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PAPER TITLE

A Study of Utilizing Mixed Reality (MR) to Establish Environmental Color Schemes

KEYWORDS

Environmental Color Planning, Color
Schemes, Mixed Reality(MR), Color
Psychophysical Experiment Method, Color
Harmony

ABSTRACT

The purpose of the study is to adopt mixed reality (MR) technology to enhance the color schemes of harbor buildings in mountainous regions, aiming to achieve color harmony and improve the overall aesthetics and visual quality of these port areas. The experimental process involves collecting image data of the harbor buildings and creating a comprehensive chromatogram database. Using digital imaging technology, various facade color schemes for the port buildings will be designed, taking into account the primary and secondary colors, architectural characteristics, surrounding environment, and regional culture to ensure a harmonious color effect. The proposed color schemes will be visually simulated to assess their impact on the appearance of the port buildings, facilitating comparison and evaluation. Participants will be invited to engage in a mixed reality experience, where they can observe and assess the visual impact and comfort of the different color schemes. Feedback will be collected to understand user preferences and suggestions, providing insights into the strengths and weaknesses of each color scheme. Based on the user feedback and evaluation results, the most effective color improvement scheme will be identified for potential application in actual environmental color planning. The ultimate goal of this research is to significantly enhance the environmental landscape quality and the overall beauty and appeal of the harbor area.

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Introduction

This study involved a systematic environmental color analysis to develop a color database of the Taiping Mountain District landscape. Regional color samples were collected and analyzed using the NCS Natural Color System. Additionally, an in-depth survey of environmental color imagery was conducted to provide a detailed representation of the region, complete with comprehensive color information. The observers' cognitive interpretation of the local environmental color imagery will be used to help the development of a color scheme.

