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A Case Study of Wuhan, China

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Article

Understanding Impacts of Neighbourhood Micro-Renewal Through a Lens of Place Value: A Case Study of Wuhan, China

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Abstract: Neighbourhood micro-renewal (NMIR) plays a critical role in the renewal landscape of urban China. However, an oversight in post-occupancy evaluation (POE) impedes the comprehensive understanding of NMIR's impact and post-implementation efficacy. This research addresses this gap by leveraging the lens of place value to examine NMIR's outcomes. Using Wuhan, China, as a case study, 10 Delphi consultations and 28 interviews were conducted among five stakeholder groups: local government, planning professionals, academics, community workers, and residents. Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation (FCE) were combined to identify and rank potential indicators. A total of 6 primary and 22 secondary indicators were identified. The indicators were derived from four key policy areas—health, society, economy, and environment—highlighting the relationship among NMIR initiatives, their contribution to place quality, and alignment with policy goals. AHP and FCE results reveal substantial enhancements in environmental quality, residential properties, and public infrastructure. Nevertheless, the analysis exposes varied satisfaction levels and divergences in the perceived relevance of indicators among the government, professionals, and the residents, particularly concerning social cohesion. These disparities underscore the layered impacts of NMIR. This research recommends integrating resident feedback with expert insights to enhance place quality in NMIR projects by balancing physical upgrades with social considerations. It also advocates for a continuous, adaptable post-occupancy evaluation system to monitor and support place value over time. This system should be flexible and context-specific, allowing NMIR initiatives to adapt to diverse urban settings globally, thus supporting long-term sustainability and thriving urban communities.

Keywords: neighbourhood micro-renewal (NMIR); post-occupancy evaluation (POE); place value; China

1. Introduction

Urban renewal is increasingly acknowledged as crucial for addressing sustainability challenges in outdated or underdeveloped neighbourhoods [1,2]. Traditionally, renewal initiatives prioritised demolition and reconstruction, at the expense of historical integrity and social cohesion, thereby hindering sustainable development [3–5]. Internationally, recent studies have shown similar shifts in countries like Switzerland, Turkey, Chile, and China, where small-scale, context-sensitive renewal strategies are increasingly valued for preserving local character and fostering social bonds [6–10]. Neighbourhood micro-renewal (NMIR) represents a vital example of this shift, aiming to improve the quality of buildings, communal spaces, and facilities through restoration and renovation, without changing the existing land use or main structures [11]. In addition to physical upgrades, NMIR also plays a crucial role in enhancing local architectural character, strengthening community ties, and preserving historical narratives and neighbourhood memory, a role similarly recognised in international studies [12–15].

Reflecting the broader benefits of NMIR, China has increasingly embraced this approach to address the evolving challenges and diverse demands within urban residential neighbourhoods. Attention towards NMIR gained momentum in 2018 when, during a visit to Guangzhou, President Xi emphasised the importance of ceasing large-scale demolitions and reconstructions in urban planning, advocating instead for NMIR to preserve and accentuate local characteristics. This perspective was further institutionalised through policy directives. In 2019, the Ministry of Housing and Urban-Rural Development (MOHURD) released the *Guidance for the Co-Creation of a Quality Environment and a Better Life in the Construction and Improvement of Urban and Rural Habitat*, followed by the State Council's (SC) *Guidance for Comprehensively Promoting Neighbourhood Rehabilitation* in 2020. Additionally, MOHURD, along with other departments, issued *Opinions on Carrying Out Actions to Make Up for Shortcomings in the Construction of Urban Residential Neighbourhoods*. They signalled a strategic shift toward a micro-rehabilitation or small-scale, human-centred renovation approach (commonly referred to as weigaizao or NMIR), replacing large-scale redevelopment as the primary renewal model [16,17]. Subsequently, local governments in major cities such as Shanghai, Guangzhou, and Wuhan have delineated NMIR objectives, processes, and operational mechanisms through regulations and technical guidelines, recommending specific renewal measures[1].

Despite the nationwide proliferation of NMIR practices, recent cases show that the efficacy of these initiatives remains largely uncertain [18,19]. Academic discourse concentrates on design principles, implementation strategies, and community engagement to ensure effective NMIR [20–24]. However, this body of research primarily focused on the preparation and implementation stages of NMIR, paying scant attention to post-occupancy evaluation (POE). This gap hampers the assessment of NMIR's actual impacts and the identification of opportunities for improvement [25,26]. To fill the gap, a growing number of researchers have started to evaluate NMIR projects from physical, environmental, and social perspectives after project completion [27–30]. Nevertheless, these studies lack a comprehensive framework to fully capture the multifaceted impacts on urban living [31,32]. Scholar Matthew Carmona's concept of place value stands out in this regard and aligns with a growing international focus on evaluating place quality, which offers a more encompassing perspective [33–35]. It includes the various forms of value—health, social, economic, and environmental—that derive from the quality of the built environment [33]. This concept provides a holistic framework for evaluating NMIR projects, ensuring they meet the specific needs of residents and align with the overarching policy objectives.

Utilising the concept of place value, this study sought to understand the impacts of NMIR on the urban neighbourhood. Wuhan was selected as the case study area due to its active engagement in NMIR initiatives. Recommendations are presented to better align place quality and place value with policy objectives and the sustainable well-being of urban neighbourhoods.

The rest of the paper is structured as follows. Section 2 reviews the evaluation criteria for renewal projects and the place value theory. Section 3 gives an overview of the NMIR in China. Section 4 introduces the case study area and the data collection and analysis methods. Section 5 presents the results. Section 6 discusses the findings and proposes policy implications. The paper concludes with limitations and future research directions.

2. Literature Review

The assessment of urban renewal efforts traditionally favours indicator-based methodologies, concentrating on metrics related to economic performance, resource use, and community benefits [36–39]. Various institutional frameworks are developed to include economic, environmental, and social dimensions as critical indicators for assessing urban regeneration impacts [40]. Environmental performance assessment in urban renewal projects has experienced substantial progress, propelled by innovative research that introduces advanced models and thorough indicators to aid sustainable decision-making. Lee and Chan [41] led the way with a comprehensive set of indicators designed explicitly for Hong

Kong's renewal efforts, implementing a points-scoring system to measure environmental quality aspects like air quality, greenery, and energy efficiency. Huang et al. [42] expanded upon this groundwork by developing an integrated model for sustainable urban renewal across China, merging social, economic, and environmental factors to allow for a holistic evaluation of projects. Chen et al. [28] advanced this methodology by promoting multi-scale models that address urban deterioration and pollution with a detailed benefits analysis, incorporating environmental, social, and economic indicators. Furthermore, Zheng et al. [43] contributed significantly by introducing models to facilitate sustainable urban renewal decision-making, emphasising reducing pollution and expanding green spaces as critical metrics. This body of work offered quantifiable metrics that gain acceptance within policymaking circles.

