

# The Application Evaluation of Natural Materials in Landscape Design Based on SD Method

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**Received:** 11 June 2025; **Accepted:** 2 July 2025; **Published:** 30 July 2025

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## Abstract:

This paper focuses on the application of natural materials in landscape design, and uses questionnaire survey and SD method to quantitatively analyze people's perception of the application of natural materials. The results show that the public generally has a positive attitude towards the application of natural materials. Based on this research conclusion, it is suggested that future design work should pay more attention to the use of natural materials, and comprehensively consider the expectations of different user groups, in order to create more attractive and practical characteristic landscape space.

## Keywords:

Natural Materials, Landscape Design, SD Method, Perception

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## 1. Introduction

With the enhancement of social awareness of ecological environment protection and the popularization of the concept of sustainable development, the application of natural materials in landscape design has been paid more and more attention. [1] Natural materials not only have the characteristics of ecological and environmental protection, but also can enrich the aesthetic value of the landscape and enhance people's spatial experience. However, how to scientifically evaluate the public's perception of the application of natural materials in landscape design, and how to optimize the design based on these perceptions, is an important issue in the field of landscape design.

This paper aims to quantify and analyze people's emotional response and evaluation of the application of natural materials in landscape design by introducing the semantic difference method ( SD method ). Through this method, we can accurately grasp the public's attitude towards the landscape design of natural materials, and provide valuable feedback for designers, so as to promote the development of landscape design in a more humane and ecological direction.

## **2. Concept Analysis**

### **2.1. Landscape design**

The concept of “landscape” in landscape design originated in the West. Its roots can be traced back to the Dutch word “landskip,” which refers to natural landscape paintings and is closely related to the naturalist painting genre in the Renaissance. There is no corresponding vocabulary in Chinese, and the term is translated from German ‘landschaft’ through Japanese. Until 1936, the Japanese scholar’s book ‘landscape geography’ was introduced into the Chinese world, it was gradually adopted by the domestic academic community. Although the concept of landscape in the Chinese context originates from the tradition of gardens, it transcends the category of material space and forms a unique landscape spirit-pursuing the dual sublimation of visual beauty and artistic conception through the construction of landscape painting and landscape painting. This cultural trait makes the landscape not only carry the visual aesthetic function, but also contain the spiritual resonance beyond the appearance, forming a common way of natural observation between the East and the West: the landscape is not only the product of natural evolution, but also the crystallization of human civilization intervention, with the dual attributes of artistic creation and rational speculation.

Landscape design is a humanities discipline that creates space with both social and cultural values and aesthetic significance through systematic environmental transformation. As a comprehensive field integrating society, culture, science and art, its core is to coordinate natural and artificial elements in architecture and planning design, and to shape the outdoor life scene of urban residents based on the principle of environmental aesthetics. The design practice covers site planning, outdoor space construction and comprehensive treatment of the transition area inside and outside the building. It aims to build a comfortable and pleasant activity place, a bio-friendly living environment, and enhance the cultural value of the regional space. The specific space category includes the open environment and its ecosystem such as the interface of the building interface, the gap of the building group, the surrounding of the traffic node and so on.

### **2.2. SD method**

In order to accurately quantify people’s perception of landscape design, this survey will be applied to the SD method. The Semantic Difference Method (SD), also known as the Feeling Record Method, is an effective psychological research method, which provides strong data support for various studies by measuring the individual’s perception and evaluation of the emotional meaning of specific concepts or words. A method of psychological measurement was first proposed by American psychologist Shad Osgood in 1957. It assigns the degree of human psychological feelings to a numerical value ( evaluation scale ), and converts the feelings of the respondents into quantifiable data that can be calculated. [2]

### **2.3. Natural materials**

Natural materials refer to natural substances that are not deeply processed or only treated on a basic basis. They are widely distributed on the earth, including minerals, plants, animal products and their complexes. As one of the earliest resources used by human beings, natural materials are still very important and widely used in architecture, art, handicrafts, medicine, energy and daily necessities manufacturing.

