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The Design of Imaginable Urban Road Landscape

Wang Zhenzhen, Wang Xu, Hong Liangping

***Abstract*—**With the rapid development of cities, the way that people commute has changed greatly, meanwhile, people turn to require more on physical and psychological aspects in the contemporary world. However, the current urban road landscape ignores these changes, for example, those road landscape elements are boring, confusing, fragmented and lack of integrity and hierarchy. Under such current situation, in order to shape beautiful, identifiable and unique road landscape, this article concentrates on the target of imaginability. This paper analyzes the main elements of the urban road landscape, the concept of image and its generation mechanism, and then discusses the necessity and connotation of building imaginable urban road landscape as well as the main problems existing in current urban road landscape in terms of imaginability. Finally, this paper proposes how to design imaginable urban road landscape in details based on a specific case.

***Keywords*—**Identifiability, imaginability, road landscape, the image of the city.

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I. Background

THE five elements of urban image mentioned in "the Image of the City" by Kevin Lynch include "roads, borders, regions, nodes, and landmarks, " among which the road is the most significant one [1]. People perceive the borders, regions, nodes and landmarks when traveling on the roads, thus forming the overall image of the city. Therefore, the road plays a vital role in shaping the image of the city.

To begin with, the function of roads is no longer limited to transportation, and it also includes other parts, including safety, convenience, aesthetic, and so on. In addition, along with the city 's economic development and the increasing scale over the past several decades, the urban traffic showing a rapid mobility trend (Table I), and thus it has become an important way that people perceive the city dynamically on vehicles.

However, designers ignore these changes, which lead to boring urban road landscapes and the disappearance of local unique characteristics. They disregard what changes motorization has brought, the road landscape is still designed based on previous design criteria, and road landscape is fragmented, dull and monotonic (Fig. 1). As a result, the needs of travelers on cars are overlooked, and they cannot perceive and understand cities better. In order to meet the needs of urban road landscape which is "on the wheels", it is necessary to integrate the various elements of the urban road landscape and facilitate people to perceive cities on roads.

Wang Zhenzhen is a graduate in the School of Architecture and Urban Planning, Huazhong University of Science and Technology (HUST), Wuhan 430074, China (e-mail: 823975701@qq.com).

Wang Xu is a graduate in the School of Architecture and Urban Planning, Huazhong University of Science and Technology (HUST), Wuhan 430074, China (phone: 8615926392776; e-mail: 248566136@qq.com)..

Hong Liangping is a professor, a PhD supervisor and the associate dean of the School of Architecture and Urban Planning in Huazhong University of Science and Technology (HUST), Wuhan 430074, China (phone: 8613907133017; e-mail: 852166136@qq.com).



Fig. 1 The chaos in the urban road landscape

TABLE I
PROPORTIONS OF TRIP MODES IN SEVERAL CITIES

	Beijing (2005)	Shanghai (2004)	Guangzhou (2005)	London (2004)	Tokyo (2004)	Los Angeles (2000)
vehicle trips (%)	42. 4	45. 6	54. 2	75. 0	67. 0	96. 2
cycling trips (%)	25. 9	29. 2	8. 2	2. 0	10. 0	0. 7
Walking trips (%)	31. 7	25. 2	37. 6	23. 0	23. 0	3. 1
In total (%)	100	100	100	100	100	100

II. Urban Road Landscape and Imaginability

A. Elements of Urban Road Landscape

The urban road landscape is a visual concept in a narrow sense, and its elements can be divided into natural factors and artificial factors. Natural factors include mountain, terrain, water, vegetation, weather conditions and so on. Artificial factors generally include the road itself, buildings, structures, historical rudiment, customs, and facilities along roads (Fig. 2). However, perception on roads depends on not only these material entities but also human beings.

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Fig. 2 (a) Landscape elements—roadside buildings



Fig. 2 (b) Landscape elements—climate and weather

B. Imaginability

1. Definition of Imaginability

In China, the word of "image" first appeared in the verse " Make an Image to Express Connotation " in " the Book of Changes • copulative ", the "image" here refers to a kind of " aesthetic image", which is formed by imagining and recombining objective things in real life, and it contains the will of the inner and the subjective emotions.

"Imaginability" in "the Image of the City" is defined as features which are owed by tangible objects and can evoke viewers' strong image, and these features can be the shape, color or structure and they can help create characteristic, well-organized and highly suitable image. Also, the imaginability can refer to "readability" or "visibility" in a profound way. What imaginability stresses is not only visibility, but also the clear and distinct perception.