Despite its widespread application, this method was critiqued for its overreliance on quantitative data, which might not fully capture the nuanced impacts of urban renewal projects [44–49]. Moreover, the absence of standardised codes and regulations poses challenges in establishing reliable benchmarks, particularly for small-scale initiatives like NMIR.

In response to the limitations of traditional evaluation methods, the concept of place value, as theorised by Matthew Carmona [33], presents a holistic framework to understand the wide-ranging impacts of NMIR on renewed neighbourhoods comprehensively. This approach suggests a direct relationship between the quality of the built environment—encompassing health, social, economic, and environmental aspects—and its overall value to the neighbourhood. According to Matthew Carmona [33], the concept is a multifaceted construct that extends beyond physical characteristics to include social dynamics and environmental sustainability, positing that high-quality places confer substantial benefits on their users. As Figure 1 illustrates, the theory posits two key hypotheses: (1) places of higher quality yield greater value by aligning with and advancing public policy goals and (2) a self-reinforcing cycle exists where environments that offer value and align with policy objectives inherently possess higher quality.
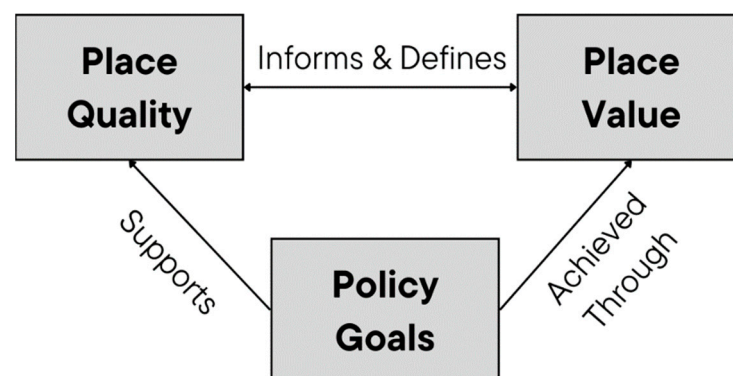
Figure 1. Interrelationships among place quality, place value, and policy goals (concluded from [33]).

Embracing the concept of place value into the evaluation of renewal initiatives represents a critical advancement in understanding the multifaceted impacts of such projects. Previous studies applying the place value lens to assess urban design impacts identified a broad range of values, including economic, physical health, and ecological sustainability aspects [50–52]. This approach ensures that evaluation indicators are in harmony with the complex needs of urban neighbourhoods, enabling projects to go beyond mere physical enhancements and contribute to the overall well-being and sustainability of communities.

Drawing on insights from existing studies and policy documents, this research identifies nine principal evaluation indicators structured around four key policy arenas—health, society, economy, and environment. These arenas were selected for their relevance in evaluating how policy interventions affect community well-being. As outlined in Carmona's concept of 'place value', these arenas reflect the primary ways that high-quality urban

spaces benefits residents: enhancing physical and mental health, fostering social cohesion, supporting economic vitality, and promoting environmental sustainability, among others. Each indicator aligns with these arenas to capture NMIR's impacts on urban communities, selected to reflect critical aspects consistently highlighted in the literature. Table 1 gives a detailed description of the indicators.

Table 1. Indicators for POE of NMIR.

Policy Arenas	Indicators	Descriptions	References
Health	Physical health	Including walkability, access to healthcare, air quality, and opportunities for physical activity	[30,53]
	Psychological health	Including the impact on residents' mental and emotional well-being and their access to mental health services	[54,55]
Society	Public security	Including safety, crime levels, social harmony, stability, and the effectiveness of security measures	[41,56]
	Social cohesion	Including the strength of social relationships, trust among residents, and the overall belonging of community	[57,58]
	Public facilities	Measuring the availability, accessibility, and quality of essential amenities and services, including culture, education, entertainment, and their impact on boosting urban vitality	[59–61]
Econ.	Public spending	Including all construction costs and the efficient allocation and utilisation of government funds	[59,62]
	Residential property quality and value	Including improvements in property condition, energy efficiency, and resident satisfaction, reflecting improvements in both physical and monetary aspects of housing	[59,60,63]
Envt.	Mobility and transportation	Including transport efficiency, accessibility, and sustainability; road improvements, traffic flow, and parking; reflecting impacts on mobility, connectivity, and resident infrastructure	[43,59,64]
	Environmental quality and value	Including the improvement of air and water quality, noise reduction, green spaces, open space, cleanliness, orderliness, resilience, and pollution control in community public areas	[59,65,66]

3. Background

Following China's economic reforms in 1978, the country witnessed a diversification in neighbourhood types. As Li et al. [67] noted, urban China is characterised by four primary kinds of housing and neighbourhoods: (1) pre-1949 tenements and lane- or courtyard-housing, reflecting historical living patterns; (2) work-unit (*Danwei*) compounds, a relic of the planned economy offering housing tied to one's place of employment; (3) commodity-housing estates, emerging from the privatisation and marketisation of housing; and (4) urban villages, which represent informal settlements often located on the peripheries of urban developments.

The diversification in housing types was significantly propelled by the housing reform of the 1990s, which sought to transition from a welfare-based housing allocation system, managed by the state and its enterprises, to a market-driven approach [68,69]. This transition catalysed the expansion of the real estate industry, resulting in a rapid increase in the development of commodity-housing estates throughout urban China. Consequently, these estates represent China's most prominent residential building market segment. Nevertheless, many of these estates were designed before the widespread use of motor vehicles, leading to traffic congestion, parking shortages, and pollution [70]. Additionally, many of these residential buildings predate the everyday use of elevators, creating accessibility issues, especially for elderly residents [71,72]. These factors make the 1990s commodity-housing estates prime candidates for China's ongoing micro-renewal initiatives [73].