### **3. Study on the Application of Materials**

#### ***3.1. The importance of natural materials in landscape design***

Natural materials play an important role in the field of landscape design. They are not only environmentally friendly, but also represent vitality and vitality. They can bring people rich feelings, reduce the industrial sense and alienation of industrial products, and give design more possibilities. The natural materials in the nature are refined and artistically processed, and applied in the landscape environment, so that people can feel the artistic beauty of harmonious coexistence with nature. [3]

The emotional significance of natural materials is particularly important for landscape design, because they can affect people's perception and use experience of space. The emotional meaning of natural materials refers to the emotional and psychological reactions that people produce when they perceive, experience and interact with natural materials. These emotional meanings can be positive, such as pleasure, calmness, relaxation, sense of belonging, etc., or negative, such as fear, disgust or uneasiness.

#### ***3.2. Classification of natural materials***

There are various types of natural materials, each of which plays an important role in landscape design with its unique characteristics and aesthetic value. [4] In this paper, common natural materials are divided into bamboo, rattan, wood, grass, stone and soil according to their types.

With its fast-growing characteristics and renewable advantages, bamboo materials occupy an important position in the contemporary landscape system. Its material is strong and has natural degradation characteristics, which is in line with ecological ethics and has aesthetic value-long and straight bamboo poles, light and swaying bamboo leaves, fresh and tender edible bamboo shoots and hollow and straight bamboo stems, all of which can be transformed into unique landscape elements. This kind of garden material rooted in Oriental civilization is glowing with the dual charm of cultural inheritance and innovative design through modern process deduction.

Vines derived materials are famous for their amazing growth rate and self-healing ability. Their naturally formed texture levels and gradient color systems give landscape components unique artistic expression. After physical processing, the rattan material not only maintains the original and simple visual characteristics, but also obtains excellent bending and shaping performance. It can be woven into a landscape facility with both functionality and decoration, which perfectly interprets the design philosophy of 'learning from nature'.

As the oldest landscape building material, wood species diversity has created a rich surface texture and color system. Through anti-corrosion treatment and structural optimization, modern technology can significantly improve the environmental weathering resistance of wood while maintaining its affinity and warm texture. This kind of 'breathing' natural material can not only create a safe and stable spatial structure, but also convey the space artistic conception of returning to nature.

The herbaceous plant system provides dynamic aesthetic materials for landscape design with amazing growth efficiency and morphological diversity. From tall ornamental grasses to low ground cover plants, the leaf color shows rich color gradient with the season, and the inflorescence form constitutes a unique visual focus.

Hay products are transformed by traditional processes such as weaving and bundling, which not only maintain the biodegradation characteristics, but also form a lightweight and flexible space device.

As a material witness of geological evolution, stone constructs landscape skeleton with excellent mechanical properties and permanent quality. Its natural texture and texture difference can create a multiple aesthetic experience from rough and bold to exquisite and elegant. Modern stone processing technology has expanded the application boundary of new materials such as transparent stone and cultural stone, and realized the organic integration of natural materials and scientific and technological processes.

As the most original landscape medium, soil is breaking through the modeling limitations of traditional cognition through the combination of modern rammed earth technology and 3D printing technology. This kind of ecological material that can ‘remember’ the temperature can not only create a landscape art with regional characteristics, but also realize zero waste construction through material circulation, and perfectly interpret the concept of sustainable design.

These natural creation elements are building a new landscape material pedigree through the translation and innovation of modern design language. By excavating the true characteristics of the material, the designer not only creates a landscape space that carries ecological wisdom, but also builds an emotional link between man and nature, so that each landscape work becomes a vivid carrier to tell the story of sustainable development.

**3.3. The application of natural materials in landscape**

The application of natural materials such as bamboo, rattan, wood, grass, stone and soil in landscape design (Table 1) not only highlights the unique texture and ecological value of materials, but also injects natural rhythm and humanistic feelings into landscape space through the integration of creative design and modern technology, showing the infinite possibility of harmonious coexistence between man and nature.

