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# EVALUATING THE URBAN ARCHITECTURAL COLOUR STATUS OF JINAN, CHINA FROM THE PERSPECTIVE OF COLOUR GEOGRAPHY

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## Abstract

This paper provides a comprehensive evaluation of the current status of architectural colour in Jinan through the theory of colour geography. Founded by Jean-Philippe Lenclos, colour geography studies the influence of geography and social culture on architectural urban colour. This study used tools to generate the data on site, including Chinese architectural colour charts, drones, and cameras. The city of Jinan, China, was chosen because of its rich history and culture, unique geographical environment, and multi-ethnic composition, all of which have contributed to its diverse urban colour. The colour characteristics of Jinan are divided into three areas: the old city, the new city, and the industrial area. This study provides an in-depth analysis of the current status of urban colour in Jinan, which provides a scientific basis for future urban planning and design to support sustainable development and cultural heritage protection. The results revealed that warm earth tones and traditional styles dominate the old city area, while cooler modern tones dominate the new city area. The industrial area is dominated by grey and yellowish brown. The study found that Jinan's urban colour scheme lacks uniformity, especially in the new development areas where highly saturated colours are widely used. In contrast, the colour scheme in the old city is more consistent and reflects traditional aesthetics. The study highlights the need for coordinated colour schemes to preserve cultural heritage and improve the consistency of urban aesthetics. We hope this study not only enriches the theory of colour geography, but also provides an important reference for existing and future urban colour planning in Jinan.

***Keywords***: Architectural, Cultural, Geography, Urban Colour, Urban planning

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## INTRODUCTION

This study delved into the importance of urban architectural colour in urban planning and design due to its far-reaching impact on urban aesthetics and cultural identity. Based on the theory of colour geography, this paper focused on the city of Jinan, which has a rich historical and cultural background. Colour geography, proposed by Jean-Philippe Lenclos, examines how geographic and socio-cultural factors influence architectural colour to create a unique regional identity.

Located in the centre of China's Shandong Province, Jinan is known for its historical value and diverse cultural heritage. The city's unique geographical features, such as the Yellow River, Mount Tai, and several iconic landscapes, contribute to its distinctive urban colour. At the same time, Jinan's multi-ethnic composition further adds to the complexity of the architectural colour scheme. This study adopted a comprehensive approach, combining a literature review and empirical research. Through the use of tools such as Chinese architectural colour charts, unmanned aerial vehicles (UAVs), and cameras, colour data from different urban areas in Jinan was systematically collected and analysed. The study covered the old city, new city, and industrial area, aiming to comprehensively analyse the urban colour landscape of Jinan.

This study is important because it provides a scientific basis for urban colour planning and design, to promote sustainable development, and to protect cultural heritage. Through an in-depth analysis of the current state of architectural colour in Jinan, the study aimed to provide practical insights and a scientific basis for future urban planning. The findings highlighted the need for coordinated colour planning to enhance aesthetic coherence and maintain the city's cultural identity during rapid urbanisation.

## LITERATURE REVIEW

Urban colour has a broad and multifaceted connotation. According to Tosca (2018), the concept of urban colour planning defines the study within the context of the visible elements of the urban entity, specifically the urban landscape defined by colour. Colour is a visual perception that arises from the response of the visual cells in the human eye to light stimuli, and the physical environment serves as an essential medium that transmits colour (Chen & Liu, 2019). This material carrier or bearer of colour perception refers to the physical environment.

### Urban Colour

Urban colour is a complex and multifaceted system that encompasses both natural and socio-human factors (Ma & Misni, 2024; Cui, 2020). Therefore, its definition should consider different levels and dimensions. China divides the definition of urban colour into a broad sense and a narrow sense (Wang et al., 2023). According to Song et al. (2019), urban colour broadly refers to studying the

interrelated qualities of colour representations as an integral part of the city and architectural space, encompassing all perceptible colour phenomena. On the other hand, urban colour, in its narrow sense, focuses on the recognisability and legibility of the overall urban image of the city, which is composed of urban architecture and spatial form (Wang et al., 2019).