While existing research documents the positive effects of NMIR on diverse neighbourhood types, such as urban villages and historic districts [74,75], the impact of these strategies on commodity-housing estates remains less explored. Despite this gap, the significance of these neighbourhoods within the scope of micro-renewal efforts cannot be

overstated. Their extensive distribution throughout urban China and their status as the primary residential areas for the urban populace render them crucial targets for renewal initiatives. Consequently, there is a pressing need for a detailed analysis to fully understand the impact of NMIR strategies.

4. Materials and Methods

This study adopted a balanced, indicator-based approach to enable a comprehensive and broadly applicable evaluation of NMIR initiatives. The methodology was designed to meet two key objectives: to identify indicators that effectively capture the place quality and to systematically assess the outcomes and long-term effects of NMIR initiatives. It was structured around a four-stage framework, as outlined in Figure 2. Step 1 involved a comprehensive review of the existing literature to compile a preliminary list of potential indicators. In Step 2, semi-structured interviews were conducted with various stakeholders, including planners, residents, and government officials, to validate the relevance of the identified indicators and adapt them to the specific context of China. Step 3 involved the application of the Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation (FCE) to assign weight and to rank the indicators according to their importance and to evaluate them comprehensively. In Step 4, the findings from the previous steps were synthesised to propose policy recommendations to enhance future NMIR applications.
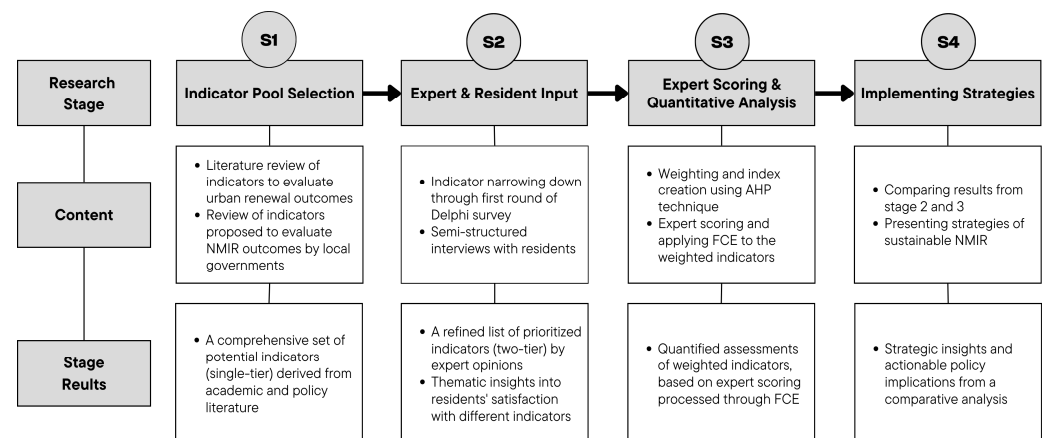

Figure 2. An overview of the research process (source: authors).

4.1. Case Study Area

Wuhan, China, was selected as the case study area. It is an interesting case for NMIR assessment, distinguished by two main reasons. Firstly, since 2020, Wuhan has launched 1264 NMIR projects [76], offering rich insights for stakeholders across public, private, and societal sectors into NMIR's implications. Secondly, while first-tier cities in China have been the focus of urban renewal research, second-tier cities like Wuhan—with their ageing neighbourhoods, tighter budgets, and conservative governance—represent an underexplored area that faces distinct challenges. Wuhan's experience thus provides crucial insights that can bridge the gap between theoretical knowledge and the practical needs of urban renewal in less developed urban contexts.

Specifically, five old neighbourhoods in Wuhan were selected for in-depth analysis (Figure 3): Shuilu, Huajinhuayuan, Jiangjunxincun, Qingcuiyuan, and Huanggangyuan. Except for Jiangjunxincun, which dates back to 1990, the others were established between 1995 and 2000. These areas span various districts within inner Wuhan, showcasing a blend of mature development and the pressing need for upgrades due to ageing infrastructure and facilities that no longer suffice for the current inhabitants. Shuilu, notable for being among Wuhan's largest older residential areas, is situated south of Wuchang Ancient City, spanning 0.55 km². Huajinhuayuan, in the Wuchang District, saw NMIR implementation through the joint efforts of 20 residents and urban planning experts. Positioned in Dongxihu

District, Jiangjunxincun is distinguished as both the oldest and most remote. Qingcuiyuan lies in Qingshan District, an area known historically for its industrial activities. Lastly, Huagangyuan, in the highly developed Jiang'an District, is the newest addition to these neighbourhoods.
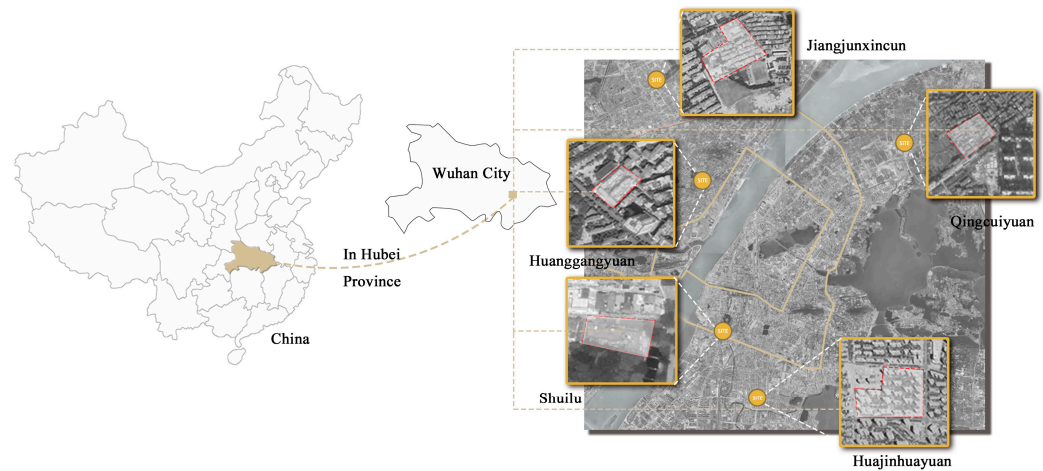

Figure 3. Location of Wuhan and selected neighbourhoods (source: authors).

Between 2017 and 2020, the studied neighbourhoods underwent a variety of micro-renewal efforts. These initiatives included revitalising building exteriors, enhancing road-side greenery, upgrading recreational facilities, optimising road networks and public parking, and removing unauthorised constructions. Figure 4 shows an overview of the NMIR outcomes and the daily usage within these five neighbourhoods.