**Table 1.** *The application of natural materials in landscape.*

| Material | Case introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Case picture                                                                                                             |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| bamboo   | 'Yong ' is a public artwork woven by bamboo in Shenzhen Xianhu Botanical Garden. It relies on the design of the surrounding natural environment and is perfectly integrated with the bamboo forest ecology. The bamboo in this area is constructed with low-tech and sustainable techniques, which retains the simple beauty of bamboo and is environmentally friendly and biodegradable. In the structural design, the bamboo weaving support system is used, and the roof is covered with bamboo strips, which has both natural rhythm and modern ingenuity. The modeling boldly integrates modern curves, arcs and grid elements. Bamboo woven grids bring a sense of lightness and transparency, promote ventilation and lighting, and reflect the concept of harmonious coexistence between man and nature. In terms of craftsmanship, traditional hand |  <p>'Yong' bamboo public artwork</p> |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                        |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|               | knitting is combined with hemp rope binding and bamboo nail fixation, and modern technologies such as 3D printing are integrated to realize the integration of tradition and modernity and show the potential of bamboo products in the new era.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                        |
| Rattan timber | <p>The KITHUL-AMI Memorial Pavilion uses the local unique 'kithul' grape vine as the main material, which not only reflects the respect and utilization of local resources, but also conveys the design concept of environmental protection and sustainability. The designer skillfully echoes the architectural style of Bawa, which is soft and rooted in nature. By avoiding sharp lines and straight lines, the designer adopts continuous amorphous design to create a monument with gentle temperament and harmonious coexistence with nature. The exquisite use of vine weaving techniques makes the memorial pavilion full of vitality even if the structure is complex and light and breathable. Structurally, the ingenious combination of vines and steel wires not only retains the natural beauty of vines, but also ensures the stability and durability of the structure, showing the harmonious coexistence of natural materials and modern technology.</p> |  <p>KITHUL-AMI Memorial pavilion</p> |
| timber        | <p>The Xylem Wood Pavilion designed by Francis Kéré is located in the park of Montana, the United States. It is another example of the recycling of wood materials. The pavilion uses the trimmed pine wood as the building material, retaining the natural texture and texture of the wood, reflecting the respect and cherish of natural resources. Structurally, the seven steel columns steadily support the entire circular space, and the curved shape of the ceiling echoes the surrounding hills, achieving a harmonious integration with the environment. The creative combination of wood and straw, both shading and ventilation, creates a comfortable and pleasant rest space, showing the infinite creativity and practicability of natural materials in landscape design.</p>                                                                                                                                                                                |  <p>Xylem wooden pavilion</p>      |
| Grass         | <p>The hay landscape house on the Canadian International Garden Festival is inspired by the haystack, but the structure has been innovatively designed. The hollow structure contains a small space, which is thought-provoking about the relationship between man and nature. Under the sun, the golden grass exudes a warm light, like a new thing, attracting people to feel its unique charm at close range. The all-round experience of vision, smell and touch makes people deeply understand the simplicity and beauty of natural materials.</p>                                                                                                                                                                                                                                                                                                                                                                                                                     |  <p>Hay landscape house</p>        |

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                 |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| stone          | The snake-shaped gallery on stone is a subversive design of the traditional building material of stone. He cut the stone into feathery flakes as the roof material. This initiative not only allows the stone to integrate into nature with a new look, but also forms an interesting echo with the traditional slate roof. The structure is supported by a light-weight thin cylinder, which makes the whole gallery seem to swing lightly with the wind, creating a sense of lightness that transcends the earth.                                                                | <br>the serpentine gallery    |
| Earth material | The design of the clay garden hall in Bern, Switzerland is an innovative exploration of the application of soil materials. The designer combines sustainable clay materials with computer technology to create a unique structure of the wave cylinder, which is both beautiful and stable. The wavy design not only increases the stability of the occupied area, but also gives the work a sense of dynamics. This work breaks people's traditional cognition of soil materials and shows the infinite potential and creativity of natural materials in modern landscape design. | <br>Wave clay exhibition hall |

**4. Evaluation of the Application of Natural Materials in Landscape Design Based on SD Method**

**4.1. Applicability of SD method in landscape design application evaluation research**

First, the SD method can accurately quantify the public’s feelings about the application of natural materials in landscape design. By designing a series of adjective pairs related to natural materials, such as ‘natural-artificial’ and ‘ecological-non-ecological’, the subjective evaluation data of the public on the application of natural materials in specific landscapes can be collected. This method can effectively transform people’s psychological reactions into quantifiable indicators, and provide direct feedback on the application effect of natural materials for research.