**Colour Geography**

In 1960, the renowned French colourist Jean-Philippe Lenclos, along with Dominique Lenclos, pioneered the innovative field of colour Geography (La Géographe de La Couleur). This theory posits that geographical variations lead to architectural colour differences within cities, influenced by regional and socio-cultural factors. The principle of colour Geography confines colour to specific regions, surveys the colour expressions of residential buildings, and analyses the underlying mechanisms influencing colour aesthetic psychology in different geographical environments (Ma & Misni, 2024). This approach explores regional colour uniqueness and establishes a dialogue between traditional and modern architectural colours. "The main purpose of colour geography research is the selection, zoning, investigation, colour sampling, summarisation, and compilation of colour characteristics of buildings in different human geography zones. By summarising tones and analysing them, the colour aesthetic psychology characteristics of residents in the region can be deduced" (Song, 2010).

Jean-Philippe Lenclos's colour Geography methodology, involving the extraction of colour landscapes and the induction of visual colour samples, provides a significant framework for urban colour practice (Huang, 2012). It has gained recognition in the academic community, influencing urban colour studies, socio-cultural studies, urban planning, and international colour trends (Ma & Misni, 2024). According to Bian Wenjuan (2015), colour Geography minimally impacts architectural structures while reproducing historical styles using modern technology, thereby aiding the preservation of traditional buildings and urban redevelopment. This methodology offers an essential approach for understanding and applying regional colour characteristics in contemporary urban settings.

**Current Status of Urban Colour Model**

Urban colour planning research abroad closely synchronises with urban development. According to Cui (2006), the earliest colour practice emerged through the application of colour geography, pioneered by Professor Jean-Philippe Lenclos, known as the "Lenclos research method," which has been successfully employed in urban colour design. This method involves abstracting the colour of surrounding landscapes, recording them through data processing and photography, and then using computer-aided software to extract the main

colour data, resulting in a quantified spectral analysis chart that refines into a spectrum guiding urban colour planning factors (Linton, 1999).

**a. Western Model**

Lin (2021) posited that the urban environmental colour of European cities often shapes people's impressions of these cities. For example, the ochre tones of Paris, France, the coffee tones of Amsterdam, the romantic hues of St. Petersburg, Russia, the vibrant tones of Florence, Italy, and the white tones of Santorini, Greece, serve as distinctive identifiers for these cities, deeply etched into the memories of visitors. Surveys indicated that a majority of respondents feel proud and pleased with the colour of their own cities, indicating that successful urban colour development can enhance citizens' sense of identity and belonging (Fang & Qin, 2014).

**b. Asian Model**

In the Asian model, Cui (2006) suggested that colour analysis is particularly prominent in Japan and South Korea. The notable performance of colour research in Japan can be attributed to two main factors. Firstly, Jean-Philippe Lenclos, after studying at the Kyoto Institute of Technology in Japan, established the research method of colour geography, which was adopted by the colour Planning Centre in Tokyo, Japan. Secondly, the compulsory intervention and strong support from the Japanese and South Korean governments have led to significant attention to colour planning research. Wilson (2011) pointed out that the Japanese and South Korean governments have incorporated colour design into administrative planning, providing strong support for colour planning research.

## RESEARCH METHODOLOGY

### Study Area

Jinan City is located in the central part of Shandong Province, China (Figure 1). It is a historically renowned cultural city with a superior geographical location. Situated south of the Yellow River, north of Mount Tai, east of the Qilu Plain, and west of Mount Cangshan, Jinan boasts beautiful natural surroundings. There are several reasons for selecting Jinan as the study area. Firstly, Jinan possesses a rich historical and cultural heritage and is one of China's most significant historical and cultural cities. Its ancient history and abundant cultural heritage have profoundly influenced the urban colour palette. Secondly, Jinan has a unique geographical environment with many iconic landscapes, such as Qianfo Mountain and Daming Lake, providing abundant natural backgrounds for urban

colour. The geographical environment plays a crucial role in the formation and evolution of urban colour.


**Figure 1**: Key plan (left) and location plan (right) of study area of Jinan, China
*Source: Authors (2024)*

Furthermore, Jinan is a city inhabited by multiple ethnic groups with diverse cultural characteristics and religious beliefs. The cultural and religious diversity of various ethnic groups has different influences on urban colour (Teriman et al., 2009). Studying urban colour in Jinan can reveal the impact mechanism of multiculturalism on urban colour. Lastly, with the advancement of urbanisation, Jinan's urban development has been rapid, and there is an urgent need for scientific colour guidance in urban planning and construction. By studying urban colour in Jinan, a scientific basis can be provided for urban planning and design, promoting the city's sustainable development. The study area is divided into three parts: old urban city areas, new city areas, and the industrial area as shown in Figure 2.