(a) Green Areas and Fitness Equipment

(b) Exterior Façade Renovation

(c) Repurposed Ground-Floor Space

(d) Ent. w/ Pedestrian and Vehicle Segregation

(e) Shared Garden w/ Repurposed Landscape

(f) Waste Sorting Pavilion

Figure 4. Pictures after NMIR in the study neighbourhoods (source: authors).

4.2. Data Collection

4.2.1. Indicator Identification

The indicator selection process for this study followed a four-step methodology, as outlined by Coombes and Wong [77], comprising conceptual clarification, analytical structuring, specific indicator identification, and index creation. Initially, we conducted a comprehensive literature review to clarify core concepts and identify indicators commonly used in prior post-evaluations of urban renewal. This was supplemented by a targeted

review to ensure that NMIR outcomes align with local government standards and guidelines [78]. Through this approach, 9 primary indicators were organised across four policy areas, ensuring both academic rigor and relevance to local conditions, as outlined in Table 1. Subsequently, the initial 9 primary indicators were refined and condensed into 6 categories, which were then expanded into 22 more specific secondary indicators through consultations with experts and residents. As depicted in Table 2, these indicators ranged from quantitative and qualitative types, covering tangible aspects such as housing quality and public infrastructure, as well as intangible elements like community cohesion. Thus, the indicators in Table 2 built upon the initial criteria in Table 1, refined through stakeholder consultations to suit the specific context of NMIR in Wuhan.

Table 2. Indicators for post-occupancy evaluation of NMIR.

Policy Arenas	Primary Indicators	Secondary Indicators	Categories	
			Quanti.	Quali.
Economy	Residential property quality and value	Increasing property value	☑	
		Living conditions improvement		☑
		Residential infrastructure improvement		☑
		Building energy efficiency	☑	
Society and Health	Public facilities	Residential exterior maintenance		☑
		Cultural and recreational facilities improvement		☑
		Social service infrastructure improvement		☑
		Educational facilities improvement		☑
		Facility accessibility time	☑	
Environment and Health	Environmental quality and value	Noise reduction	☑	
		Community cleanliness		☑
		Quality of green and open space		☑
		Percentage of green and open space	☑	
Environment	Mobility and transportation	Pedestrian accessibility		☑
		Parking convenience		☑
		Increase in public transit	☑	
Society	Public security	Decreasing crime and accident rate	☑	
		Increasing confidence in security measures		☑
Society	Social cohesion	Residents' satisfaction with neighbourhood relations		☑
		Residents' sense of belonging		☑
		Social network density	☑	
		Participation rates in community activities	☑	

4.2.2. Delphi Method and Semi-Structured Interview

To further refine the indicator list and determine the weighting of these indicators, semi-structured interviews were conducted to assess their significance. For expert interviewees, consultations utilising the Delphi method were conducted. From January to March 2023, ten experts participated in refining and interpreting the list of indicators, with five also involved in the weight assignment process. Additionally, semi-structured interviews were conducted with residents and community workers within the five selected neighbourhoods. From March to July 2023, 28 interviews were conducted, supplemented by non-participant observations of the micro-renewal spaces.

Specifically, the expert panel involved multiple rounds of rating and feedback, to gather experts' opinions and judgments on the implementation performance of NMIR in Wuhan. The interviews were conducted in a dedicated, interruption-free environment to ensure a focused and confidential setting. Each session lasted between 40 and 60 min, allowing sufficient time for a comprehensive discussion. Techniques such as active listening, seeking clarification, and providing unconditional feedback were employed to reduce potential biases. Resident participants were approached using purposive sampling, specifically focusing on residents who had lived or would live in the neighbourhood for a

long time. The final sample covered diverse participant profiles including a wide range of genders, ages, educational levels, incomes, and types of occupations. This selection provided a comprehensive representation of perspectives relevant to NMIR impacts, ensuring diverse viewpoints from key demographic and social groups. The details of the interviewees are shown in Appendix A.

The interview protocol was reviewed and approved by the Human Research Ethics Committee of the authors' institution. All interviews were recorded, noted, and transcribed with the consent of the interviewees.

4.3. Data Analysis

4.3.1. Qualitative Data Analysis

To ensure methodological rigour, the qualitative analysis began with a cross-case thematic analysis. We adopted an open and reflective coding strategy to process the interview transcripts. This approach, facilitated by the widely used qualitative data analysis software NVivo 14, involved distilling each response into a concise meaning unit that captured its essence. For instance, a statement like "*Waste sorting has seen remarkable improvement, and there are numerous hand sanitisers conveniently placed near the bins...*" was succinctly coded as *Waste Management*. Then, the analysis shifted from a primarily descriptive to a more interpretive approach. The focus was on integrating these concepts, like *Waste Management*, into broader, more complex thematic categories. For example, *Waste Management* was classified under *Environmental Quality*. The process involved carefully balancing inductive and deductive reasoning, transitioning from the participants' narratives to a more theoretical interpretation of the data. By this, the coding evolved into first- and second-order themes, enriching the thematic framework with greater depth and theoretical alignment.

4.3.2. Quantitative Data Analysis—A Combination of AHP and FCE

The identified indicators were synthesised into an index using an Analytic Hierarchy Process (AHP) to assign weights. AHP ensures a balanced representation by including the expert-assigned importance of each indicator. Meanwhile, to obtain objective and measurable insights on how well NMIR works in selected neighbourhoods, we combined the AHP with Fuzzy Comprehensive Evaluation (FCE). FCE is a comprehensive evaluation approach based on fuzzy numerology. Based on membership theory, it uses fuzzy mathematics to quantitatively assess qualitative evaluations, providing a thorough evaluation of subjects influenced by multiple factors [79]. The combination leads to more comprehensive outcomes in intricate decision-making and evaluation contexts, addressing multifaceted factors and uncertainties [80]. This integration is particularly relevant to this research's context, where evaluating NMIR performance demanded the consideration of diverse factors that frequently impact one another, alongside the intricate balancing of stakeholders' multifaceted goals.