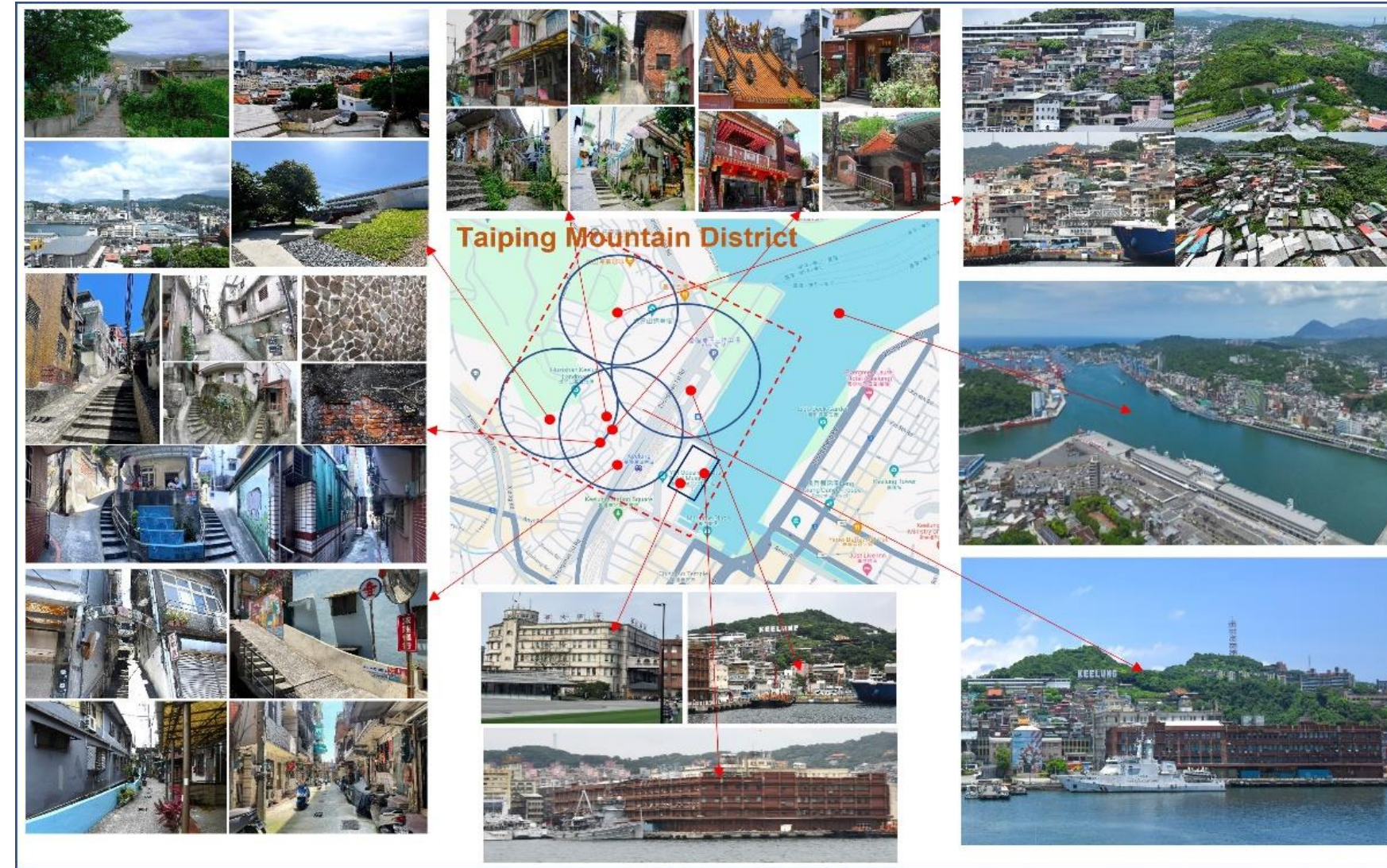


Figure 1. Selected images of Taiping Mountain District of Keelung City harbor region.

Method

1. Color Samples Preparation

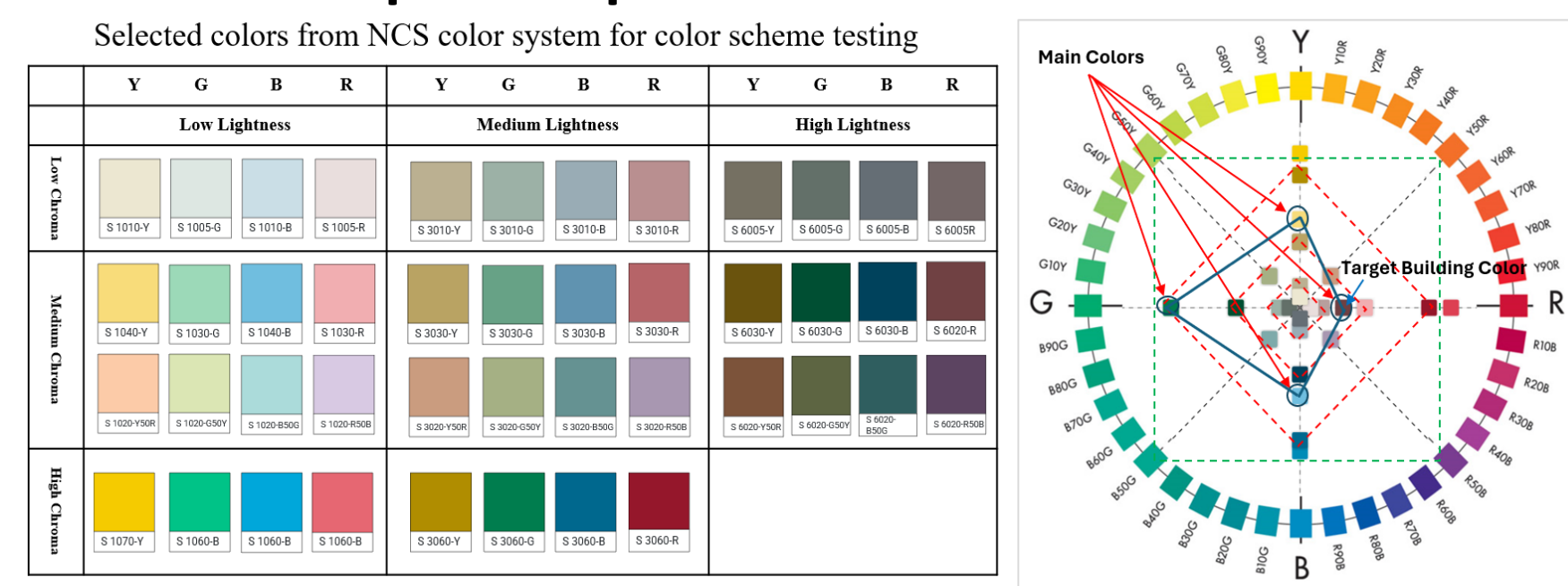


Figure 3. Selected colors from NCS Chromatography based on the main colors of the background environment for color scheme.