**Figure 2:** Specific site plan of new, and old city, and industrial areas in Jinan city
*Source: Authors (2024)*

**Research Method 1: Literature Review**

This study employed a literature review method aimed at comprehensively understanding issues related to the conservation and planning of geographical colour and providing a theoretical basis for the current status of urban colour in Jinan. Firstly, relevant literature, including academic journals, conference papers, theses, and government reports, was collected and screened based on the research topic. Subsequently, the literature was comprehensively reviewed and summarised, with a focus on theoretical frameworks, methodologies, and case analyses, as well as the progress and trends of research both domestically and internationally. During the organisation process, sorting and categorisation based on keywords, publication years, or countries were conducted to facilitate comparison and analysis of different research characteristics and development trends. Through a comprehensive literature review, an in-depth understanding of issues related to geographical colour preservation and planning was obtained, providing a theoretical foundation for the current state of urban colour in Jinan.

**Research Method 2: Colour Geography Research Method**

Utilising the colour geography research method in conjunction with the Chinese Architectural Colour Chart, unmanned aerial vehicles (UAVs), and cameras, the tangible geographical colour landscape and abstract cultural colour genes were abstracted and refined. This approach aimed to explore the essence of colour and grasp the evolving patterns of urban colour. Through on-site observations, high-altitude aerial photography using UAVs, and recording with cameras, colour data of buildings, public spaces, and landscapes were collected. This empirical evidence supported the planning and preservation of urban colour in Jinan.

**Technological Means:**

In the actual investigation of urban spatial environmental colour, different information collection tools were selected based on the different research objects. In this research, a CBCC Chinese Building Colour Card, a Spectrophotometer CS410 portable colour brightness metre, and an SG906MAX1 unmanned aerial vehicle were employed. Table 1 provides a summary of the equipment, objectives, and methodologies employed in the study of urban colour in Jinan. The Chinese Architectural Colour Card is utilised for obtaining information on building colour, the portable colourimeter (Spectrophotometer CS410) was employed to measure colour brightness and spectral data; and the SG906MAX1 drone was utilised for panoramic research, capturing high-altitude perspectives of urban colour.

**Table 1:** Equipment used and its purpose and method

| No. | Equipment | Purpose | Methodology |
|---|---|---|---|
| 1 | CBCC Chinese Architectural Colour Card | Obtain Colour information of buildings | Select appropriate Colour card samples, compare with the colour of buildings, and record Colour codes and descriptions. |
| 2 | Spectrophotometer CS410 Portable Colourimeter | Measure brightness and spectral data of colour | Use the portable Colourimeter to measure the colour of buildings or environments, obtaining brightness and spectral data. |
| 3 | SG906MAX1 Drone | Conduct urban spatial panoramic research, obtain high-altitude perspective of colour | Capture urban landscape photos using the drone, with a specific focus on the overall colour of buildings and environments, obtaining panoramic Colour information. |

*Source: Authors (2024)*

### Research Steps

Based on the research methods of colour geography, the specific research steps for the urban colour investigation in Jinan were designed as follows:

i. Site Selection: Choose regions with typical, distinctive, and significantly variable urban colour, identify the survey area, specify to specific streets and individual buildings, etc.
ii. Investigation: Focus on the colour image and cultural atmosphere of specific areas; take photos of building materials and surrounding natural environmental colour. Develop a specific investigation plan for building names, block history, etc.
iii. Measurement: Primarily use CBCC Chinese Building Colour Card National Standard Samples (GBT18922--2008) for comparison, supplemented by a Spectrophotometer CS410 portable colour brightness metre, and an SG906MAX1 unmanned aerial vehicle. Record the data.
iv. Induction: Transform the colour with urban regional features measured into specific colour data. Adopt a unified colour format, Munsell values, and RGB values. Next, systematically summarise large-scale colour schemes and discard chaotic and interfering colour outside the series.

## ANALYSIS AND DISCUSSION

### Analysis of Jinan's Architectural Colour Context

The development of architectural colour in Jinan shares similarities with the evolution of northern cities, embodying distinct characteristics of "Spring City." Transitioning from the traditional grey tones of Ming Prefecture City to the red brick and brown tile in the commercial area and further to the modern new city with elegant, bright, and stable colour tones reflects Jinan's unique orientation within its geographical and temporal environment.