AHP

An improved AHP method was applied to assign weights to the indicators identified in the panel sessions and interviews. First, due to the different dimensions and magnitude of selected indicators, all indicators needed to be normalised and converted into similar measurement scales. It was assumed that micro-renewal projects have *n* independent evaluation indexes in *m* samples. It used the minimum–maximum re-scaling method to normalise the positive index with Formula (1) below and negative index with the Formula (2). The smaller the negative index value is, the better performance is.

$$Y_{ij} = \frac{P_{ij} - Min_j(P_{ij})}{Max_j(P_{ij}) - Min_j(P_{ij})}, \tag{1}$$

$$Y_{ij} = \frac{Max_j(P_{ij}) - P_{ij}}{Max_j(P_{ij}) - Min_j(P_{ij})}, \tag{2}$$

in which indicator P_{ij}'s normalised value is Y_{ij} *and* P_{ij} is the original value of indicator i for sample community j. Secondly, we needed to determine the indicator's AHP value. The judgment matrix in the evaluation model of the NMIR projects represents the relative importance of each index, as shown below:

$$A_u = (a_{ij})_{m \times m} = \begin{pmatrix} 1 & \dots & a_{1m} \\ \dots & \dots & \dots \\ a_{m1} & \dots & 1 \end{pmatrix} \tag{3}$$

in which A_u is the judgment matrix and a_{ij} is indicator i's relative importance to indicator j, which ranges from 1 to 9.

FCE

FCE was conducted in two steps. First, the evaluation determinant subset was divided into 6 subsets according to different indicators' attributes, denoted as $U_1, U_2, \dots, U_6$, meeting the following conditions:

$$\bigcup_{i=1}^{6} U_i = U \ \ U_i \bigcap U_j = \varphi \tag{4}$$

For each subset $U_i = \{U_{i1}, U_{i2}, \dots, U_{in}\}$, where $i = 1, 2, \dots, 6$, we conducted a comprehensive evaluation on each U_i according to the first-level model. It assumes that for the judge set $V = \{v, v_2, \dots, v_5\}$, $U_i's$ weight distribution is $W_i = \{w_{i1}, w_{i2}, \dots, w_{in}\}$, $\sum_{j=1}^{ni} w_{ij} = 1$, and U_i's single indicator evaluation matrix is R_i. So, a comprehensive evaluation in the first level is: $B_i = W_i * R_i = (b_{i1}, b_{i2}, \dots, b_{im})$ and $i = 1, 2 \dots 6$. Secondly, U_i is treated as an element and B_i is used as its single indicator evaluation, thus:

$$R = \begin{bmatrix} B_1 \\ B_2 \\ \dots \\ B_6 \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} & \dots & b_{1m} \\ b_{21} & b_{22} & \dots & b_{2m} \\ \dots & \dots & \dots & \dots \\ b_{61} & b_{62} & \dots & b_{6m} \end{bmatrix} \tag{5}$$

Each U_i is a part of U, reflecting certain attributes of U, and its weight can be assigned according to its importance: $W = (w_1, w_2, \dots, w_6)$; thus, it can obtain the second-level comprehensive evaluation:

$$B = W * R = (b_1, b_2, \dots, b_6) \tag{6}$$

Finally, based on the principle of maximum membership degree, the grade of the evaluation indicators can be determined after the micro-renewal of five neighbourhoods in Wuhan.

5. Results

5.1. Indicators of NMIR

5.1.1. Property Quality and Value

Resident interviewees frequently reflected on the improvements in residential property quality and value. In examining this indicator, a nuanced narrative emerged, reflecting a dichotomy between aesthetic enhancement and resident convenience. As interviewee N12, a resident of Jiangjunxincun, noted, "*The fresh paint on our buildings has breathed new life into our community*". However, alongside this positive note, residents' narratives also echoed frustrations over the construction disturbances, with reports of constant noise and disruption. This aspect of their experience highlighted the unintended consequences of such aesthetic-focused projects. The repeated reference to aesthetic image *(fengmao xingxiang)* in official documents underscores a policy inclination towards projects that

deliver an immediate visual impact, ostensibly improving ageing infrastructure while potentially fortifying the perceived effectiveness and authority of the governing bodies.

However, this emphasis on external facade enhancements sometimes overshadows the practical aspects of residents' daily lives. For instance, the disruptions caused by facade construction activities point to a significant gap in balancing these visible improvements with the actual lived experiences of community members. This dichotomy highlights a broader urban renewal challenge—the need to align policy-driven aesthetic ambitions with authentic enhancements in living conditions. A more resident-centric approach that recognises the impacts of such projects on daily life is crucial.

5.1.2. Public Facilities

The NMIR initiative's enhancement of public facilities profoundly transformed community life in Wuhan, extending beyond the visible realm to crucial yet often overlooked aspects of municipal infrastructure. According to community committee members, critical interventions involved upgrading drainage systems and public utility lines, addressing issues like flooding in low-lying areas during heavy rains, and enhancing aesthetic appeal and safety by relocating utility lines underground. Such improvements have had a marked impact on daily life, not only elevating the physical landscape but also mitigating safety hazards like entangled wires and makeshift clotheslines. Furthermore, NMIR's revamp of public spaces and utilities impacts residents' well-being. Transforming unused areas into practical amenities, notably intelligent charging stations for electric vehicles, directly addressed residents' needs, as many interviewees reported. Residents also reported a notable increase in opportunities for social interaction and leisure, facilitated by new additions like small pavilions or public seating areas. This indicated a positive shift not only in the physical realm but also in the psychological fabric of community life. To some extent, from residents' perceptions, these initiatives effectively address the quality, safety, and well-being of life in these communities.

5.1.3. Environmental Quality and Value

Environmental quality emerged as a crucial factor in residents' discussions. According to the official guidelines for NMIR in Wuhan [78], the public space environment is a crucial component, encompassing green areas, landscapes, lighting, and communal spaces. Residents noted substantial improvements in these areas. Before NMIR, neighbourhoods like Qingcuiyuan faced poor hygiene and overcrowding issues, addressed through infrastructure overhauls. For instance, a resident highlighted the elimination of persistent problems like dripping water from outdated drainage systems. The transformation of public spaces in places like Huajinghuayuan was notable, with residents observing reclaimed areas now serving communal purposes: "*The revitalisation of parks, squares, and fitness areas has significantly enriched our social and leisure activities*". Beyond aesthetics, these changes include practical improvements such as enhanced waste management and hygiene facilities. Introducing do-it-yourself flower beds and well-maintained lawns exemplifies NMIR's commitment to beautifying and creating healthier, more sustainable living spaces. Residents appreciated this shift towards a cleaner and more organised environment, recognising its positive impact on community health and well-being.

