Analysis of Urban Landscape Planning Based on Haze Environment

Yaoyao Zhang
Art & Design Department of Yinxing Hospitality Management College of CUIT, Chengdu, Sichuan, 611743, China
*Corresponding author e-mail: lillian2211@163.com

Abstract. With the acceleration of the urbanization process, the domestic economy has achieved rapid growth, but with the deterioration of the atmospheric environment, especially in cities with rapid industrial development, haze has been the primary air pollutant in recent years. All cities have been hit by haze. Frequent haze weather has seriously affected the lives of urban people, which makes us have to pay attention to how to deal with the haze problem. This article starts with the dangers of haze, analyzes the design principles of urban landscape planning, the active role of plant greening in the management of haze, and the method of arranging landscape plants. It shows that whether from the perspective of aesthetics, or from the function of anti-haze and environmental protection, the selection of a landscape design method that suits local conditions in the design will definitely be one of the major trends in urban landscape planning.

1. Introduction
The haze is extremely harmful to human survival and development. First of all, the haze greatly weakens ultraviolet rays, causing many bacteria to be unable to be killed. The bacteria reach the human body through the respiratory tract and cause human diseases or even death. And because these inhalable particles are very light, they are not easy to fall and settle, and they often float in the air. The sunlight is absorbed or scattered on these particles, which causes the sky to be dim and the visibility is greatly reduced, and this brings great harm to human life, such as affecting crop growth and transportation safety. In view of the great damage caused by the haze weather to human habitats, this article starts with the use of elements such as green buildings and green plants to establish an ecosystem that filters haze. We can improve the severe impact of haze weather on human living space in accordance with the design concepts of innovation, green, coordination, openness and sharing, so as to truly realize the unification of natural ecology with human ecology, natural environment and artificial environment.

2. Major Approaches to Urban Green Livable Environmental Planning
As the haze weather has brought serious impacts on economic and social activities such as production, life, and travel to the human environment, it is a warning that we should take actions to protect environment for human survival and social development. The question that designers need to think about now is how to make the concept of green and livable environment take root and truly form a healthier lifestyle on travel, life, study, work, and activities.
2.1. Innovate Haze Design Concept
In view of the current haze environment, the five development concepts which includes innovation, coordination, greenness, openness and sharing should be strictly considered, and the negative impact of haze weather on people's daily life should be fully considered. Gardens, green spaces, squares, roads, streets, roadways should be scientifically and effectively laid out from point to area and then combines point and area[1].Try to make the living environment more humane and lifelike, and truly make greening play a role in purifying the haze and effectively realize the ingenious combination of people and nature, nature and cities, cities and people, building facilities and landscape planning.

2.2. Increase the flat space of human environment
In the overall planning of the urban environment, the spatial scale should be expanded. First, use plants as design elements. According to the composition principle, such as point-line-area, far and near, unreal and real, huge and small, front and back, and perspective, construct underground garages, or above-ground three-dimensional, elevating parking to maximize the conservation of non-renewable land resources for plant greening. When designing and arranging landscape roads, fitness facilities, sculptures and other outdoor spaces in residential green spaces, the scale of landscape sketches, the scale of trees, and the scale of buildings should be comprehensively considered and reasonably quantified, so as to further increase the flat space of living environment, which can achieve Anti-Haze effect.

2.3. Reasonably develop three-dimensional space resources
Green livable environment should be a spatial-intersecting four dimensions of green space which includes two parts, plane greening and vertical greening. It is necessary to pay attention to the greening on the plane and break through the traditional garden greening mode, make full use of vertical and three-dimensional conditions, and the surrounding walls, roofs, balconies, and corners of the building. Three-dimensional green vegetation is arranged to form a vertical space development ecological effect to enrich the greening landscape[2].In particular, it is necessary to make full use of the architectural sketches, corridors, overpasses, and indoors of the building for environmental greening and beautification, which not only can increase the green area of human settlements and increase the greening rate of human settlements, so as to achieve the effect of preventing and controlling smog, but also improve the living environment and living space of people.