Second, the SD method provides specific evaluation indicators for the application of natural materials in landscape design. These indicators can include the type, quantity, distribution and texture of natural materials. Through the evaluation of these indicators, we can understand the practical application effect of natural materials in landscape design, so as to find out the possible problems and put forward corresponding improvement measures. For example, if the evaluation results show that the public is not satisfied with the use of a natural material, it can be recommended to increase or decrease the use of the material to optimize the overall effect of the landscape.

**4.2. Development of SD scales and questionnaires**

The perception of human beings is composed of eyes, ears, nose, tongue, body, meaning and so on. Among them, the visual perception of eyes is the dominant one, which accounts for 87 % of sensory perception. Because the author adopts the method of picture-guided investigation, the case interpreted in this paper is used as a survey sample to conduct a questionnaire survey on the public’s perception of the landscape with natural materials to verify that the application of natural materials in the

landscape can indeed achieve good landscape effect. The natural material cases interpreted in this paper adopt the real photos collected by the author.

The author wants to study how people view the landscape construction of natural materials through this survey. This paper mainly collects the semantic adjectives of common natural materials through experimental observation and literature review.

According to the requirements of the SD method, the words are paired antonyms, and the collected semantic adjectives are summarized into 60. The following is an example of emotional semantic vocabulary of natural materials. Closeness, natural materials can arouse people's sense of closeness to the natural environment and provide a sense of connection with nature ; sense of security, some natural materials, such as wood and stone, can provide a sense of security because of their strong and stable characteristics; aesthetic sense, the shape, texture and color of natural materials can stimulate people's appreciation of beauty and increase the aesthetic value of landscape; sense of tranquility, the use of natural materials can create a tranquil environment, help reduce stress and anxiety; the sense of vitality, some natural materials, such as vegetation, can bring vitality and vitality to the landscape ; sense of belonging, the use of natural materials can enhance people's sense of belonging to a place, especially when the material is in harmony with the local environment and culture ; sense of history, with the local natural materials can arouse memories of history and tradition, enhance people's recognition of the place; mystery, some of the characteristics of natural materials, such as the tall trees or the strange shape of the rock, can stimulate people's curiosity and desire to explore ; healing, the use of natural materials is considered to have a healing effect in some cases and can promote physical and mental health. [5]

Starting from the feelings of landscape effects, combined with the evaluation of landscape characteristics by experts and scholars, and combining adjectives with the same or similar meanings, a total of 10 pairs of semantic adjective groups were selected, namely, local-city, environmental protection-luxurious, creative-trivial, artistic conception-straightforward, close-mysterious, safe-dangerous, good-looking-unsightly, complex-simple, plain-fashionable, quiet-vigorous. Using the five-level evaluation scale standard, taking the phrase 'local-city' as an example, the five levels are divided into - 2, - 1, 0, 1, and 2, and the corresponding evaluation is very local, more local, general, more urban, and very urban. The score on the left side indicates that the respondents believe that the adjectives on the left side can better describe their feelings about the picture, and the same is true on the right side ( Table 2 ).