5.1.4. Mobility and Transportation

However, discussions on mobility and transportation revealed a mixed picture. These neighbourhoods, developed before the prevalence of private cars in China, faced significant challenges with parking due to the lack of underground facilities. NMIR interventions have targeted these issues, with NR18, a Huagangyuan resident, noting, "*Parking convenience and public transport accessibility have significantly improved*". Such enhancements demonstrate NMIR's success in addressing accessibility and convenience in transportation. However, this positive development was not uniform across all areas. In less-centred neighbourhoods

like Jiangjunxincun, residents grapple with insufficient ground-level parking, highlighting the complexities inherent in urban transportation planning in densely populated areas.

Another critical focus of NMIR's transportation strategy has been maintaining and upgrading pedestrian infrastructure, which is crucial for enhancing safety and mobility, especially for vulnerable populations like older people. In Huajinghuayuan, residents welcomed improvements such as repairing deteriorated sidewalks and implementing separate entryways for pedestrians and vehicles. *"The rectification of damaged sidewalks has greatly improved pedestrian mobility"*, shared NR7, underscoring the tangible impact of these interventions. While NMIR has advanced mobility and transportation, the disparate experiences across different communities indicated a continuing need for focused efforts to achieve equitable and comprehensive enhancements in urban transportation infrastructure.

5.1.5. Public Security

Public security was another area where NMIR's impact was felt strongly, with residents from five communities acknowledging the substantial improvements in safety measures. Advanced lighting and surveillance enhancements, especially cited by NR10, a Jiangjunxincun resident, significantly increased the sense of security during nighttime. This shift in safety perception, covering aspects like crime rates and overall security, was further affirmed by a Shuilu resident, NR1, who praised the new traffic signs and pedestrian crossings for enhancing safety, particularly for the elderly and children. In addition, NMIR's infrastructure repair and increased surveillance have positively impacted residents' sense of safety. Notably, a Huajinghuayuan resident, NR8, highlighted the role of heightened patrols and camera installations in improving security, especially for women. Fire safety initiatives, including addressing blocked fire escapes, as mentioned by a Qingcuiyuan resident, NR12, further demonstrate NMIR's commitment to comprehensive safety improvements. Collectively, these efforts have not only upgraded physical security infrastructure but also bolstered residents' confidence in neighbourhood safety, aligning with the broader goals of urban development for creating safer, more secure living environments.

5.1.6. Social Cohesion

Interestingly, social cohesion was the domain where opinions varied most. Residents recognised the physical upgrades but highlighted a gap in social engagement post-NMIR. NR15, a resident from Qingcuiyuan, encapsulated this sentiment, noting, *"Despite visible enhancements, limited types of communal activities have weakened our sense of belonging"*. This subjective indicator, assessing residents' connections and sense of belonging, revealed mixed reactions to NMIR's impact. The challenges in organising activities like square dancing in constrained spaces often led to conflicts in Qingcuiyuan. At the same time, a Huajinghuayuan resident, NR5, pointed out the influx of new neighbours, especially tenants, but a lack of deeper relational ties. This reflected a broader issue of diminished neighbourhood identity and participation. Furthermore, as noted by many residents, the scarcity of initiatives fostering neighbourly relations impedes social cohesion. They emphasised the importance of developing social connections. In summary, NMIR's significant physical transformations bring to light the need for parallel efforts to bolster social cohesion. Bridging this gap is critical to enhancing the physical infrastructure and the social dynamics of urban communities, underscoring the holistic nature of NMIR.

The in-depth interviews across five communities indicated a nuanced impact of NMIR on urban living. Particularly notable was the emphasis on *Environmental Quality* and *Public Security*, which residents frequently cited as profoundly impacting their daily lives. The transformation of public spaces and upgrades in safety measures was highly valued. However, the aspect of *Social Cohesion* elicited mixed responses. While the physical upgrades were generally appreciated, a considerable number of residents voiced concerns about inadequate community engagement and social activities, underscoring a gap in fostering deeper community bonds and participation. The predominant sentiment among residents was that the most marked and beneficial changes were observed in environmental- and

security-related improvements. Yet, there was a strong call for more concerted efforts towards strengthening social cohesion, with residents highlighting its critical role in enhancing the overall quality of life. In summary, while NMIR has significantly improved various facets of urban living, the feedback from residents pointed to an essential need for a balanced approach.

5.2. Ranking and Weight of Indicators

5.2.1. Results of AHP

After performing weight calculations using the SuperDecisions V3.2 software, we determined the weights of evaluation indicators at two levels. The importance of each secondary indicator was determined by multiplying its weight vector by the weight vector of the higher-level indicator to which it belonged, represented as $w_{in} \times w_i$. This comprehensive weight was used to rank the importance of the 22 indicators. As shown in Table 3, the top five indicators that experts prioritised were increasing confidence in security measures, social service infrastructure improvement, facility accessibility time, quality of green and open spaces, and decreasing crime and accident rates. Conversely, more intangible indicators like residents' sense of belonging were considered less important. Table 4 displays the score results for assessing NMIR performance in five selected neighbourhoods.

The weight vector of the first-level index is following:

$$W = [0.120, 0.317, 0.196, 0.055, 0.284, 0.028]$$

The weight vector of the second-level index is following:

$$w_1 = [0.230, 0.382, 0.107, 0.039, 0.244]$$
$$w_2 = [0.132, 0.479, 0.050, 0.339]$$
$$w_3 = [0.050, 0.339, 0.479, 0.132]$$
$$w_4 = [0.292, 0.605, 0.103]$$
$$w_5 = [0.250, 0.750]$$
$$w_6 = [0.507, 0.296, 0.053, 0.144]$$

Table 3. Weight of indicators and importance ranking.