2. Psychophysical Experiment



Figure 5. The experiments are consisted of two phases: phase I : Environmental Color Imagery Survey; phase II : Harmony Assessment of Environment Color Schemes.

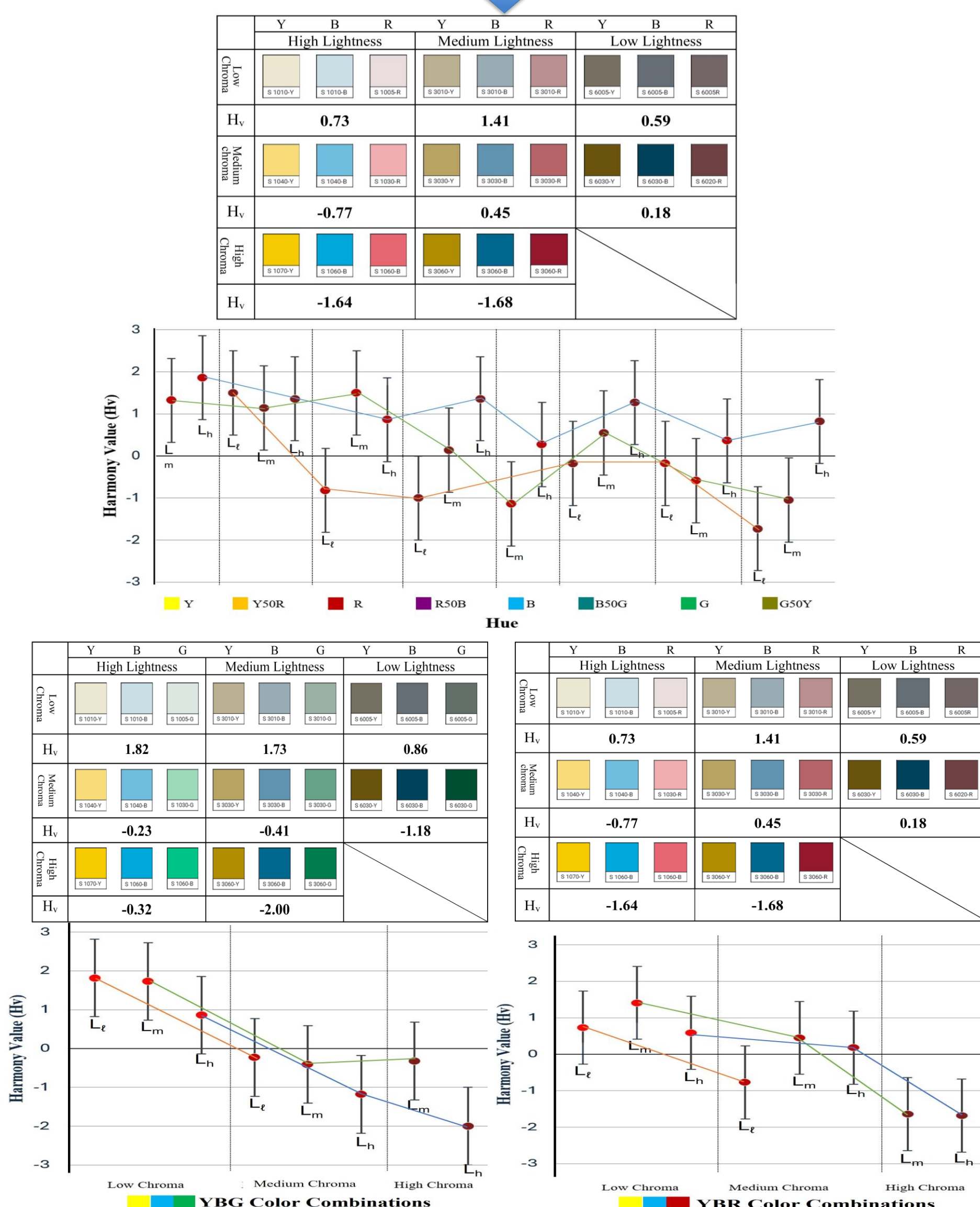


Figure 7. The values of harmonious of either monochromatic color or color combinations indicated the observers' color preference with low chroma and medium to high lightness, shown on above graphs.



Figure 2. 164 chromatograms were categorized by NCS color system to represent the environment colors in this region.

