporate a substantial absorption of land, easy to cultivate, even by small farmers achieve circulation to larger farms. From the planning perspective it has very large limitations this kind of space, narrow, dark, small and limited height, cannot be extended on both sides, from the other point of view, the presence of noise, light and space problems under the bridge, and this kind of space can easily give people instable emotions, like fear and other psychological reactions. In addition, the junction’s form, such as single-pillars, double-pillars; also, the relationship between the highway bridge and the road, for example, in the middle of the bridge, the bridge on one side. Or on both side those problems are also have to be considered when we do the planning.
4.3.4 energy and supply

But if we want to make the best use, is inevitable to the energy supply problems, with the parking lot, we just need a good venue and route planning to ensure that the vehicle is parked and does not affect traffic, but if, we build things as shops, grocery stores, and even restaurant, it is much complicated than others, it goes with a lot of energy supply issues, how to plan water pipes, electricity and gas supply how to bury pipeline put, cabling, security switch, etc.

4.3.5 discharge

How to discharge waste and waste water, since, the viaduct is unlike buildings near the residential, or in the commercial area, etc. it goes without unified planning pipelines and facilities, and when we re-use the space under the bridge is when we inevitably need to consider how to discharge garbage efficiently Under the premise of without an disposal facilities.

4.3.6 economy and maintaining

While in the city, economic disputes is not easier then property rights issue, first of all it is likely to be a non-profitable project, hardly to gain money, it is very difficult to attract investors to invest this. In view of the Shanghai Municipal Government for highway bridge space laws and regulations, if we willing let it make better use of the space under this circumstances, it seems to be able to only rely on government revenue, In my opinion, this is also the reason that the government has not to issued any action yet. Since Shanghai highway network is very huge, if we want to transform a good majority of spaces under the junction the cost will be very immense, The post-maintenance, staff costs may be huge, but its real value can be created is very small, so that economic investment so far is still a vexing problem.

4.3.7 safety

Pictures show that the bridge fire disaster is very likely to affect the environment under the bridge. The use of such space must take into account to not to endanger the safety on the bridge. Because an accident under the bridge is likely to cause casualties on the bridge, property damage, or cause traffic gridlock, etc., and traffic accident on the bridge, fire and collapse and other accidents could be the security threat to the space blow the bridge which is also a thorny issue.

![Fire on Tokyo Japan, Metropolitan Expressway No.7 Komatsuzaki Line.](image1)

4.3.8 public opinion

This is a very critical issue, a number of difficulties that we mentioned above, the public opinion for the under bridge construction issue has been seen as vital. Under many difficulties, it is necessity to use it, whether people are still willing to spend taxes to use the space under
the junction, or to what extent they want it to be used, or the people may be more willing to maintain the status quo.

This is the emphasis of this discussion, we are pleasure to survey public opinion on the necessity for the transformation of the space under the highway, what kind of space they need, how to reform, how to maintain and so on. To speculate when the construction is completed, the public whether to use, whether they like, if it's convenient for them, weather is there some bad influence, and for such an effect, if they are willing to pay taxes to maintain these programs.

But the city is entirely not followed by this way of thinking. Most scattered land should try to merge into the surrounding land in order to improve the utilization of land. After all, China is still partial tension of urban land. If it is very difficult to integrate so then it should be systematic as much as possible, such as inclusion green systems, municipal service system, leisure activities system. The value of small isolated land is small, because the lack of systematic management and promotion. In Shanghai, some leftover spaces that under the junction can not be considered as "remained", it can be made to a decent green zone, basketball court, parking and other facilities. under the human scale, there is no dead ends, all can be utilized by the system.

So the main way out, is to make this idea to a hypothesis intend to use the political system, as a task to complete embellishing the appearance of a city, which is relatively reasonable. Strong operational, but it also depends on the attitude of the city government that if it is willing to sacrifice some interests. But even so, this space will soon also sacrifice the functionality.

On this point it can refer to Japanese cities, the Japanese government has a very great experience on this issue, Because Japan has a small territory, so there is no excuses to waste any inch of land. Overall, in the Japanese aesthetic tradition, the attention to detail, attention to nature, exquisite Simplicity, exquisite aesthetic spirit meaning, constitute the spiritual pillar of Japanese design. However, a lot of effort in the details of this matter that China still has a long way to go. Not to mention, aerial and underground space development of the city is one of the main direction of future urban development. China in this direction has not even to explore and research.
5. Shanghai elevated road development context

5.1 Shanghai City Profiles

Shanghai is the most populous city in the People’s Republic of China as well as the most populous city proper in the world. It is the second most populous of the four direct-controlled municipalities in China, with a population of more than 24 million as of 2014. It is a global financial center, and a transport hub with the world’s busiest container port. Located in the Yangtze River Delta in East China, Shanghai sits on the south edge of the mouth of the Yangtze in the middle portion of the Chinese coast. The municipality borders the provinces of Jiangsu and Zhejiang to the North, south and west, and is bounded to the east by the East China Sea.

![Shanghai Administrative Division](https://en.wikipedia.org/wiki/Shanghai)

The 2010 census put Shanghai’s total population at 23,019,148, a growth of 37.53% from 16,737,734 in 2000. 20.6 million of the total population, or 89.3%, are urban, and 2.5 million (10.7%) are rural. Based on the population of its total administrative area, Shanghai is the second largest of the four direct-controlled municipalities of China, behind Chongqing, but is generally considered the largest Chinese city because Chongqing’s urban population is much smaller.
Shanghai also has 150,000 officially registered foreigners, including 31,500 Japanese, 21,000 Americans and 20,700 Koreans. Of course, this is based on official figures, so the real number of foreign citizens in the city is probably much higher.