**Table 2.** SD method landscape comprehensive sensitivity evaluation scale.

| serial number | Evaluation scale ( score ) Evaluation scale           |
|---------------|-------------------------------------------------------|
| 1             | Rural (-2, -1, 0, 1, 2) Urban                         |
| 2             | Eco-friendly (-2, -1, 0, 1, 2) Luxurious              |
| 3             | Creative (-2, -1, 0, 1, 2) Ordinary                   |
| 4             | Artistic Conception (-2, -1, 0, 1, 2) Straightforward |
| 5             | Intimate (-2, -1, 0, 1, 2) Mysterious                 |
| 6             | Safe (-2, -1, 0, 1, 2) Dangerous                      |
| 7             | Attractive (-2, -1, 0, 1, 2) Ugly                     |
| 8             | Complex (-2, -1, 0, 1, 2) Simple                      |
| 9             | Rustic (-2, -1, 0, 1, 2) Fashionable                  |
| 10            | Tranquil (-2, -1, 0, 1, 2) Dynamic                    |

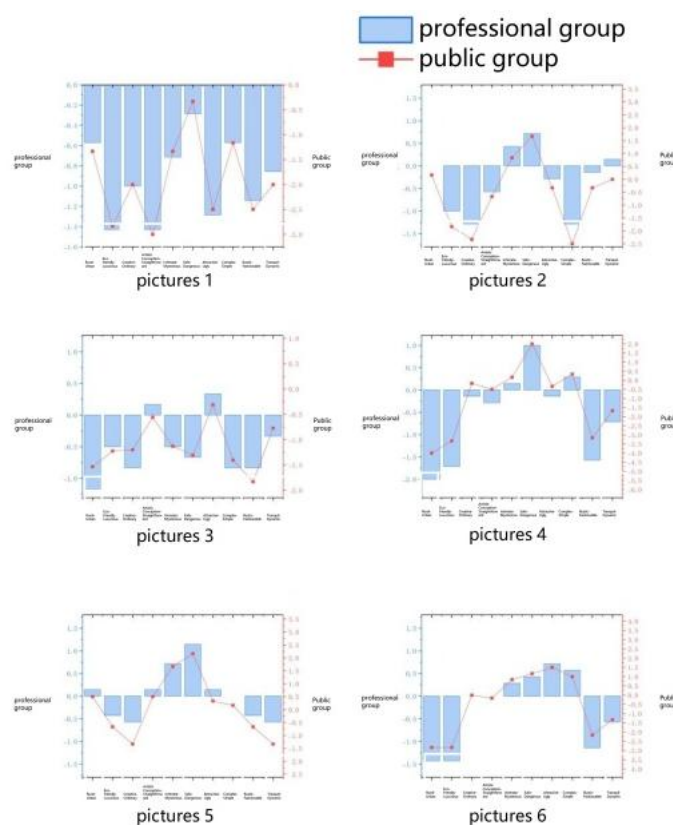
### 4.3. Respondents

Due to the different thinking and perspectives of the general public and relevant professionals on landscape works, the evaluators of this survey are divided into two groups: one group is landscape design teachers, practitioners and students; the other group is the general public. A total of 40 questionnaires were sent out, 32 were recovered, and 32 were valid. Among them, 20 were valid questionnaires related to the profession, and 12 were valid questionnaires for the general public. The effective recovery rate of this questionnaire survey was 80 %.

#### 4.4. Comprehensive evaluation of the use of natural materials landscape

According to the results of the final effective questionnaire, the data of the samples are counted and calculated, and the score tables of the professional group, the general public group and the whole sample are sorted out respectively, and the evaluation line chart of the comparison between the professional group and the public group of each sample is made (Figure 1). Finally, these charts are analyzed to obtain the research results (Table 2, Table 3, Table 4). Figure 1 shows the SD score line chart of pictures 1 to 6 on different phrase nodes. Through the line chart, we can intuitively see the score of each picture on different phrase nodes, as well as the score difference between the professional group, the public group and the whole sample.

From the SD score results, the perception of professionals and the general public is roughly close, and the overall data trend is negative, indicating that the intuitive feelings left by these samples are more local, environmentally friendly, creative, artistic, close, good-looking, and quiet. The data line chart tested by professionals is generally moderate, which indicates that professionals will look at the essence through phenomena based on a certain professional background when evaluating, while the general public is more based on their own psychological feelings.