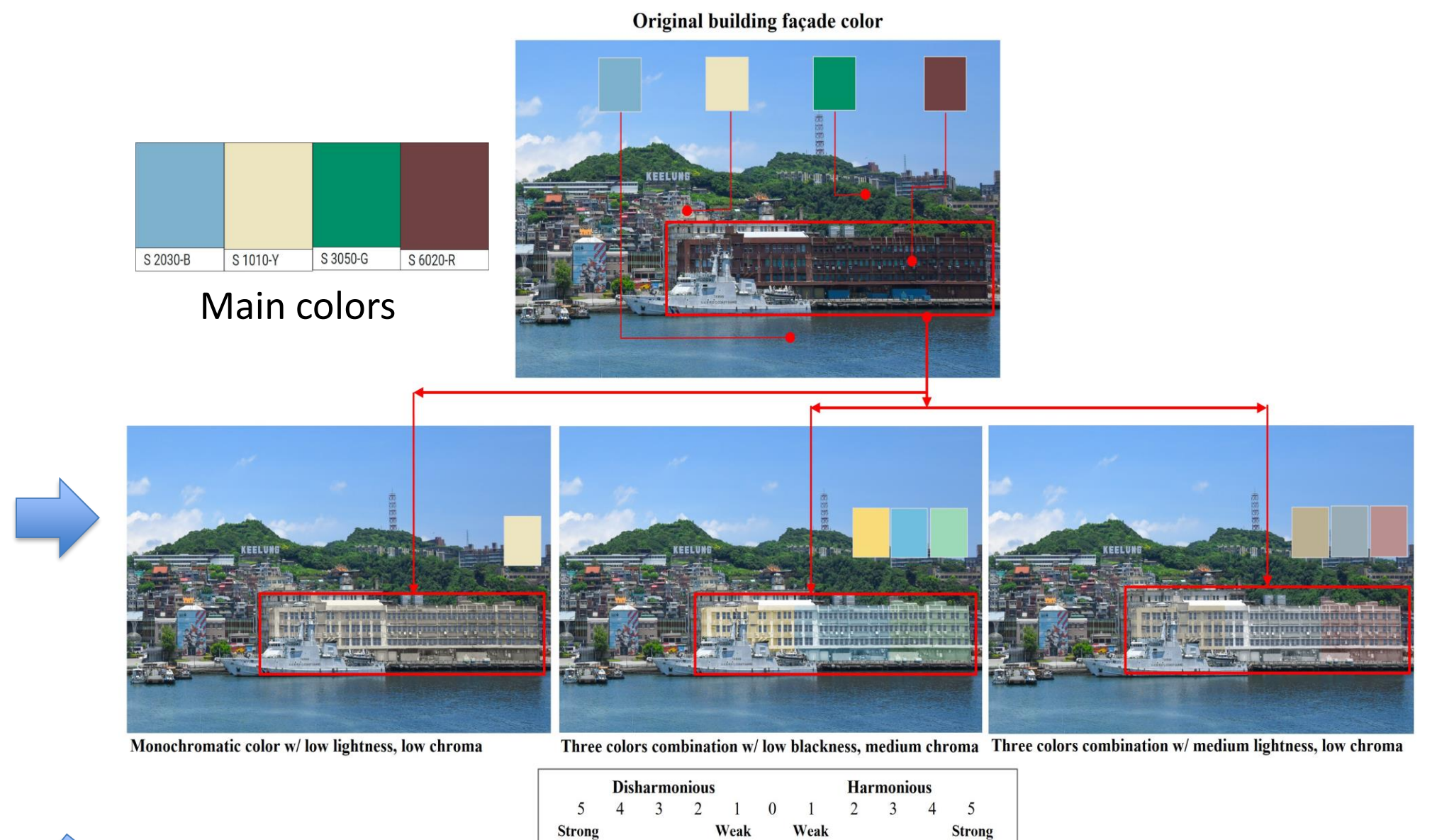


Figure 4. Harmony assessment among the environment color schemes w/ different hue, chroma, and lightness, above as an example.