5.2 Public transport

Shanghai has an extensive public transport system, largely based on metros, buses and taxis. Payment of all these public transportation tools can be made by using the Shanghai Public Transportation Card.

The Maglev with a top speed of 431 km/h (268 mph) exiting the Shanghai Pudong International Airport

Shanghai’s rapid transit system, the Shanghai Metro, incorporates both subway and light railway lines and extends to every core urban district as well as neighboring suburban districts.

As of 2014, there are 14 metro lines (excluding the Shanghai Maglev Train and Jinshan Railway), 329 stations and 538 km (334 mi) of tracks in operation, making it the longest network in the world.[101] On 22 October 2010, it set a record of daily ridership of 7.548 million.[102] The fare depends on the length of travel distance starting from 3 RMB.

Shanghai also has the world’s most extensive network of urban bus routes, with nearly one thousand bus lines, operated by numerous transportation companies.[103] The system includes the world’s oldest trolleybus system. Bus fare normally costs 2 RMB.

Taxis are plentiful in Shanghai. The base fare is currently ¥14 (inclusive of a ¥1 fuel surcharge; ¥18 between 11:00 pm and 5:00 am) which covers the first 3 km (2 mi). Additional kilometers cost ¥2.4 each (¥3.2 between 11:00 pm and 5:00 am).[104]
5.3 Roads

also: as Expressways of Shanghai
Shanghai is a major hub of China’s expressway network. Many national expressways (prefixed with G) pass through or terminate in Shanghai, including G2 Beijing–Shanghai Expressway (overlapping G42 Shanghai–Chengdu), G15 Shenyang–Haikou, G40 Shanghai–Xi’an, G50 Shanghai–Chongqing, G60 Shanghai–Kunming (overlapping G92 Shanghai–Ningbo), and G1501 Shanghai Ring Expressway. In addition, there are also numerous municipal expressways prefixed with S (S1, S2, S20, etc.). Shanghai has one bridge-tunnel crossing spanning the mouth of the Yangtze to the north of the city.

In the city center, there are several elevated expressways to lessen traffic pressure on surface streets, but traffic in and around Shanghai is often heavy and traffic jams are commonplace during rush hour. There are bicycle lanes separate from car traffic on many surface streets, but bicycles and motorcycles are banned from most main roads including the elevated expressways.

Private car ownership in Shanghai has been rapidly increasing in recent years, but a new private car cannot be driven until the owner buys a license in the monthly private car license plate auction. Around 8,000 license plates are auctioned each month and the average price is about 45,291 RMB (€5,201). The purpose of this policy is to limit the growth of automobile traffic and to alleviate congestion,[105]

5.4 Railway

Shanghai has four major railway stations: Shanghai Railway Station, Shanghai South Railway Station, Shanghai West Railway Station, and Shanghai Hongqiao Railway Station. Three are connected to the metro network and serve as hubs in the railway network of China. Two main railways terminate in Shanghai: Jinghu Railway from Beijing, and Huhang Railway from Hangzhou. Hongqiao Station also serves as the main Shanghai terminus of three high-speed rail lines: the Shanghai–Hangzhou High-Speed Railway, the Shanghai–Nanjing High-Speed Railway, and the Beijing–Shanghai High-Speed Railway.

In the 1960s, the rapid development of the automobile industry, motor vehicle traffic in the city has become an increasingly serious problem, in order to solve traffic congestion, Europe, Japan and other countries chose to build elevated roads in the city. Among them, in Tokyo urban areas more than 50 per cent of express way are elevated. Similarly, Hong Kong is also used overpass way to solve the problem through the urban express way, the first elevated road was built in mainland China in September 1987, called Renmin Road, between Liu Er San road in the municipal Guangzhou. The improvement for urban traffic after the completion is obvious, the traffic capacity is three times than the original, and the journey time is shortened by more than half. In this backdrop, Shanghai elevated road also been developed.
6 Development situation of Elevated road in Shanghai

Most city expressways are found in the inner districts of Shanghai, including several elevated highways which run directly above surface-level roadways. In Chinese, these expressways are literally termed City High-speed Roadways (Chinese: 城市快速道路), but the maximum speed is usually 80 kilometres per hour (50 mph). These are still considered expressways or controlled-access highways because of the presence of ramps, grade-separated junctions, and the absence of traffic lights. Most of these expressways are elevated and run above a lower-speed roadway. Two city expressways, the Inner Ring Road and Middle Ring Road, are, or will be ring roads or beltways.

Figure 36 shanghai expressway map
https://en.wikipedia.org/wiki/Public_transport_in_Shanghai
After the victory of the Anti-Japanese War, with the economic recovery, an increasing in the vehicle, the road began to be crowded and congested in the downtown.

Shanghai Urban Planning Committee, according to the opinion “without a speed of 100 km highway the mega-cities would be paralyzed”. Combined with the situation of lacking roads which have capacity to full access thought the city, and the road width were too narrow. In the second edition of “Draft of Shanghai Urban General Planning Report” which prepared by the committee in 1947, They planned trunk, and suggested trunk road through the city could be applied in the form of overpass.