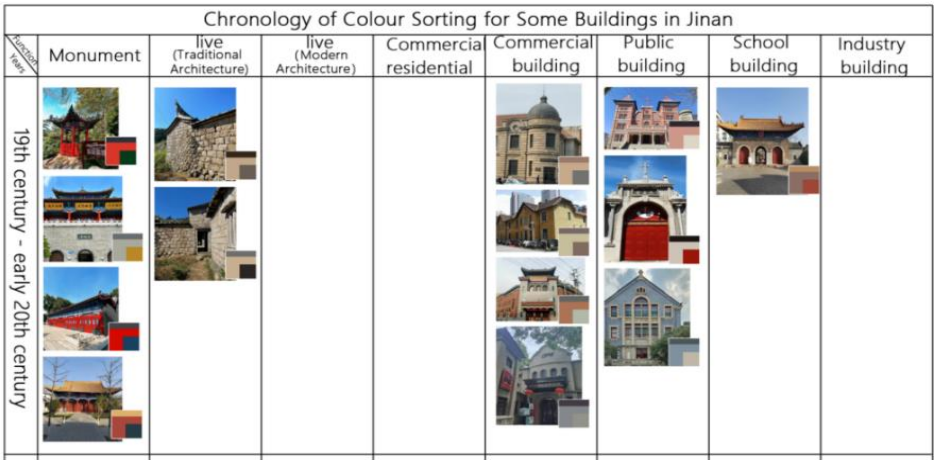
Jinan's architectural colour has long transcended traditional boundaries, presenting the face of a modern urban environment. The development of the commercial area has led to a mixture of Chinese and Western architectural styles, creating an experimental ground for the fusion of these influences and showcasing the diversity of Jinan's urban colour palette (Table 2).

**Architectural colour Spatial Composition in Jinan**

Historical buildings in Jinan are widely distributed, primarily concentrated in the old city area, including the ancient city and the commercial area. These buildings encompass a rich variety of types, such as residential, religious, consulates, transportation and telecommunication structures, banking and financial buildings, schools, hospitals, commercial establishments, and other service-related structures. Architectural forms vary, covering Gothic, Roman, classical, and modern styles while also featuring traditional architecture such as German, Japanese, English, and a fusion of Chinese and Western styles. The architectural structures predominantly use brick and stone, preserving the original colour of blue bricks, red bricks, or cement mortar.

There is a substantial number of newly constructed buildings, mainly distributed in the western and eastern new city areas. The application of modern construction techniques and high-tech building materials has led to a diminishing distinctiveness in the colour palette of new areas. Residential buildings extensively use warm colour tones, but there is an issue of independent colour schemes in each community, lacking coordinated connections. The colour design of commercial buildings appears disorderly, with prominent misuse of large outdoor billboards and high-saturation colour.

**Table 2.** Chronological Table of Colour Sorting for Some Buildings in Jinan




*Source: Authors (2024)*

Administrative buildings have a large volume, and the lack of variation in street-facing facades makes them appear somewhat monotonous. In terms of industrial facilities, there is a lack of consideration for industrial characteristics, resulting in a homogeneous colour presentation. It is recommended to design colours based on different industries and forms, emphasising the coordination between individual industrial buildings along the street.

**Analysis of the Current Situation of Architectural Colour in Jinan**

In the qualitative study of urban colour in Jinan, various observation methods were employed, including literature review, photographing, colour card comparisons, and physical sampling, to comprehensively understand the current status of architectural colour in Jinan. Special attention was given to the overall colour in the old city area and the new city area, analysing the colour of typical buildings to gain an in-depth understanding of regional colour profiles under different terrain and location conditions. This comprehensive research approaches allows us to analyse, at a macro-level zoning, the colour characteristics and colour layout of Jinan city more profoundly (Figure 3).