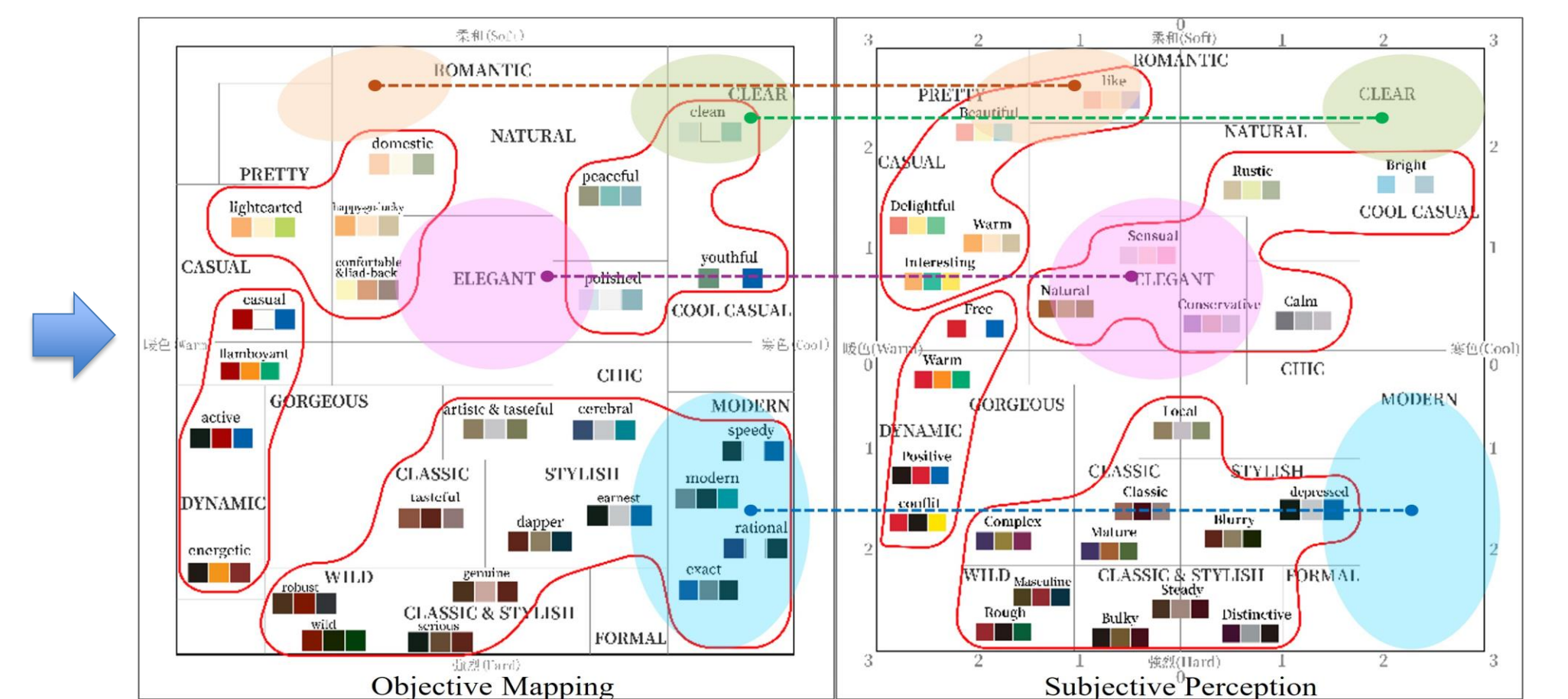


Figure 6. Inconsistencies between the objective and subjective predictions of some semantic areas were evident on the Kobayashi Color Image Scale coordinate plane.

Results & Discussions

1. The perceptual assessment of the harmoniousness of color schemes revealed that observers preferred colors with low chroma and medium to high lightness, whether the scheme involved a single color or a combination. The findings are consistent with previous studies on color harmonization.
2. Yellow and yellow-orange were the most preferred, corresponding to zone area as Pretty-Casual-Delightful-Warm-Interesting on Kobayashi Color Image plane, while blue and blue-green were the least favored, particularly in medium to high chroma or low lightness.
3. The results also indicated a significant degree of consistency between the selected color schemes and the environmental background colors, reflecting a sense of harmony in the choices.

Conclusions

Utilizing a scientific approach with MR for environmental imagery surveys and systematic color schemes offers dual benefits: it enhances the understanding of observers' perceptions of environmental color imagery and provides objective insights into their color preferences. This method reduces potential discrepancies in judgment that may stem from the subjective interpretations of color planners, ensuring a more accurate and consistent application of color schemes in environmental design.

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