In the “Shanghai built-up area trunk system plan” prepared in June of 1947, it suggested, elevated road could be constituted by the total width of 23 meters of electrical Lane (the same as the express way now) and driveway. Driveway width 7 meters, vehicle speed of 90-100 km/h, this is the beginning of the Shanghai high-speed roads and overpass. Shanghai Urban Planning Survey and Design Institute wrote “Shanghai high-speed trunk road system plan” in October of 1958. The plan indicated using ring radial form in the city, including high-speed inner roads, middle ring road, outer ring road and an express traffic system formed by dozens of radioactivity road, in which, the inner ring, the middle ring are recommended to build as elevated road. Shanghai Planning Institute wrote in January 1985 “Automobile lanes planning scheme from Zhongshan road(Da Bai Shu) to Caoxi road” based on this, in Augusto of 1985 Shanghai Planning Institute wrote “preliminary program of the system of elevated road for automobile lane in Shanghai”, drew “1985 schematic of planning scheme of elevated road for automobile lane in Shanghai”, this plan indicated a none closed ring road,

roads run through the centre as a cross, An east-west direction road across the main area. The centre city part of the total length was 95 km; the design speed of peripheral part of the expressway was 80 kilometres per hour. The rest of it was 60 kilometres per hour. difficult area was 30 to 40 kilometres per hour, the elevated part were designed to 4—6 lanes. The feature of this layout was formed of a cross-shaped elevated system in the centre.

This planning scheme was approved by the Shanghai Urban Planning and Environmental Protection Committee in July of 1987. So far, Shanghai had formed a complete elevated road system design scheme, And began the contraction in 1992; in September 1992, the Inner Ring elevated road went into operation, December 1994 opened to traffic; ; in July 19923, the North-South elevated road went to operation, and started to run in December 1995, en 1997 the Yan an elevated road began to contract. And en 1999 opened to traffic.
<table>
<thead>
<tr>
<th>English name</th>
<th>Chinese characters name</th>
<th>Termini</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Ring Road</td>
<td>上海内环线</td>
<td>Ring road</td>
<td>47.7 kilometers (29.6 mi) long. Crosses the Huangpu River using the Yangpu Bridge and Nanpu Bridge.</td>
</tr>
<tr>
<td>Yanan Elevated Road</td>
<td>延安高架路</td>
<td>Hongqiao International Airport, The Bund, Bund Tunnel, East Zhongshan No. 1 Road</td>
<td>15 kilometers (9.3 mi) long.</td>
</tr>
<tr>
<td>South-North Elevated Road</td>
<td>南北高架路</td>
<td>Jingan- and Yuhua Roads, Lupu Bridge</td>
<td>18.1 kilometers (11.2 mi) long.</td>
</tr>
<tr>
<td>Yan'an Elevated Road</td>
<td>淞沪高架路</td>
<td>Inner Ring Road</td>
<td>6.6 kilometers (4.1 mi) long.</td>
</tr>
<tr>
<td>Middle Ring Road</td>
<td>中环路</td>
<td>Jinqiao Road and Puoting Avenue, Puoting Middle-Huaxia Road, Shengping Road, and Huaxia Elevated Road, Puoting</td>
<td>Sections of Middle Ring Road are still under construction. Its length so far is 59.22 kilometers (36.78 mi). When completed, it will become a ring road, Crosses the Huangpu River using the Jinqing Road Tunnel and Shengping Road Tunnel.</td>
</tr>
<tr>
<td>Humen Elevated Road</td>
<td>沪昆高速公路</td>
<td>Inner Ring Road</td>
<td>13.32 kilometers (8.28 mi) long.</td>
</tr>
<tr>
<td>Jiamin Elevated Road</td>
<td>嘉定外环路</td>
<td>BeiLe Elevated Road</td>
<td>Part of the Hongqiao Comprehensive Transportation Hub.</td>
</tr>
<tr>
<td>Huaxia Elevated Road</td>
<td>华夏高架路</td>
<td>Middle Ring Road at Shengping Road</td>
<td>18.6 kilometers (11.6 mi) long.</td>
</tr>
<tr>
<td>BeiLe Elevated Road</td>
<td>北安龙路</td>
<td>Jiamin Elevated Road</td>
<td>7.9 kilometers (4.9 mi) long. Part of the Hongqiao Comprehensive Transportation Hub.</td>
</tr>
<tr>
<td>Sengxi Elevated Road</td>
<td>峙浦高速公路</td>
<td>SGS Shengping-Hangou Expressway</td>
<td>Part of the Hongqiao Comprehensive Transportation Hub.</td>
</tr>
<tr>
<td>Jiangshou Elevated Road</td>
<td>江苏高速</td>
<td></td>
<td>Part of the Hongqiao Comprehensive Transportation Hub.</td>
</tr>
<tr>
<td>Hongqiao Elevated Road</td>
<td>火车南站</td>
<td>Hongqiao Comprehensive Transportation Hub.</td>
<td></td>
</tr>
<tr>
<td>Hongqiao Elevated Road</td>
<td>火车南站</td>
<td>Hongqiao Comprehensive Transportation Hub.</td>
<td></td>
</tr>
<tr>
<td>Cangxi Elevated Road</td>
<td>淮海路</td>
<td>Hongqiao Comprehensive Transportation Hub.</td>
<td></td>
</tr>
</tbody>
</table>

Figure 37 Shanghai expressway information
https://en.wikipedia.org/wiki/Public_transport_in_Shanghai

6.1 Features of elevated roads

Elevated Road using a variety types of bridge structures, construction of continuous operation without signal control truck roads, Facility construction period is short, wide range of services, adaptable, able to provide high-capacity, high-speed, continuous transport services, characteristics of urban expressway traffic can be briefly summarized as follows:

(1) High speed: Elevated Road designed for exclusively automobile use, can effectively solve the problem of mixed traffic;

(2) Security: mainly through the introduction of separate travel to ensure the partition with two aspects, first is to set up median strip, separated the upstream and downstream traffic, so as to prevent the conflict of the traffic. second is divided the co-lane road, so that it makes different speed cars to drive in its own lane. While limiting pedestrians, non-motorized vehicles entering, fully enclosed, all-way interchange, the vehicle only come and out from the off-ramp.

(3) Efficiency: Elevated Road has a greater traffic capacity at higher traffic speeds. Shanghai Elevated Highway System design speed is 80km / h, besides the North-South and East
Yan'an elevated road design speed is 60km / h.