2. How to Construct Imaginability

The environmental images are formed when the observer and the observed environment interact with each other. In this process the objective things combine with people's will of the inner and the subjective emotions. The objective things in real life are experienced through visual, auditory, tactile and olfactory senses, and they include terrain, weather, roads, buildings, structures, facilities and furniture along the road. Meanwhile, people's will of the inner and the subjective emotions also influence their senses and perceptions, which are based on social and cultural background. As a result, the formation of urban image can be described as: people receive stimulations about urban images through a multi-faceted way in the normal life, and then they process these stimulations and form the final images about the city in their hearts.

C. Connotation of Imaginability of Urban Road Landscape

The Connotation of imaginability of urban road landscape contains three aspects: morphological image recognition, functional image recognition and humanistic image recognition.

1) Morphological image recognition: Road landscape is a real entity with an objective form, and its external form conveys the functional and spiritual connotation. Without the image recognition of the external form, Feature recognition and cultural recognition will be out of the question.
2) Functional image recognition: the functional significance of road landscape is made up of symbolic codes which stand for different functions. When people are faced with different functional codes of road landscape, they will select the appropriate symbol codes according to their own psychological needs, and reorganize these codes into a new language which meets the needs of function. This new language offers the source of stimulation.
3) Humanistic image recognition: the road is affected by the events, custom and culture in the long history, therefore we should consider the diachronism as well as the synchronicity when designing road landscape. The morphological image recognition and the functional image recognition primarily consider the synchronicity, while the humanistic image recognition mainly considers the diachronism.

III. The Current Main Problems of Urban Road Landscape in Terms of Imaginability

The construction of the urban roads is growing by leaps and bounds in China; however, there are many deficiencies in the development of the urban road landscape. At present, the design of urban road landscape has the following several problems in terms of the imaginability:

1. Lack of the Sense of Hierarchy and Dimensions

The urban road system is composed of different levels of roads, and these roads have different requirements in terms of red line width, design speed and means of transportation, therefore they have different requirements for road landscape. However, the designers are ignoring the differences of these requirements when designing urban road landscape, and make it lack of the sense of hierarchy and dimensions, thereby reducing its imaginability.

2. Lack of Systematical Connection with Other Urban Landscape Elements

As a linear element, urban roads should serve as the skeleton network for urban landscape. However, the current urban roads in domestic are lack of overall consideration of the impact of urban layout and aesthetic effect, making parts of the urban landscape elements isolated and lack of links between each other (Fig. 3). Therefore, pedestrians cannot get integrated city images from the road landscape.

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Fig. 3 An isolated historical building on the back of the West Street in Harbin

3. Lack of Context Awareness

The existing roads always show no respect to the original urban landscape, and the new landscape elements are always incompatible with the former landscape elements. Therefore, the original urban road landscape features and historical context are destroyed, people's memory and identity to the environment are ruined, and the imaginability of road landscape is reduced (Fig. 4).



Fig. 4 The disappearing hutong in Beijing

4. Lack of characters

Currently, most of the urban road landscape ignores the history, character, style of the city and the personalities, concepts, life styles, customs of urban residents, leading to the dilemma that thousands cities in China are similar, eventually causing the similarity between images of different cities and different road landscape.

5. Lack of Integrity and Continuity

Landscape elements, such as roadside buildings, vegetations, furniture and facilities, are lack of consideration in a unified way when being designed, and different landscape elements are lack of coordination and independent with each other, then making the overall style of the road vague and the road landscape messy and chaotic, eventually making the image of city road landscape obscure (Fig. 5).



Fig. 5 (a) Urban road landscape's lack characteristics



Fig. 5 (b) Disordered and messy urban road landscape

IV. The Design Methods of Imaginable Urban Road Landscape

Generally, the imaginability of urban road landscape can be constructed from three aspects, including morphology, function, and culture. It will be illustrated one by one.

A. The Imaginable Design on Morphology

1. Hierarchy and Structure

The hierarchies and structures of road space is an important factor affecting morphology's imaginability. The structures of road space include both the one on the horizontal direction, which is divided in accordance with road grades and traffic modes, and the other one in the vertical direction, which is divided according to the different attention attracted by the landscape at different heights [2].

The design of road landscape also needs to comply with the hierarchy and structure of roads. For example, the landscape design of pedestrian streets should highlight the dispose of humanized details, while the landscape design along express roads needs to concentrate on the convenience and efficiency. Similarly, road landscape at different heights should be designed according to the different attentions paid by people, for instance, the design of underlying architectures always tend to be more exquisite than that of upper parts (Fig. 6).