3. The role of green plants in alleviating the haze pollution
The green natural inherent in the effect of retention, adsorption, adhesion and activation. Utilizing these effect, the damage of the haze to the ecological environment can be greatly reduced. By planting flowers, trees and other plants to build urban landscapes, it can achieve greening and increase the rate of greening, which not only can reduce dust, but more importantly, it can improve air quality and play an active role in controlling haze.

3.1. Green plants reduce PM2.5 in various forms
Practice has proved that the canopy and branches of trees not only have the effect of trapping, blocking, and absorbing dust in the air, significantly reducing harmful bacteria and germs carried by carbon and lead particles in dust, but also have extremely importance on purifying air with its filtering effect. According to relevant research data, although the leaves of plants have various forms of adsorbing dust, there are generally three types: one is retention, the other is attachment, and the third is adhesion. Although Many of the trapped, attached, and adhered particulate pollutants are most likely to return to the atmosphere, it still have a certain dust retention effect, because some of them are washed to the ground by precipitation or external forces.
3.2. Green plants are extremely capable of improving air quality
According to relevant research data, if the concentration of pollutants has not exceeded the critical value of the plant itself, the plant will reduce the pollution of the atmosphere by absorbing certain toxic and harmful substances in the atmosphere, thereby improving the air in the city surroundings. The study found that each acre of wood can absorb toxic sulfur dioxide gas, which can reach as much as 4kg per month on average. In this way, it can absorb 20 to 60 tons of dust each year. And in the breathe process of trees, trees can produce a lot of special air[3]. For example, birch trees, poplar trees, lime trees, etc. Not only can secrete phytoalexins, but also can effectively kill diphtheria, tuberculosis, typhoid, dysentery and other pathogenic bacteria. The green plants, which rely on nature, use this way to degrade and resist the damage of the livable environment by haze. This way is not only an important means to improve the living environment, but also one of the essential conditions to improve the quality of living.

3.3. Absorb harmful substances in the air and generate negative ions
A large number of experiments by domestic and foreign research institutions on the absorption of harmful substances in the air by vegetation have shown that the leaves of green vegetation have a significant effect on adsorbing and purifying harmful substances in the air. The presence of urban vegetation can effectively control the concentrations of free elements such as fluorine, chlorine, and sulfur. In addition, a large number of research observations have proven that the concentration of negative ions near the densely planted green plants has significantly increased, which has very beneficial effects on the human body.

4. Application of green plants in haze environment

4.1. Choose green plants that purify the air
According to the Beijing Academy of Landscape, Architecture and the Urban Construction Research Institute, they have researched on more than 60 tree species. And they found that the arb or includes acer truncatum, persimmon, Chinese scholar tree, Ginkgo, Ailanthus altissima, catalpa bungei, sabina chinensis, Eucommia ulmoides, Populus tomentosa, Koelreuteria paniculata, Robinia pseudoacacia, and other 18 kinds of green plants includes Prunus cisten, lilac, Lespedeza bicolor, hibiscus, flowering plum, peony, Malus 'Sparkler', etc., which have a particularly strong adsorption capacity for PM2.5, and serve as plants selected in Beijing green belt. In addition, studies have shown that broad-leaved trees have a stronger ability to absorb dust than other non-broad-leaved trees. On average, the annual amount of dust retention by each broad-leaved tree can reach at least 3.16 kg. For this reason, by planting green canopy plants, the particulate matter inhaled in the air can be reduced by more than 62% than that before greening, and especially it has a strong adsorption capacity for tiny particulate matter.

| Varieties of trees          | Latin Name                  | Family name      | Feature     | Canopy shape       |
|-----------------------------|-----------------------------|------------------|-------------|--------------------|
| acer truncatum              | Acer truncatum Bunge        | Aceraceae        | defoliation | Broadly elliptic   |
| Aceraceae                   | Diospyros kaki             | Ebenaceae        | defoliation | oval               |
| Ginkgo                      | Ginkgo biloba              | ginkgoaceae      | defoliation | oval               |
| Chinese scholar tree        | Sophora japonica           | Leguminosae      | evergreen   | oval               |
| Ailanthus altissima         | Ailanthus altissima        | Simarubaceae     | defoliation | oval               |
| catalpa bungei              | Catalpa bungei             | Bignoniaceae     | evergreen   | ovalsabina chinensis |
| sabina chinensis            | Sabina chinensis           | Cupressaceae     | evergreen   | spire              |
| Populus tomentosa           | Populus tomentosa          | Salicaceae       | defoliation | oval               |
| Koelreuteria paniculata     | Koelreuteria paniculata    | Sapindaceae      | defoliation | oval               |