**Figure 1.** Sample pictures (1-6) Data line chart.

**Table 3.** *SD scores of professional group samples.*

| Seria<br>l<br>Num<br>ber | Rur<br>al<br>-<br>Urb<br>an | Eco-<br>friendl<br>y<br>-<br>Luxur<br>ious | Creat<br>ive<br>-<br>Ordin<br>ary | Artistic<br>Conceptio<br>n<br>-<br>Straightfo<br>rward | Intimat<br>e<br>-<br>Myster<br>ious | Safe<br>-<br>Dange<br>rous | Attrac<br>tive<br>-Ugly | Com<br>plex<br>-<br>Simpl<br>e | Rustic<br>-<br>Fashio<br>nable | Tranq<br>uil-<br>Dyna<br>mic |
|--------------------------|-----------------------------|--------------------------------------------|-----------------------------------|--------------------------------------------------------|-------------------------------------|----------------------------|-------------------------|--------------------------------|--------------------------------|------------------------------|
| Imag<br>e1               | -<br>0.5<br>7               | -1.43                                      | -1.00                             | -1.43                                                  | -0.71                               | -0.29                      | -1.29                   | -0.57                          | -1.14                          | -0.86                        |
| Imag<br>e2               | 0.0<br>0                    | -1.00                                      | -1.29                             | -0.57                                                  | 0.43                                | 0.71                       | -0.29                   | -1.29                          | -0.14                          | 0.14                         |
| Imag<br>e3               | -<br>0.4<br>3               | -0.71                                      | -0.43                             | -0.71                                                  | -0.57                               | -0.71                      | -0.71                   | -0.86                          | -1.00                          | -0.29                        |
| Imag<br>e4               | -<br>2.0<br>0               | -1.71                                      | -0.14                             | -0.29                                                  | 0.14                                | 1.00                       | -0.14                   | 0.29                           | -1.57                          | -0.71                        |
| Imag<br>e5               | 0.1<br>4                    | -0.43                                      | -0.57                             | 0.14                                                   | 0.71                                | 1.14                       | 0.14                    | 0.00                           | -0.43                          | -0.57                        |
| Imag<br>e6               | -<br>1.4<br>3               | -1.43                                      | 0.00                              | 0.00                                                   | 0.29                                | 0.43                       | 0.71                    | 0.57                           | -1.14                          | -0.57                        |

**Table 4.** *SD scores of public group samples.*

| Seria<br>l<br>Num<br>ber | Rur<br>al<br>-<br>Urb<br>an | Eco-<br>friendl<br>y<br>-<br>Luxur<br>ious | Creat<br>ive<br>-<br>Ordin<br>ary | Artistic<br>Conceptio<br>n<br>-<br>Straightfo<br>rward | Intimat<br>e<br>-<br>Myster<br>ious | Safe<br>-<br>Dange<br>rous | Attrac<br>tive<br>-Ugly | Com<br>plex<br>-<br>Simpl<br>e | Rustic<br>-<br>Fashio<br>nable | Tranq<br>uil-<br>Dyna<br>mic |
|--------------------------|-----------------------------|--------------------------------------------|-----------------------------------|--------------------------------------------------------|-------------------------------------|----------------------------|-------------------------|--------------------------------|--------------------------------|------------------------------|
| Imag<br>e1               | -<br>0.5<br>0               | -1.17                                      | -0.83                             | -0.83                                                  | -0.17                               | -0.83                      | -0.50                   | 0.50                           | -0.50                          | -1.17                        |
| Imag<br>e2               | 0.3<br>3                    | -1.17                                      | -1.67                             | -0.83                                                  | -0.33                               | -0.17                      | -0.67                   | -0.50                          | -0.33                          | 0.17                         |
| Imag<br>e3               | -<br>1.1<br>7               | -0.50                                      | -0.83                             | 0.17                                                   | -0.50                               | -0.67                      | 0.33                    | -0.83                          | -0.83                          | -0.33                        |
| Imag<br>e4               | -<br>1.8<br>3               | -1.33                                      | 0.17                              | 0.17                                                   | -1.50                               | -0.33                      | 0.50                    | 0.17                           | -1.17                          | -1.17                        |
| Imag<br>e5               | 0.8<br>3                    | 0.33                                       | -0.33                             | 0.33                                                   | 0.00                                | 0.67                       | -0.17                   | 0.33                           | 0.33                           | -0.50                        |
| Imag<br>e6               | -<br>1.1<br>7               | -1.17                                      | -0.50                             | -0.17                                                  | -0.17                               | -0.83                      | 0.17                    | 0.00                           | -0.50                          | -0.33                        |