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Fig. 6 The design of the underlying buildings is more exquisite than the upper ones



Fig. 7 Close-up views passes in an instant watched from a fast moving car

2. Form and Scale

Roads can be divided into two types: roads for living and roads for transportation. People's activities and their ways to travel on these two types of roads are different, so the way they experience road landscape and their requirements are also different.

In terms of roads for transportation, people usually use them for motorized travel, and they move quickly in cars, causing the fast movement of their sights, so their recognition ability is weakened. Close-up view passes in an instant, so people have to observe some objects which are farther and more stable (Fig. 7). People's attention transfer from foreground to medium long shot and from the details to the outlines, so the landscape design of roads for transportation should pay more attention to the viewing effect from intermediate and long distance, therefore the scale of such road landscape should be enlarged to ensure that people can identify and appreciate these landscape elements under moving vision (Tables II, III).

TABLEII
THE MINIMUM DISTANCES TO RECOGNIZE THE ROADSIDE SCENERIES WITH DIFFERENT SPEEDS

Speed(km/h)	20	40	60	80	100
minimum distance(m)	1. 71	3. 39	5. 09	6. 79	8. 50

TABLE III
THE MINIMUM DISTANCES AND SCALES TO RECOGNIZE THE FRONT LANDSCAPE WITH DIFFERENT SPEEDS

Speed(km/h)	60	80	100	120	140
minimum distance(m)	370	500	660	820	1000
minimum scale(cm)	110	150	200	250	300

Regarding roads for living, it is more complicated, because they are used for diverse purposes, including motorized travel, non-motor vehicle travel, walking, and so on. The driving speed on such roads are much slower and it has less impact on people's vision, thus the landscape of those roads can be designed under the principle of the low speed or static view. People's feelings of the landscape are comparatively more exquisite when walking, and the ways they appreciate the landscape is not single perspective, but diverse perspectives. As a result, the landscape design of roads for living should pay attention not only to the design of shapes and profiles, but also to the design of details, in order to bring exquisite landscape experience and improve the imaginability of road landscape[3].

3. Colors

The Color tends to be the most eye-catching element, so it is the most recognizable image feature. The appropriate design of the colors of the road landscape can increase the visual impact that road landscape has on people, thereby shaping image of road landscape with a bright and distinct character (Fig. 8).



Fig. 8 The main color in Harbin is yellow

The color design of the road landscape should consider the climatic conditions, historical background, culture and politics in local area, and the designed colors should match and harmonize the primary colors of the city. Specifically, the design of urban road landscape in the area with higher temperature and abundant sunshine and water should select colors which are relatively quietly elegant and have low lightness. The design of urban road landscape in cold regions

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should consider some warm and bright colors in order to bring people a sense of warm through vision. The design of urban road landscape in historically protected area should select some colors which are in coordination with the environment (Fig. 9).



Fig. 9 The Silent color in the historic district in Chengdu

4. Materials and Textures

Materials and skin textures are some more detailed properties of the landscape (Fig. 10). In addition to meeting the functional requirements, the material of road landscape should reflect the function, characters, history, culture of the road, thus increasing the imaginability of the road landscape.

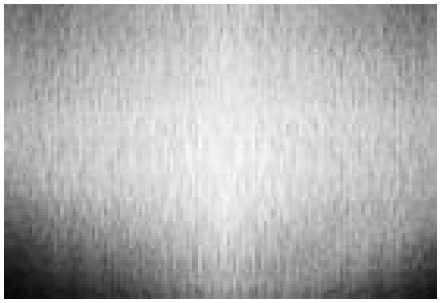


Fig. 10 (a) The metal texture



Fig. 10 (b) The wooden texture

In the historical area, we should try to reflect the historical context when selecting materials. In the modern area, appropriate colors should be used to show the roads' themes and functions. For example, the road landscape in financial districts should give priority to modern materials, including metal, concrete, glass, luminescent fiber and so on, in order to reflect some industrial characteristics, like preciseness, and quick.

B. The Imaginable Design on Function

The design process of imaginable function of road landscape can be summarized as "function - symbol - design ". This design process is a procedure of creating a new symbol system, in order to avoid the sameness caused by the design based on experience, and the chaos and nonidentifiability brought by failing to introduce symbolic language which implies the function [4].

1. The Assembly and Combination of Functional Symbols

The assembly and combination of function symbols mean meeting the requirements of two functions or even more with one entity. We should pay attention to both the continuation and the innovation of functional symbols. This is because continuing the existing morphology patterns can help people's accurate identification, while innovation can bring a feeling of freshness and then stimulate people's perceptions.