Table 1. Arbor plants suitable for haze environment
4.2. Reasonably choose plant configuration for controlling haze

According to investigation and analysis, the order of the plant's adsorption capacity for inhalable pollutants is generally pure needles, lawn, Shrub and herbaceous plant, tree-grass, arbor-shrub-grass compound land. Therefore, in the selection of urban green plants, a reasonable combination of arbores, shrubs and lawn plants is needed. The well-arranged “tree + shrub + grass” type community model has the strongest dust and haze suppression effect[4]. Among them, arbor plants are relatively large and can slow down the wind speed and block floating dust. The choice of arbor can be gold leaf, maguey, Graptophyllum pictum, Schefflera arboricola, Euonymus japonicus, pomegranate and so on. Shrub plants can absorb dust from the ground, such as photinia serrulata, Ligustrum, crape myrtle, fragrans, prunus, mulberry, crab cactus and so on. Liana plants block dust at different heights, such as Chinese wistaria, honeysuckle, calabas, grapes, and roses. In short, in the plant configuration, it is necessary to reasonably match arbor-shrub-grass compound land to form a community structure to achieve the largest dust retention effect.

Table 2. Anti-pollution characteristics of green plants commonly used in haze environment

| Varieties of trees       | Latin Name            | Family name | Feature     | The anti-pollutional characteristic |
|-------------------------|-----------------------|-------------|-------------|------------------------------------|
| pomegranate             | Punica granatum       | Punicaceae  | evergreen   | Anti-Nitrogen dioxide              |
| crape myrtle            | Lagerstroemia indica  | Lythraceae  | evergreen   | Anti-sulfur dioxide                |
| fragrans                | Osmanthus             | Oleaceae    | evergreen   | Anti-sulfur dioxide                |
| Chinese wistaria        | Wisteria sinensis     | Leguminosae | defoliation | Anti-chlorine                      |
| prunus                  | Cerasus pseudocerasus | Rosaceae    | defoliation | Anti-chlorine                      |
| Ligustrum               | Ligustrum lucidum     | Oleaceae    | evergreen   | Anti-sulfur dioxide                |
| mulberry                | Koelreuteria paniculata | Moraceae    | evergreen   | Anti-nitrogen dioxide              |
| Magnolia grandiflora    | Magnolia grandiflora  | magnoliaceae| evergreen   | Anti-nitrogen dioxide              |
| Sabina chinensis        | Sabina chinensis      | Cupressaceae| Evergreen   | Anti-hydrogen fluoride             |
| Boxwood                 | Buxus sinica          | Buxaceae    | Evergreen   | Anti-hydrogen fluoride             |

In areas where the haze is relatively severe, the configuration of green plants needs to be more targeted and plentiful, and selection should be based on the characteristics of plants and pollution. For example, in dusty areas, Lagerstroemia indica, Osmanthus fragrans, and Chinese rose should be selected; in areas with more harmful gases, ginkgo, pomegranate, and cannabis should be selected; in areas where metal pollution is more serious, cedar, rhododendron, and purple leaf plum should be selected. In a word, corresponding plants should be selected for specific polluted areas, which is also the key link for preventing haze.

5. Conclusion

The haze damages people's lives at all times. As China's economy continues to develop, attention on how to improve the environmental issues of urban space has also increased with the economic development. Aiming at the haze problem, we should strengthen innovation in urban environment planning, design and construction, rationally integrate advanced science and technology into design and construction, and promote the development of China's construction industry towards green buildings. In addition, whether it is from the perspective of landscape aesthetics or from the perspective of anti-haze and environmental protection functions, it is quite necessary to increase more green areas on limited land, absorb more harmful gases in the urban environment, absorb impurities in the air, form a local microclimate, and purify the surrounding air.

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