According to statistics from April 28, 2000, the daily service of the Shanghai Elevated Road network amounting to 910,000 vehicles, assume about 50 per cent of motor vehicle traffic in downtown.

4.3 Effects of elevated road
Since the elevated road has more than three properties we mentioned above, so its presence on the specific role of urban development mainly in the following aspects:

(I) Faster speed
Since the implementation of motor vehicle in different traffic lanes en elevated road, in order to be across all intersections without any interference, and generally designed according to high technical standards of design, so the vehicle can reach speeds generally 40 to 60 km, (Today, this speed has been greatly enhanced) Its speed is about two to five times than the average speed of the ground.

(2) Large capacity
Because the capacity of the original road has not been reduced, and because there is no intersection blocked, so that the traffic is more fluid than before, and can travel buses and taxis, so that traffic grandly increases.
According to opinion of the surveys of many urban transport research department and experts, the capacity of ground (3-4 lanes) is 1500 - 2400 vehicles per hours, elevated road (3-4 lanes) has the capacity of 4000 6000 vehicles per hour.

(3) Clarity of road traffic function
The urban road system is formed by primary roads, secondary road, slip road and side walk, since the interference of the intersect n the ground, it is different to distinguish between primary and secondary road, neither unable on the difference of speed, with the large traffic, the entire road has become slow. Especially in rush hour, the part which has interleaving of motor vehicles and non-motorized vehicles frequently has serious traffic congestion. Elevated roads functioned as express ways. Each lane’s division has its functions, makes network function more clearly. In addition elevated roads can both carry passenger and freight, If necessary, it can achieve to stagger in rush hour the passenger and cargo traffic. Improve the efficiency of elevated roads, and in this respect it is superior to the light rail and subway.

(4) Traffic Safety
Due to the elevated roads only with motor vehicles, motor vehicles and non-motorized split between different lane, and no pedestrian interference, There is no interleaving when the vehicle driving, so although the speed is faster, but the traffic is much safer than the road surface of the ground.
In addition, most of the fast vehicles traveling on the elevated road, while the slow ones are in the ground, this can also reduce traffic accidents.

(5) Covering less
The full using of the upper space of the ground has increased the available traffic area, it increases the effective area of the road. A road with 40M wide, can be built as maxim 8 lanes, with 4—8m sidewalk on both side. But to construct elevated road, the ground lanes can arranged as 6 motorized vehicles lanes and the flyover can be arranged 4 lanes, then the lanes can be increased 25%.

(6) less demolition, less investment
Elevated roads can be built over the original road because they can take advantage of the original construction, to reduce the demolition, thus saving investment. Now many cities are in their expansion of the road surface, 80% to 70% of the investment is demolition costs basic accounting. Reducing demolition, not only saves investment, but also conducive to social stability. In addition the construction of elevated roads in the city also has a short duration, can be phased construction; operation and maintenance costs lower. Since elevated roads improved speed, shorten the travel time, so it is also very obvious economic benefits.

The negative impact of the elevated roads in Shanghai
It is obvious that elevated road brings many unfavourable factors to urban space.

6.2 Summary of negative impact of elevated road to the city

including the following aspects

The urban ecological environment
Elevated road impact on urban ecological environment is mainly from two aspects, traffic noise and traffic fumes. The hazards of noise on human health is no doubt, is an important source of many diseases, and a motor vehicle on a bridge climbing process, a greater resistance to be overcome, the consumption of power and energy is greatly increased, so that more exhaust gas emissions into the atmosphere.

(2) coordination with urban environmental space
Elevated Bridge in the city centre, because it has its own spatial nature, permanent, fixity and attention, makes it with other natural and artificial landscapes together formed an environmental landscape that cannot be neglected, in turn, a great impact and transform has applied to the human living environment. If the urban environment of the central area and elevated road are uncoordinated, it can easily lead to the degradation of urban functions.

The effectiveness aspects to the traffic situation
Because the elevated road only effect positively to the city traffic, basically only to vehicles, and somehow it makes the traffic more complicated than before, contrary to urban transport development. In this regard, the emergence of elevated road, capacity formation can only play a small part, it is not economic performance in a long term.

Trends of elevated roads development
China's urban elevated road construction mainly reform and opening up began in the 1980s, by the end of 2005, Beijing, Shanghai, Guangzhou, Tianjin, Dalian and other cities more than 20 under construction or ready to build and planned new light rail transit, line length of more than 4000 kilometers, is expected to 2050 China's urban light rail transit line length will be over 6000 km.
So far, in major cities have been booming, and now small cities have begun a small scale of construction of elevated road in the center's downtown area. In recent years, many cities in the new round of urban master plan revision or transportation plan have put forward the idea of the construction of elevated roads, such as Guangzhou city loop traffic engineering; Nanjing inner fast loop planning and so on.
Therefore, in our country, at this stage, although the impact of elevated road to the urban space cannot be ignored, the development of urban light rail and elevated roads is the inevitable choice to solve the metropolitan traffic problems.

7 Distribution of space utilization in Shanghai centre

7.1 Distribution of the Inner Ring Road

In the north inner circle, there are 7 constructions under the elevated road, 6 of them are electricity transformation facilities, respectively in Tianshan road, Guangfu road, Zhongshanbei er lu Road, Zhengben Road, Fu shun Road, Kongjiang Road. And the left one is an parking management alone the Suzhou river. In the south of inner circle Road, there are 3 constructions beneath the bridge, respectively, in Caoxi Bei Road, Damuqiao Lu Road, also are electricity transformation facilities, and the other one is on Guohuo Road, which is a parking management. The Zhongshan Xi Lu Road elevated road is a single column bridge, the rest
are double column bridges, In addition to the form of use of the building, others are planting green space. From the overall situation the inner ring road, power distribution room evenly arranged according to the needs of municipalities, with the form of the surrounding roads and distribution of human activity not directly linked.