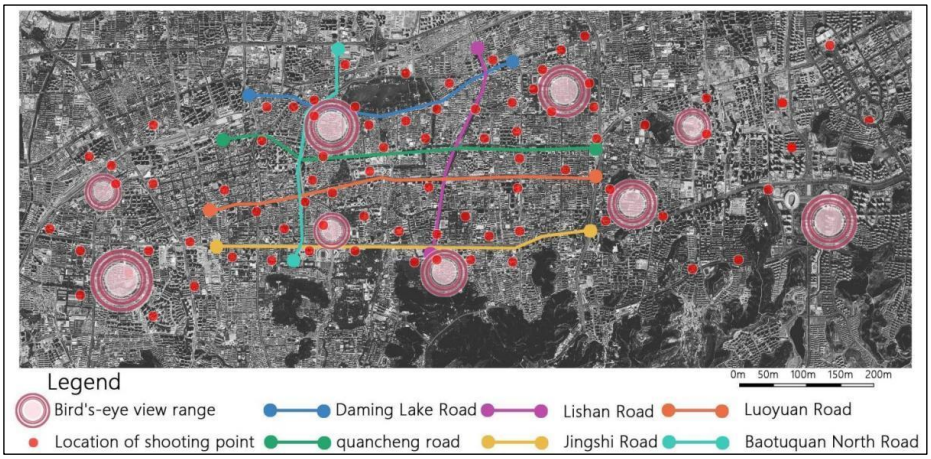



**Figure 3:** Schematic diagram of survey distribution points
*Source: Authors (2024)*

For a more precise and detailed investigation into Jinan's urban colour palette, we delineated the primary areas into the old city district, the eastern new city, and the western new city.

**i. Analysis of Architectural colour in the Old City Area**

Architectures in the old city area predominantly utilise warm yellow and warm red colours with medium to low brightness, complemented by warm and cool grey colours with medium to low brightness and saturation, creating a warm,

simple, and steady urban atmosphere. In late autumn, the vegetation presents an interweaving of yellow, green, and red, primarily characterised by warm and moderately saturated shades of green with medium to low brightness (Figure 4).

By employing the method of colour restoration through typical architectural colour, a detailed analysis was conducted on the colour tendencies of buildings with different functions (Figure 5). This unveiled the characteristics of architectural colour in different Jinan urban areas. Such research aids in comprehending the unique traits of urban colour and serves as a reference for future colour positioning.

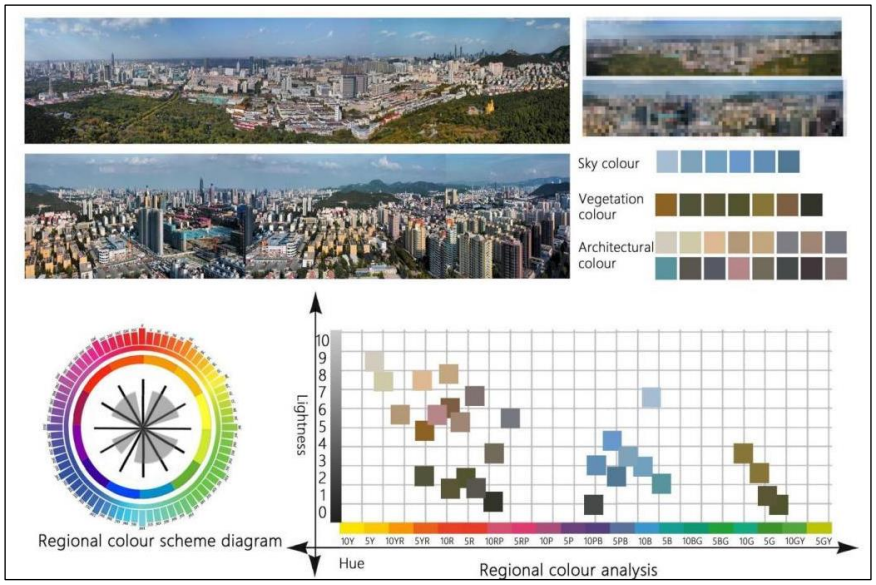



**Figure 4:** Schematic diagram of the current colour situation in the old urban area
*Source: Authors (2024)*

### ii. Analysis of Architectural colour in the New Urban Area

The new urban area of Jinan presents a cool colour tone with medium to high brightness and low saturation, demonstrating medium to long tonal colour contrasts (Figure 6). This area includes large public buildings, high-tech industrial parks, and newly constructed residential communities. Large public buildings primarily feature medium to high brightness in the grey colour range, while the colour palette in newly built residential areas is more vibrant. The predominant tone comprises medium-to-high brightness and low-saturation warm colours, which are complemented by elements of medium-to-high saturation.