**Table 5.** *SD scores of all samples.*

| Seria<br>l<br>Num<br>ber | Rur<br>al<br>-<br>Urb<br>an | Eco-<br>friendl<br>y<br>-<br>Luxur<br>ious | Creat<br>ive<br>-<br>Ordin<br>ary | Artistic<br>Conceptio<br>n<br>-<br>Straightfo<br>rward | Intimat<br>e<br>-<br>Myster<br>ious | Safe<br>-<br>Dange<br>rous | Attrac<br>tive<br>-Ugly | Com<br>plex<br>-<br>Simpl<br>e | Rustic<br>-<br>Fashio<br>nable | Tranq<br>uil-<br>Dyna<br>mic |
|--------------------------|-----------------------------|--------------------------------------------|-----------------------------------|--------------------------------------------------------|-------------------------------------|----------------------------|-------------------------|--------------------------------|--------------------------------|------------------------------|
| Imag                     | -                           | -1.31                                      | -0.92                             | -1.15                                                  | -0.46                               | -0.54                      | -0.92                   | -0.08                          | -0.54                          | -1.31                        |

|            |               |       |       |       |       |       |       |       |       |       |
|------------|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| e1         | 0.5<br>4      |       |       |       |       |       |       |       |       |       |
| Imag<br>e2 | -<br>1.0<br>8 | -1.46 | -0.69 | 0.08  | 0.31  | -0.46 | -0.92 | -0.23 | 0.15  | -1.08 |
| Imag<br>e3 | -<br>0.7<br>7 | -0.62 | -0.62 | -0.31 | -0.54 | -0.69 | -0.23 | -0.85 | -0.92 | -0.31 |
| Imag<br>e4 | -<br>1.9<br>2 | -1.54 | 0.00  | -0.08 | -0.62 | 0.38  | 0.15  | 0.23  | -1.38 | -0.92 |
| Imag<br>e5 | 0.4<br>6      | -0.08 | -0.46 | 0.23  | 0.38  | 0.92  | 0.00  | 0.15  | -0.08 | -0.54 |
| Imag<br>e6 | -<br>1.3<br>1 | -1.31 | -0.23 | -0.08 | 0.08  | -0.15 | 0.46  | 0.31  | -0.85 | -0.46 |

## 5. Conclusions

In this paper, the SD method is used to evaluate the application of natural materials in landscape design. The results show that the application of natural materials in landscape design is generally recognized, especially in reflecting the local flavor, environmental protection concept, creative design and quiet atmosphere. However, some potential error sources were also found in the evaluation process, such as respondents may tend to exaggerate personal emotional preferences and make choices in neutral options, which may affect the accuracy of the data. In addition, there may be significant differences in the emotional attitudes of individuals from different cultural backgrounds towards the same concept, suggesting that we should use the SD method cautiously in cross-cultural research.

When evaluating the landscape of natural materials, professionals are often able to conduct more in-depth analysis due to their professional background, showing a more keen sense of perception. At the same time, different people have different feelings about the same landscape, which requires us to fully consider the needs and feelings of different user groups in the process of landscape design.

Based on the above findings, it is suggested that future landscape design should pay more attention to the application of natural materials and comprehensively consider the needs of different groups to create design works that are more in line with public expectations. In addition, in order to improve the scientificity and accuracy of the evaluation, it is suggested to optimize the design of the questionnaire, increase the diversity of samples, and adopt more advanced statistical analysis methods to reflect the evaluation needs of different groups more comprehensively, and dig deeper into the rules and trends behind the data.

Finally, the research in this paper not only provides empirical support for the application of natural materials in landscape design, but also provides valuable guidance for design practice, which helps to promote the development of landscape design in a more humane, scientific and artistic direction.

## Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

## Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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