7.2 North-South elevated express distribution

North-South Elevated express from Lianyi Road extended to the light rail sections are combined with an elevated section, there are three whole section of road utilizing buildings, Are all transformer substation. The entire express way is formed with separation double column and conjunct double column. In Guangzhong West Road, Xuiazhai Road and Fuxing Mid Road, also have three sections used as open parking lot. Other sections are used as greening, because the North-South Elevated express using beams of box girder, easy access to both sides of the light, a good living environment for the plant placed under the elevated road.

7.3 Distribution of the Yan'an Elevated Road

From Sichuan Road to Changshu Road, a total have six used facilities, which is four substations, two traffic police guard post and command post. The major part of the express way is formed with separation double column, the west of Zhongshan Xi road inner circle are mainly greening, those parking lots are located in Chongqing Nan road between Huangpi nan road, Zhaohua Road and Jiangsu Road. The rest of the space under Yan’an express way are enclosed by railings. Inside of the space the floor is smooth concrete floor with an idle state. The utilization of this part is mainly as advertising and art poster, integrating the structure of the support columns. Between every two support columns has a substantial advertising post. Zhaohua Road near inner circle yan’an, Chongqing south Road, Huangpi south road near the People Square has large flow of people, also a large number of traffic transfer behavior occurs. the resulting car parking and bicycle parking lots of functional requirements determine the use of space is determined to produce and function. Similarly, Shandong Road in the downtown area, at the intersection of Fujian Road and elevated complicated because of traffic, but also generated to traffic command post, the traffic police booth has been located there. But each open from the closed billboard has a temporary pavilion for management, these simple booth is a small size makeshift, and no identification neither the visually mixed with the support column.

7.4 Light Rail Line Distribution

The part from Caoxi Lu stop to the JiangWan Zhen stop of the light rial line, the utilization under the rail way is multitudinous. Including two bus station, located in Anshun Lu road /Hongqiao Lu Road, another located in Zhongqian Lu Road, four parking lots are in the junction of Huaihai Road, Ningxia Road intersection, Zhenping Road junction and Xingzhi Lu Road. There is a temporary structure sheds in Xinhua Road intersection, there are seven temporary kiosk vendors in Kaqiao green land, Huichuan Lu Road, Ningxia Lu Road, Caoyang Lu road, Wuning Lu Junction, Dongbao Xing Lu Road, Luo fu Lu road triangle, and Haijun Lu road. For commercial destination permanent building which is a three floors building has been located in Gongxing Lu road crossed Baoshan Road. Wuning Road intersection platoon shops, 2 bicycle parking lot in Wuning Road intersection and Luofu intersection. There are several stall traders without architectural forms, occurred in the south side of the Jingjiang Road, under the North-South Elevated Highway the Jichuan Road and Xingguang Road.

Guangling Road and Xinshi Road part is not available to reuse, the Guangling Er Lu Road rail is near the surrounding buildings, the space under the light rail is sidewalk. Along other sections of the green segment, a large open space area in the west of the wall appears in North Road, near the train station because the track is not in the form of elevated horizoned but with a similar open space appears in the slope from the place.
7.5 Summary

The utilization of space under elevated express way in Shanghai could be divided in two categories, utilization in form of construction or utilization in open form. Building type refers to use space under the elevated road form of the building, with the external structure of the space into an indoor space utilization, and open space is without the limit of a construction or structure. with the space undefined scope, carried out an unlimited space. The characteristics of the utilization in form of construction: cannot ignore the impact of the volume and morphology of the street interface. But the internal function barely influenced by surrounding building, according to functional requirements, mainly for municipal power distribution room, the traffic police booth, newsstands, public toilets. utilization in open form’s characteristics are transparent sight, the function is easily influenced by surrounding environment, use function primarily for parking, green parks, retail and so on. Because the elevated express way across different districts also the different form and varies structures. therefore, utilization the distribution of the Inner Ring Road, North-South Elevated express, the Yan’an Elevated Road and Pearl light rail line are distinct.(photo 桌面 png).

8 Questionnaire
关于上海立交桥下空间利用调查

注意：本调查问卷范围为上海市区高架、立交及立交桥枢纽，桥下空间为非交通道路、河流等不可利用空间。ps的图片仅供参考，并非实际项目。

1. 您的年龄 *
   - 小于18岁
   - 18–30
   - 30–60
   - 大于65岁

2. 您的职业 *
   - 学生
   - 办公室职员
   - 工人
   - 服务业
   - 其他

3. 您对现有立交桥下空间的利用程度感到满意吗？ *
   - 满意
   - 还行
   - 不满意
   - 无所谓

4. 对于重新规划利用立交桥下的空间会对你产生什么样的影响？ *
   - 我觉得能提供便利
   - 我觉得没什么差别
   - 我觉得会产生负面效果
   - 对我没有任何影响

5. 您见过的现有的立交桥下空间都有怎样的利用模式？ *[多选题]
   - 空地
   - 停车场
6. 您觉得现有的枢纽空间存在怎样的问题？ * [多选题]
- 交通繁忙、人多
- 噪音太大
- 不健康、恶气、扬尘等
- 缺乏绿化
- 缺乏美观
- 缺乏管理
- 其他 ________________

7. 对于利用立交桥下空间，以下方案您觉得哪个更好？ * [多选题]
- 不需要改变，保持现状
- 公交车站
- 加油站、洗车店、停车场
- 休闲运动设施、公园
- 公园
- 综合停车场
- 综合运动设施
8. 您认为重新规划利用楼空空间将带来何种影响？