Primary Index & Weight	Secondary Index and Weight	Rank
Residential property quality and value ($w_1 = 0.120$)	Increasing property value ($w_{11} = 0.230$)	11
	Living conditions improvement ($w_{12} = 0.382$)	7
	Residential infrastructure improvement ($w_{13} = 0.107$)	16
	Building energy efficiency ($w_{14} = 0.039$)	20
	Residential exterior maintenance ($w_{15} = 0.244$)	10
Public facilities ($w_2 = 0.317$)	Cultural and recreational facilities improvement ($w_{21} = 0.132$)	8
	Social service infrastructure improvement ($w_{22} = 0.479$)	2
	Educational facilities improvement ($w_{23} = 0.050$)	14
	Facility accessibility time ($w_{24} = 0.339$)	3
Environmental quality and value ($w_3 = 0.196$)	Noise reduction ($w_{31} = 0.050$)	17
	Community cleanliness ($w_{32} = 0.339$)	6
	Quality of green and open spaces ($w_{33} = 0.479$)	4
	Percentage of green and open spaces ($w_{34} = 0.312$)	12
Mobility and transportation ($w_4 = 0.055$)	Pedestrian accessibility ($w_{41} = 0.292$)	13
	Parking convenience ($w_{42} = 0.605$)	9
	Increase in public transit ($w_{43} = 0.103$)	19
Public security ($w_5 = 0.284$)	Decreasing crime and accident rate ($w_{51} = 0.250$)	5
	Increasing confidence in security measures ($w_{52} = 0.750$)	1
Social cohesion ($w_6 = 0.028$)	Residents' satisfaction with neighbourhood relations ($w_{61} = 0.507$)	15
	Residents' sense of belonging ($w_{62} = 0.296$)	18
	Social network density ($w_{63} = 0.053$)	22
	Participation rates in community activities ($w_{64} = 0.144$)	21

Table 4. Index score results.

Primary Index	Secondary Index	Index Score (N)
Residential property quality and value (w_1)	Increasing property value (w_{11})	6
	Living conditions improvement (w_{12})	5
	Residential infrastructure improvement (w_{13})	6
	Building energy efficiency (w_{14})	4
	Residential exterior maintenance (w_{15})	5
Public facilities (w_2)	Cultural and recreational facilities improvement (w_{21})	9
	Social service infrastructure improvement (w_{22})	8
	Educational facilities improvement (w_{23})	6
	Facility accessibility time (w_{24})	6
Environmental quality and value (w_3)	Noise reduction (w_{31})	5
	Community cleanliness (w_{32})	6
	Quality of green and open spaces (w_{33})	4
	Percentage of green and open spaces (w_{34})	6
Mobility and transportation (w_4)	Pedestrian accessibility (w_{41})	8
	Parking convenience (w_{42})	3
	Increase in public transit (w_{43})	4
Public security (w_5)	Decreasing crime and accident rate (w_{51})	6
	Increasing confidence in security measures (w_{52})	5
Social cohesion (w_6)	Residents' satisfaction with neighbourhood relations (w_{61})	6
	Residents' sense of belonging (w_{62})	4
	Social network density (w_{63})	7
	Participation rates in community activities (w_{64})	4

5.2.2. Results of FCE

The deterministic judgment matrixes of six primary indicators by five experts follow. The evaluation matrix of "Residential property quality and value" is as below:

$$R_1 = \begin{bmatrix} 0 & 0 & 0.5 & 0.5 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0.5 & 0.5 & 0 \\ 0 & 0.5 & 0.5 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

The evaluation matrix of "Public facilities" is as below:

$$R_2 = \begin{bmatrix} 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0.5 & 0.5 \\ 0 & 0 & 0.5 & 0.5 & 0 \\ 0 & 0 & 0.5 & 0.5 & 0 \end{bmatrix}$$

The evaluation matrix of "Environmental quality and value" is as below:

$$R_3 = \begin{bmatrix} 0 & 0 & 0.5 & 0 & 0 \\ 0 & 0 & 0.5 & 0.5 & 0 \\ 0 & 0.5 & 0.5 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

The evaluation matrix of "Mobility and transportation" is as below:

$$R_4 = \begin{bmatrix} 0 & 0 & 0 & 0.5 & 0.5 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0.5 & 0.5 & 0 & 0 \end{bmatrix}$$

The evaluation matrix of "Public security" is as below:

$$R_5 = \begin{bmatrix} 0 & 0 & 0.5 & 0.5 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

The evaluation matrix of "Social cohesion" is as below:

$$R_6 = \begin{bmatrix} 0 & 0 & 0.5 & 0.5 & 0 \\ 0 & 0.5 & 0.5 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0.5 & 0.5 & 0 & 0 \end{bmatrix}$$

The findings of FCE are as follows:

$$B_1 = W_1 * R_1 = [0, 0.019, 0.181, 0.168, 0]$$
$$B_2 = W_2 * R_2 = [0, 0.025, 0.330, 0.579, 0]$$
$$B_3 = W_3 * R_3 = [0, 0.240, 0.434, 0.301, 0]$$
$$B_4 = W_4 * R_4 = [0.605, 0.657, 0.052, 0.146, 0.146]$$
$$B_5 = W_5 * R_5 = [0, 0, 0.875, 0.125, 0]$$
$$B_6 = W_6 * R_6 = [0, 0.220, 0.473, 0.307, 0]$$

Then, the evaluation results of the performance of the NMIR projects of the conventional residential neighbourhoods in Wuhan are as follows:

$$B = W * R = W * \begin{bmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \\ B_6 \end{bmatrix} = \begin{bmatrix} 0.120 \\ 0.317 \\ 0.196 \\ 0.055 \\ 0.284 \\ 0.028 \end{bmatrix} \times \begin{bmatrix} 0 & 0.019 & 0.181 & 0.168 & 0 \\ 0 & 0.025 & 0.330 & 0.579 & 0 \\ 0 & 0.240 & 0.434 & 0.301 & 0 \\ 0.605 & 0.657 & 0.052 & 0.146 & 0.146 \\ 0 & 0 & 0.875 & 0.125 & 0 \\ 0 & 0.220 & 0.473 & 0.307 & 0 \end{bmatrix}$$
$$= [0.043, 0.099, 0.506, 0.314, 0.028]$$

The FCE results analysis are as follows. According to the principle of maximum membership degree, the maximum membership degree value corresponding to the "general" level was 0.506, which means that the possibility of the NMIR performance being rated as "general" was 50.6%. Likewise, the possibility of a "very dissatisfied" rating was 4.3%; the possibility of a "very satisfied" rating was 2.8%; the possibility of a "less satisfied" rating was 31.4%; and the possibility of a "satisfied" rating was 9.9%. Table 5 shows the rating level for each primary and secondary indicator.

The results indicated the evaluation of 4 secondary indicators, including cultural and recreational facilities improvement, social service infrastructure improvement, facility accessibility time, and pedestrian accessibility, suggests that the performance of the NMIR project is "satisfied", whereas the evaluation of 12 secondary indicators, such as living conditions improvement and social network density, fell within the "general" category. The evaluation of green and open spaces' quality and increase in public transit fell between "general and less satisfied". Additionally, the evaluation results for four secondary indicators were categorised as "less satisfied", including building energy efficiency, parking convenience, residents' sense of belonging, and participation rates in community activities. Therefore, the overall evaluation grade of the NMIR project in conventional residential neighbourhoods in Wuhan was "general". This implied that there is still room for improvement in fully meeting the needs of the residents.