If an entity can integrate a variety of functional requirements, it will stimulate people's creativity, imagination and cognitive activity, resulting in a joyful aesthetic process. Combining sociability with comfortableness when designing road landscape can promote people's communication in the space along roads. The combination of functional symbol can improve the taste of the road landscape, such as tree pool benches or other street furniture (Fig. 11).



Fig. 11 The combination of seats and tree pools

2. The Meaning' Alteration and Combination of Functional Symbols

The meaning' alteration and combination means that when using one symbol to explain another one, the latter will lose its original form when expressing itself with the form of the former one, making the final function of the latter one also change. The meaning' alteration and combination always take place spontaneously under different social backgrounds. Therefore, to make the road landscape meet more requirements, landscape designers should consider expanding the meaning of landscape function symbols [5].

The meaning' alteration and combination, in effect, mean to update symbols, which are essential to identifiability and imaginability of road landscape [6]. For instance, the sculptures, which are used as seats, convey the symbols of recreation and relaxation, which express its function clearly and make it identifiable and thus imaginable (Fig. 12)

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Fig. 12 Sculptures used as seats

C. The Imaginable Design on Culture

1. Selection of the Street Names

The influence of the name should not be ignored. For example, the Huangxing pedestrian street in Changsha is named after a historical figure- Huangxing, because this street used to be the place where he taught and worked and then became the stronghold where he propagandizes the revolution. The present Huangxing street is a commercial pedestrian street which gets the promotion of the cultural connotation and enjoys a great reputation because of its name, thereby becoming the most identifiable and imaginable street in Changsha.

2. The Continuation of Development of Thematic Activities

Urban road landscape not only includes material landscape, but also includes non-material landscape, like thematic activities. Roads are places for people's public activities, and they have developed many local customs and culture in the long history [7]. For example, in the past people enjoyed holding temple fairs, street markets, lion dancing and many other traditional activities, whereas people prefer to hold some performances now, advertising, whip-round and many other activities according to current affairs (Fig. 13).



Fig. 13 (a) The traditional lion dancing activity on roads



Fig. 13 (b) The modern raise donations activity on roads

Under the premise of ensuring the well administration of roads, traditional thematic activities should be continued and developed, and some new thematic activities in line with modern life should be guided and promoted [8]. By doing so, a stable sense of place will be formed, and the cultural connotation and value of road landscape will be promoted. Also, people's sense of identity and belonging will be enhanced, and then the imaginability of road landscape will be improved.

3. The Morphological Shaping and Dissemination of Humanistic Philosophy

The humanities connotation of urban road landscape can be regional culture and traditional customs, also it can be the functional properties of the road itself, which can be embodied and conveyed by morphological shapes [9]. For instance, roads in the university town can use the morphological shape of road landscape to express the humanistic connotation, which gives priority to imparting knowledge and educating people (Fig. 14), whereas roads in the financial district should show their preciseness, rationality and efficiency and many other industry characteristics. In terms of roads in the dwelling district, they should reflect the warmness and harmony of home. Road landscape facilities (such as buildings, sculptures, signboards, leisure chairs, etc) are the carrier of the philosophy and humanities of roads, so they should be designed systematically by combining with the philosophy and humanities of roads, in order to construct identifiable and imaginable road landscape.



Fig. 14 The rich flavor of the humanities on the University Avenue in Chengdu

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V. The Case of Imaginable Design of Urban Road Landscape

This project is named "The Public Green Space Landscape in Zhongguancun Science and Technology Park", and the site of this project acts as the southern entrance door to Zhongguancun Science and Technology Park in Beijing. This road green landscape not only has the function of recreation and entertainment, but also acts as a good road landscape node along the North 5th Ring Road and the Information Road, and an iconic door of Upper Land Information Technology Industry Base and Zhongguancun Software Plaza. Therefore, it is significant for the plaza's image and identifiability, and this project is to show the image of the plaza and improve its identifiability and imaginability.

A. Project Background

The site of this project is made up an area of 4.35 hectares. It is important and has obvious symbol significance. This is because its southern side adjoins River Qing and the North 5th Ring Road, which is a significant road in Beijing and has a high traffic volume. Also, the Information Road, which goes through this site, leading to Upper Land Information Technology Industry Base and Zhongguancun Software Plaza (Fig. 15). Therefore, this project aims to shape a good road landscape node and a iconic door along the North 5th Ring Road and the Information Road and to promote the identifiability and imaginability of Upper Land Information Technology Industry Base and Zhongguancun Software Plaza.