- 会为交通带来便利
- 会为生活带来便利
- 会为环境带来便利
- 不认为会对产生负面影响

9. 您觉得有必要为此空间进行景观规划设计吗？

- 非常有必要，事关城市形象
- 是必要，浪费资金
- 不必要，资金充足就可以进行适当设计

10. 您觉得什么样的景观设计适合楼空空间

- 适当点缀，为交通服务，人可以自己进入其中
- 提高美观设计感
- 结合娱乐休闲商业设施
- 单纯绿化，不通行人，保持建筑稳定性

11. 如政府进行此类空间规划利用而征收税款，您是否愿意支付？

- 愿意
12. 如征税，您愿意支付每年多少元人民币用于此项规划和维护？

0 000 999

元/年

13. 关于重新规划此类空间，您有什么样的担忧？

- 可能会对交通造成不利影响，如造成交通拥堵
- 可能会对生态环境造成不利影响，如破坏水文气候等问题
- 可能会对人文环境造成不利影响，商业市场等形成造成生活习惯的改变
- 可能会产生额外的税收
- 可能会对城市美观造成不利影响
- 可能会对经济造成不利影响，如影响当地商品等市场价值
- 安全问题，或会有人身，车辆等危害
- 我担心与投入成本相比，整体成效并不会显著
- 我并不觉得担忧
Start date:2016-3-2   finish time:2016-3-24

Answer received: 294

数据与分析：

第1题 Your age:

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
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<tbody>
<tr>
<td>younger than 18</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>18-30</td>
<td>123</td>
<td>41.84%</td>
</tr>
<tr>
<td>30-60</td>
<td>171</td>
<td>58.16%</td>
</tr>
<tr>
<td>older than 60</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>

In view of the questionnaires distributed through internet, the survey sampled of some limitations on the scope, the questionnaire responses concentrated in 18-60 years, it lacked the results of the people who is under 18 and more than 60 years old. But because young people are the main population of urban traffic travel, so basically can represent the views of the
majority of the population for the survey results.

第 2 题  Your profession:

<table>
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<tr>
<th>选项</th>
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<th>比例</th>
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</thead>
<tbody>
<tr>
<td>student</td>
<td>9</td>
<td>3.06%</td>
</tr>
<tr>
<td>office worker</td>
<td>230</td>
<td>78.23%</td>
</tr>
<tr>
<td>manufacturing</td>
<td>27</td>
<td>9.18%</td>
</tr>
<tr>
<td>Service sector</td>
<td>16</td>
<td>5.44%</td>
</tr>
<tr>
<td>other</td>
<td>12</td>
<td>4.08%</td>
</tr>
<tr>
<td>total number of answers</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>

第 3 题  Are you satisfied with the current condition of the space under the elevated road?
### Table 1

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>satisfied</td>
<td>46</td>
<td>15.65%</td>
</tr>
<tr>
<td>more or less</td>
<td>176</td>
<td>59.86%</td>
</tr>
<tr>
<td>no</td>
<td>60</td>
<td>20.41%</td>
</tr>
<tr>
<td>i don’t care</td>
<td>12</td>
<td>4.08%</td>
</tr>
</tbody>
</table>

**本题有效填写人次**

294

Nearly 60% of the people now have the attitude of basically accepted. But there is still one in five people are not satisfied with the status, summarized with the 60%, a total of 80% of people accepted but does not reach the level of satisfy with the currently status. For this result, it proves that we still have a lot of space and necessity to have a great improvement. The priority should be to reduce the dissatisfied crowd and let the people who basically accepted to upgrade to the satisfaction level.

### 第 4 题
**what kind of influence does the space under highway affects you?**

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>provide convenience</td>
<td>189</td>
<td>64.29%</td>
</tr>
</tbody>
</table>
The vast majority of people are optimistic about improvement plan and they believe it can facilitate a positive impact. Description people think this transformation is necessary and have confidence that will produce positive results.

第 5 题  what kind of use have you seen about the space under the elevated road , (Multiple Choice)
The majority of the currently utilizations of the space beneath the elevated road are parking and equipment storage space for sanitation workers. Nearly 70 percent of people have seen it used as a parking lot, indicating that the vast majority of the space is used as parking space, for solving the tense situation for parking in Shanghai. All the respondents have all been selected, indicating that the use of the space is diversified. But also 36% of people have been seen it vacant, indicating that there is still a lot of space to be exploited and used. The privately built, dirty and messy and other irregularities phenomenon accounted for 24% and 26%, a quarter of people have seen this violations, reforming and improving the space under the laws and regulations still needs to work.

第 6 题  what problem do you think has these space? (Multiple Choice)

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>greening</td>
<td>157</td>
<td>53.4%</td>
</tr>
<tr>
<td>Warehouses, debris piled Location</td>
<td>103</td>
<td>35.03%</td>
</tr>
<tr>
<td>Privately illegal structures</td>
<td>72</td>
<td>24.49%</td>
</tr>
<tr>
<td>dirty place with garbage</td>
<td>79</td>
<td>26.87%</td>
</tr>
<tr>
<td>Social movement gathering place</td>
<td>74</td>
<td>25.17%</td>
</tr>
<tr>
<td>other</td>
<td>1</td>
<td>0.34%</td>
</tr>
</tbody>
</table>

本题有效填写人次 294
<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>too much traffic and people</td>
<td>136</td>
<td>46.26%</td>
</tr>
<tr>
<td>too noisy</td>
<td>166</td>
<td>56.46%</td>
</tr>
<tr>
<td>not healthy, Automobile exhaust and dust</td>
<td>201</td>
<td>68.37%</td>
</tr>
<tr>
<td>lack of greening</td>
<td>165</td>
<td>56.12%</td>
</tr>
<tr>
<td>Unaesthetic</td>
<td>152</td>
<td>51.7%</td>
</tr>
<tr>
<td>lack of management</td>
<td>142</td>
<td>48.3%</td>
</tr>
<tr>
<td>other</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>

Car exhaust gas dust and other environmental issues are outstanding problems about space utilization, as well as several other options have been chosen, basically close to 50%, which represents nearly half of people worry about these issues. Only 4% saw no need to make changes, more than 90 percent of people believe that changes need to be made.