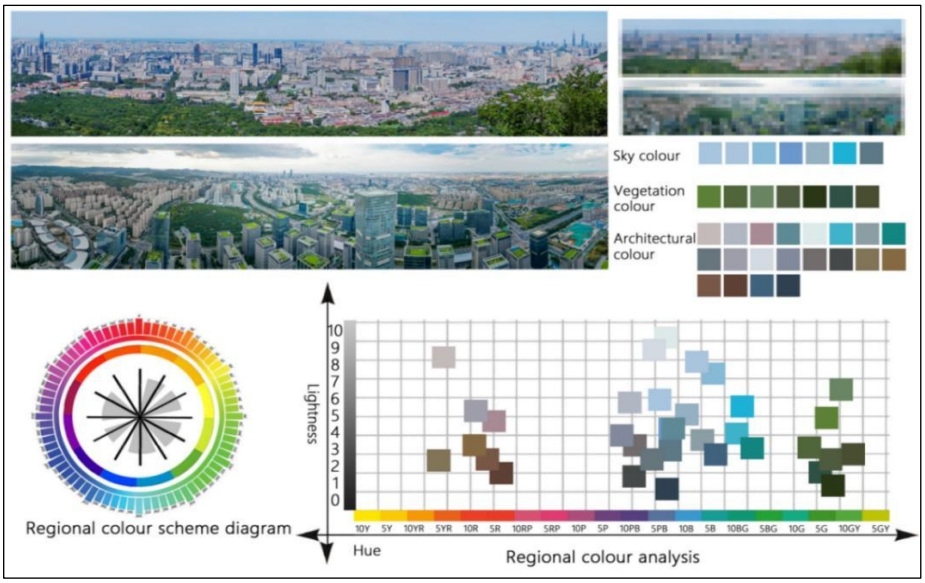



**Figure 5:** Current status of typical architectural colour in old urban areas
*Source: Authors (2024)*

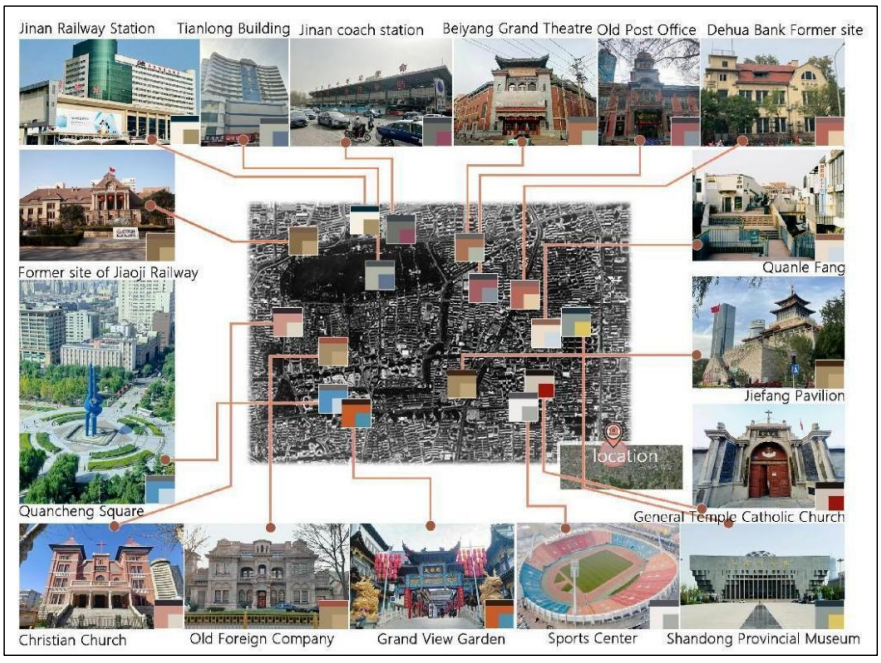



**Figure 6:** Schematic diagram of the current colour situation in the new urban area
*Source: Authors (2024)*

### iii. Analysis of Architectural Colour in the Industrial Zone

Industry is one of Jihan's economic pillars, and the industrial zone's colour palette occupies a significant position within the urban colour scheme. An analysis of the current colour situation reveals that the industrial zone is characterised by a concentration of medium to high brightness in the grey colour range and medium to high brightness, low saturation yellow-brown hues (Figure 7).