Fig. 15 The analysis of the location

B. Design Methods Based On the Concept of Imaginability

The main purpose of this project is to build an iconic green landscape and a landmark of the northern region and the new Zhongguancun Software Plaza, meanwhile provide a space for public leisure activities. Based on the analysis above, from the three perspectives of imaginability, six design ideas and methods are proposed as follows.

1. The Imaginable Design on Function

1) Make this green road landscape an identifiable landmark and reflect the image of the plaza. An image should be built to stand for the Upper Land Information Industry Park and act as an iconic door, in order to guide the direction and instruct the position for the public (Fig. 16). Therefore, the furniture, such as theme statures, should contain the connotation of the door and window for the industrial park. The form of the landscape elements should be designed differently and originally to bring a fresh and new visual effect to the public (Fig. 17). In terms of the functions, this site should reveal the nature of the place and become a real gate of this industry park.



Fig. 16 The analysis of the viewing sights



Fig. 17 The landscape used as a signal and landmark

2) In order to in response to the theme of Beijing Olympic in 2008, this green road landscape should be ecological and in harmony with its surroundings. We should not only pay attention the ornamental value of green plants, but also lay emphasis on their ecological features and effects, such as dust absorption, climate regulation, wind resistant, sound insulation and many other functions. Also, the material selection focuses on some green materials with low consumption and pollution.
3) Allowing people to enter and take some activities in this green space. Some activity space should be designed and some leisure facilities should be equipped to meet the requirements of the public's leisure activities. Then people can experience and appreciate the landscape through a multi-faceted and multi-sensory way when joining in some activities in this place, thereby strengthen the spirit of this place.

2. The Imaginable Design on Morphology

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1) Due to the visual effect of the landscape for pedestrians on the North 5th Ring Road, this design uses terrains to make a magnificent and grand visual effect. Among the influence factors of surroundings, the North 5th Ring Road can provide the most important perspective of the landscape, as it adjoins this site and it is the most important roads in Beijing which has a high traffic volume. Therefore, it should be considered carefully when designing. However, as a road for transportation, it has different features from the road for living, as it is much wider and the speed of vehicles is much higher. Therefore, in order to ensure the visual effect for the pedestrians on vehicle trips, the design of landscape in this site should pay more attention to the visual effect from intermediate and long distance. Some landscape elements which have large scales and contour lines should be considered firstly, such as some huge terrain landscapes and construction sculptures. Also, we should pay more attention to the design of the dimension, contour and rhythm of landscape elements instead of some small exquisite details. Besides, as the North 5th Ring Road is a elevated road, the pedestrians need to overlook this landscape from the high, so visual effect from the high should also be noticed when designing.
2) Design the details of landscape in full. Using materials and colors to reflect the characteristics of "high-tech and new" and convey the spiritual connotation of "innovation and exploring" of the science park. For example, the selected theme sculptures, materials and color should express reveal the nature of the place and the characteristics of the high and new technology industry, such as innovation, rigorous, unity, efficiency, and so on.
3) Ensure the coordination and integration of the landscape elements and the surroundings. The design should take the Clear River into consideration as it can make the visual effect better. And the Sports University and Olympic Gymnasium nearby has a good visual effect, so these sceneries should be considered not being covered. However, the low and massy buildings on the northern part have a poor visual effect, so they are supposed to be covered to reduce their negative effects (Figs. 18, 19).



Fig. 18 The current conditions and surrounding landscape elements



Fig. 19 The overall plan

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Wang Zhenzhen was born in China, 1988. She is a graduate in the School of Architecture and Urban Planning, Huazhong University of Science and Technology (HUST), Wuhan, China, who majors in urban planning.
She is the chief planner in Sustainable design research center, HUST, Wuhan, China now, and she participated many practical projects.

Wang Xu was born in China, 1988. He is a graduate in the School of Architecture and Urban Planning, Huazhong University of Science and Technology (HUST), Wuhan, China, who majors in urban planning.
He is the chief planner in Sustainable design research center, HUST, Wuhan, China now, and he has participated many practical projects, such as Master Plan of Huangheshao town, Hohhot, Inner Mongolia, Low Carbon New Town Planning of North Baoding, Hebei province, urban design of the Hebei university science park, new town planning of east Hohhot, Inner Mongolia and so on.

Hong Liangping was born in China, 1965. He is a professor, a PhD supervisor and the associate dean of the School of Architecture and Urban Planning in Huazhong University of Science and Technology (HUST), Wuhan, China, and his research interest is the sustainable urban planning and design.