第 7 题  which do you prefer to use these spaces? (Multiple Choice)
<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>the same as the current situation, no need to change</td>
<td>10</td>
<td>3.4%</td>
</tr>
<tr>
<td>bus station</td>
<td>81</td>
<td>27.55%</td>
</tr>
<tr>
<td>gas station, car washing, parking lot,</td>
<td>116</td>
<td>39.46%</td>
</tr>
<tr>
<td>Leisure Place</td>
<td>163</td>
<td>55.44%</td>
</tr>
<tr>
<td>charging place for electric cars</td>
<td>158</td>
<td>53.74%</td>
</tr>
<tr>
<td>shops and market</td>
<td>75</td>
<td>25.51%</td>
</tr>
<tr>
<td>exhibition and area for local culture or graffiti wall</td>
<td>98</td>
<td>33.33%</td>
</tr>
<tr>
<td>Construction of urban land (such as road maintenance, sanitation cleaning, landscaping, road patrol, traffic enforcement)</td>
<td>74</td>
<td>25.17%</td>
</tr>
<tr>
<td>greening</td>
<td>115</td>
<td>39.12%</td>
</tr>
<tr>
<td>billboard</td>
<td>44</td>
<td>14.97%</td>
</tr>
<tr>
<td>other</td>
<td>1</td>
<td>0.34%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>
In terms of the direction of transformation, leisure and sports facilities, parks and electric vehicle charging station are the most chosen options, half of them are in favor of these two options, in view of the rapid development in recent years as Shanghai’s first-tier cities, the electric car has undergone considerable development, the proportion of hybrid cars increased rapidly year by year, but construction of the charging station has lagged far behind; Shanghai plans in 2015 to build 6000 charging stations, The end of May 2014, the government has announced, charging station construction business fully open to social capital, which we can just use the leftover space under the elevated road project to build charging stations.  

Demanding for leisure facilities, parks has the largest proportion of selecting, Shanghai downtown apparently absence leisure facilities, parks. In total there are 114 parks in Shanghai, but many of them located in the suburbs. The Shanghai center city parks and public leisure areas rare, plus the downtown land is expensive, and the huge demand for land, therefore use the remaining space for the construction of parks and other green spaces to meet the public demand for leisure activities in space is very reasonable.

第 8 题  what do you think if we reform these spaces? (Multiple Choice)

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>more convenient for the traffic</td>
<td>154</td>
<td>52.38%</td>
</tr>
<tr>
<td>more convenient for life</td>
<td>238</td>
<td>80.95%</td>
</tr>
<tr>
<td>benefit for the environment</td>
<td>216</td>
<td>73.47%</td>
</tr>
<tr>
<td>negative effects</td>
<td>10</td>
<td>3.4%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>

第 8 题  what do you think if we reform these spaces? (Multiple Choice)

上海发改委：将大规模建设电动车充电站  sohu news  http://news.sohu.com/20140731/n402950491.shtml
2014/07/31
Most people think it can bring convenience to life, basically people still hope that through such a transformation of the leftover space to improve the lives. 70% of people believe that it is able to improve the environment, in view of the sixth question, most of them concerns about the environmental problems, they believe this transformation can bring improvement to the environment. Only 4% of people think it will come with a negative impact, indicating that the public basically holds a positive attitude.

第9题 do you think it is necessary to have landscape design for these spaces?

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>it is necessary</td>
<td>256</td>
<td>87.07%</td>
</tr>
<tr>
<td>dose not necessary</td>
<td>21</td>
<td>7.14%</td>
</tr>
<tr>
<td>doesn't matter, or do it when there is budget</td>
<td>17</td>
<td>5.78%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>
第 10 题 what kind of landscape do you think would be better for it?

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>with a reasonable pedestrian traffic organization, easy walking access</td>
<td>151</td>
<td>55.31%</td>
</tr>
<tr>
<td>Beautiful green environment, Emphasize the design</td>
<td>62</td>
<td>22.71%</td>
</tr>
<tr>
<td>combine with attractive activities, vendors, entertainment facilities</td>
<td>38</td>
<td>13.92%</td>
</tr>
<tr>
<td>Pure greening is good, Prohibited from entering</td>
<td>21</td>
<td>7.69%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>273</td>
<td></td>
</tr>
</tbody>
</table>

第 11 题 would you will to pay extra tax for the improvement?

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>216</td>
<td>73.47%</td>
</tr>
<tr>
<td>----------</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>no</td>
<td>78</td>
<td>26.53%</td>
</tr>
<tr>
<td>本题有效填写人次</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>

第 12 题  how many tax would you pay every year? (Matrix slider, range from 10—999 yuan)
(this question only can be seen to the people who choose yes in the last question.)

<table>
<thead>
<tr>
<th>行标题</th>
<th>平均值</th>
</tr>
</thead>
<tbody>
<tr>
<td>元 / 年 RMB yuan/year</td>
<td>300.35 Yuan = 41 euros</td>
</tr>
<tr>
<td></td>
<td>小计：300.35 平均：300.35</td>
</tr>
</tbody>
</table>
More than half of the people believe that the transformation should focus on improving living facilities and transport services, and agreed to make reasonable arrangements for free access, to participate in this space. 90% of people think the design is very important, the combination of these two options can also reflect the majority of people still wants to have more available aesthetically designed leisure land. Since Shanghai overall GDP and fiscal revenue are in the forefront of the country, per capita income was significantly higher than other cities. The citizens generally has a relatively high quality of spiritual civilization, urban maintenance is also very concerned, respect to tax issue, most people expressed willingness to accept taxes, which we can be optimistic for the maintenance costs.