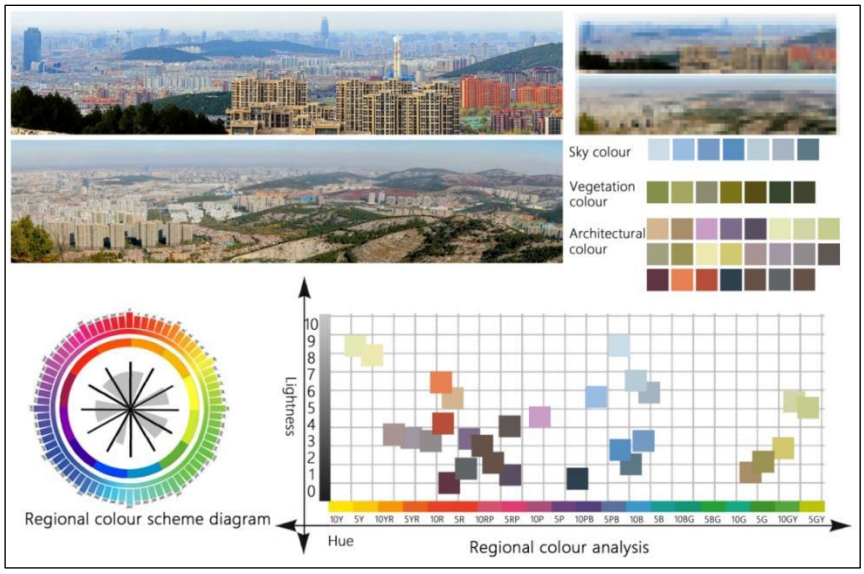



**Figure 7:** Schematic diagram of the current colour situation in industrial areas
*Source: Authors (2024)*

### iv. Analysis of the Current Architectural Colour in Different Functional Buildings

The analysis of architectural colour in Jinan shows that red-brown and yellow-brown hues heavily influence building colour schemes. Industrial and public buildings have the lowest colour saturation, followed by educational buildings, while residential and commercial structures exhibit higher saturation. The ancient city and commercial areas boast the most vibrant architectural colour. Overall, Jinan's urban colour palette appears diverse but somewhat disorderly, with a warm grey base and issues arising from the arbitrary use of highly saturated colour. The new city's colour scheme lacks coherence and distinctiveness, whereas the old city's hues are more pronounced, mainly in medium-to-low brightness yellow-grey and red-grey ranges.

**Landscape Greening colour**

Landscape greening is a significant component of urban colour, primarily manifested through colour artistry, showcasing a variety of colourful and diverse plant forms (Adam et al., 2022; Ali et al., 2018). The study of landscape greening colour in Jinan focused primarily on park greening and road greening. Jinan's major parks include Wulongtan Park, Quancheng Park, Zhongshan Park, Baihua Park, Jinan Botanical Garden, etc., and the plants in each park exhibit diverse colours.

## CONCLUSION

Various factors influence the architectural colour of Jinan, displaying significant differences between the old and new urban areas. The buildings in the old city predominantly use warm yellows and reds, complemented by medium-to-low brightness warm and cool greys, creating a warm, simple, and stable urban atmosphere. These colours, combined with traditional grey bricks and black tiles, reflect Jinan's rich historical and cultural heritage.

In contrast, the new urban areas are dominated by cool colours with high brightness and low saturation, presenting a modern and bright urban image. Public buildings mainly use grey with medium to high luminance, while the new residential areas show more vibrant colour with warm tones of high luminance and low saturation. Overall, Jinan's architectural colours are varied, but there is some confusion. The colour scheme of the new city lacks coherence and uniqueness, while the old city is more uniform and distinctive. Future urban planning and development should focus on the coordinated design of building colour to maintain overall harmony and unity, while preserving Jinan's unique historical and cultural hues.

In order to preserve and pass on Jinan's rich architectural colour, future urban development should focus on the following key aspects: Firstly, attention should be paid to the protection of historical buildings and cultural heritage to ensure that their original colours are preserved, thus maintaining the city's historical atmosphere and cultural identity. Secondly, reasonable urban colour planning should be incorporated into urban construction, and relevant policies and standards should be formulated to guide the colour coordination and design of buildings and public facilities, so as to ensure the overall harmony and unity of urban colour. In addition, special attention should be paid to the protection of religious buildings in order to preserve their unique religious colour and historical values. The dissemination and understanding of Jinan's history and culture by residents and tourists can be enhanced through the promotion of cultural education and tourism development. Finally, community participation and public opinion surveys are encouraged to actively collect residents' opinions and suggestions on urban colour protection and development, so as to form a consensus and promote the implementation and enforcement of relevant policies.

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