第 13 题  what concern you if we reuse these spaces,(Multiple Choice)

<table>
<thead>
<tr>
<th>选项</th>
<th>小计</th>
<th>比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>it may effect to the traffic, Causing traffic jams</td>
<td>113</td>
<td>38.44%</td>
</tr>
<tr>
<td>it would make the contamination worse</td>
<td>121</td>
<td>41.16%</td>
</tr>
<tr>
<td>May result in adversing effects to the cultural environment, business and market changes that result in the formation of habits</td>
<td>113</td>
<td>38.44%</td>
</tr>
<tr>
<td>it will process more tax</td>
<td>150</td>
<td>51.02%</td>
</tr>
<tr>
<td>it doesn’t look nice in the city</td>
<td>73</td>
<td>24.83%</td>
</tr>
<tr>
<td>it effects to the economic, Local real estate prices, etc.</td>
<td>63</td>
<td>21.43%</td>
</tr>
<tr>
<td>Question</td>
<td>Count</td>
<td>Percent</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>it is not safe, Or there will be a fire, car accident and other risks</td>
<td>118</td>
<td>40.14%</td>
</tr>
<tr>
<td>how much improvement it will make, the input costs compared with the overall performance does not significantly</td>
<td>97</td>
<td>32.99%</td>
</tr>
<tr>
<td>I do not feel worried</td>
<td>22</td>
<td>7.48%</td>
</tr>
</tbody>
</table>

Respect to the entire transformation plan that most people think it will generate taxes, (people who selected this should be included the 26% of the eleventh question who chose unwilling to deliver extra tax). However, if the taxes is under controlled in 300 yuan per year, it should not cause much controversy. Emissions of effluents, security risks, and the impact on business are also on a high percentage chosen. one-third of people think that effect of the transformation plan will not be significant compared with the cost. which indicates that we still need to improve public confidence and hope on this.
Currently, the city elevated road lower space due to the transformation of urban functions, unreasonable planning and design, lack of management, regulatory authorities are not standard, and other aspects of reasons. It appeared in a variety of complex issues. By finishing the analysis, it can be divided into the following areas.

Fragmented space which lack integration
elevated road has a huge volume, miles and also its lower space which both present the characteristics of linear division. Extending in space with the elevated road and continue the process of expansion, it is bound to go through the various land properties neighborhoods. Bridging the lower space as part of the urban space in the existing use patterns, very few will be able to combine itself with the urban space. In addition, even for the lower space under the elevated itself, but also the lack of appropriate linkages between different land use patterns adjacent spaces. The decision of the lower space utilization often in the hand of who lease or manage the express way which means the relevant government departments. These decision makers include several department in the government. Each unit each array, and the municipal planning department nor a general direction to control of the overall layout, this situation directly leads to a messy disorderly status. In the meantime, the government is not planning to give land allocation rights to individuals or institutions to neither extend regulatory powers.

Low utilization ratio, ignoring humanization
With the improvement of the level of urbanization, the city gathered a large number of population, so that the city's population density has increased steadily. And the high population density of the city is incompatible with limited land and space resources. It also is one of the important reasons that prompted elevated road produce. Traditional city streets is added artificial "cap" (elevated road bridge floor), making traffic space increased at the same time, people are ignored space below the "cap" there is a large area, a waste of valuable land resources. Low utilization of the space under the bridge is mainly reflected in two aspects: First, the lack of planning and design conscious, the bridge has not been effective development space, or is incorrectly used.

Ignoring the actual needs, the lack of effective management
With the rapid development of Shanghai's economic construction, every year appear some new economic phenomenon in the city, whether the public or the government should be aware of this phenomenon and pay attention. The infrastructure of the city should also be carried out with the new developments and constantly adjusted. The authorities in this area, many law has not been improved, regulators are not complete, there is no many new adjustments made to respond the new situation. The respondents to our survey gives us about the space under the elevated road there are many new requirements arise, such as hybrid electric vehicle charging stations, although city government is trying to build more charging stations, but apparently did not take into account the full use the space under the elevated road.

Lack of beauty, loss characteristics, serious ecological problems
The questionnaire can be seen by the most people for the space of the current design and planning is not satisfied, that its lack of aesthetics and design, no features, people do not want to interact with it. Plus noise and dust problems, the enduring dirty and messy problem are the problem that we have to pay attation.

For the specific transformation direction, although there are many problems, the same time, the results is not like what I expected that the most chosen option is parking lot, but electric vehicle charging stations, which results not only showed a significant increase of the number of electric vehicles, and also represents new problems for the city. To build charging stations, we must take into account the electricity consumption, grid layout, and access of parked vehicles, and so on, this brings a lot of thinking for the follow-up study.
people who chose leisure facilities and parks are also a considerable number, indicating that there is a big disparity of the public demand for leisure venues, but it also gives us new consideration about how to plan, to design, to arrange the access of flow of people design, Greening facilities arrangement and in which the most important is how to ensure safety and environmental protection, because of the people’s involvement, especially in the majority of people think that under the elevated road’s poor environmental conditions.

Under the premise of the overall results of the survey are optimistic, we also see a number of concerns about the negative impact of almost every Category has nearly one third of options, described this transformation has been widely public concerned. How to avoid negative effects or to reduce the negative effects to a minimum is what we must also be taken into account.
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月
万人次
年

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http://news.sohu.com/20140731/n402950491.shtml
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