Table 5. Rating level of evaluation index.

Primary Index	Rating Level	Secondary Index	Rating Level
Residential property quality and value	General	Increasing property value	General
		Living conditions improvement	General
		Residential infrastructure improvement	General
		Building energy efficiency	Less satisfied
		Residential exterior maintenance	General
Public facilities	Satisfied	Cultural and recreational facilities improvement	Satisfied
		Social service infrastructure improvement	Satisfied
		Educational facilities improvement	General
		Facility accessibility time	Satisfied
Environmental quality and value	General	Noise reduction	General
		Community cleanliness	General
		Quality of green and open spaces	Between general and less satisfied
		Percentage of green and open spaces	General
Mobility and transportation	Satisfied	Pedestrian accessibility	Satisfied
		Parking convenience	Less satisfied
		Increase in public transit	Between general and less satisfied
Public security	General	Decreasing crime and accident rate	General
		Increasing confidence in security measures	General
		Residents' satisfaction with neighbourhood relations	General
Social cohesion	Less satisfied	Residents' sense of belonging	Less satisfied
		Social network density	General
		Participation rates in community activities	Less satisfied

6. Discussion

6.1. Consensus and Conflict Between Expert and Resident Perceptions of NMIR Indicators

Similarities and variances emerge in evaluating indicators' importance and satisfaction levels in the nuanced juxtaposition of resident and expert perspectives. They shed light on the underlying complexities inherent in NMIR projects, revealing different priorities and expectations between those who experience these changes first-hand and those who plan them.

First, regarding the importance of indicators, there was a notable consensus between residents and experts in prioritising environmental quality and public security. Both groups agreed on the critical importance of these areas, acknowledging their direct impact on enhancing the quality of urban life and ensuring the community's safety. Also, there was a divergence in the weighting of other indicators. Residents, with their immediate experiences of the NMIR's impact, strongly preferred tangible improvements that directly enhance their daily lives. This was exemplified in their emphasis on better housing conditions and accessibility of public facilities. Such priorities underscored their desire for visible, immediate enhancements that improve their living environment, reflecting a practical approach grounded in everyday realities. In contrast, the experts demonstrated a broader, more strategic perspective. While they acknowledged the significance of physical improvements, their evaluations often considered long-term urban health and systemic changes. This perspective was particularly evident in their approach to social cohesion. In this area, residents strongly desired more attention, which experts may have overlooked in their more structural evaluations.

However, the satisfaction levels painted a more complex picture. Residents and experts expressed general satisfaction with environmental quality improvements and public facilities and security enhancements. Residents frequently cited these areas as profoundly impacting their daily lives, resonating with expert evaluations. Also, experts and residents agreed on the less satisfying performance of NMIR on social cohesion, whereby residents voiced concerns about inadequate community engagement and social activities post-NMIR,

indicating a gap in fostering deeper community bonds and participation. Expert evaluations also reflected a lack of satisfaction here, albeit for different reasons. Experts might have recognised the challenges in achieving social cohesion through physical upgrades alone, highlighting a need for more focused strategies on community-building initiatives.

A notable difference in satisfaction levels emerged in the context of residential property quality and value. Residents expressed mixed feelings about the aesthetic-focused upgrades in their living spaces, often citing the inconvenience caused by construction activities. This reflected a more profound need for a more resident-centric approach, balancing physical enhancements with the residents' comfort. In their evaluations, experts focused on the long-term structural benefits of such upgrades, potentially overlooking the short-term disruptions these activities entailed. This discrepancy suggests a gap in understanding the full spectrum of resident experiences during the implementation of NMIR projects. A similar divergence in perceptions was observed in mobility and transportation. Residents, particularly in high-density areas like Jiangjunxincun, reported persistent challenges, such as inadequate parking facilities, highlighting the ongoing struggles in daily commutes. This contrasted with the more favourable evaluations from experts, who appeared to appraise these improvements within the broader context of urban efficiency and future-oriented planning. This assessment difference underscores the complexities of addressing transportation needs in densely populated urban landscapes. It hints at a potential misalignment between expert-driven urban efficiency goals and the immediate transportation realities residents face.

In China's NMIR projects, stakeholders like residents, local governments, and businesses each bring a unique role to the renewal process [17,81]. This multi-stakeholder involvement naturally creates differing priorities and levels of satisfaction with project outcomes. The disparities in indicators' importance and satisfaction levels between residents and experts can be ascribed to their inherently different perspectives. Residents' evaluations focused on NMIR's immediate impact on daily life, emphasizing practical concerns, while experts prioritized long-term goals and structural improvements within broader urban planning principles. Residents' quality-of-life needs lead them to value usability and immediate benefits, whereas local governments, as decision-makers, focus on aligning projects with policy objectives [19]. Where NMIR did not adequately address residents' practical needs, such as transportation and social infrastructure, satisfaction levels were lower among the community members. Experts, meanwhile, gauged satisfaction based on the NMIR's contribution to the overarching urban development objectives. This contrast highlights the necessity of integrating resident-centric perspectives with strategic urban planning goals, ensuring a balanced approach in NMIR projects that cater to both the immediate community needs and long-term sustainability.

6.2. The Application of Place Value Theory in the POE of NMIR

Carmona's framework emphasises the multidimensional concept of 'place value' extending beyond physical environments to include social and environmental sustainability [33]. This concept aligns well with our study on the nuanced interplay among place quality, place value, and public policy goals. This triangular relationship is evident in Wuhan's NMIR as the project's focus on improving community spaces addresses public policy goals across health, society, the economy, and the environment. This approach reaffirms the hypotheses that higher-quality places offer greater value through their influence on public policy goals and environments that generate value and support policy goals inherently possess greater quality.

In this research, using key policy arenas to inspire evaluative indicators innovatively bridged public policy with place quality and value. This strategic approach is exemplified by creating pedestrian-friendly environments and green spaces in Wuhan's NMIR. This intervention reduces traffic speeds, air pollution, and accidents, enhances environmental quality, and elevates place social value by creating more attractive and liveable areas. This increases community engagement and well-being, aligning with health and environmental

policy arenas. Another example is the enhancement of public safety and accessibility within these redesigned spaces, which not only aligns with socio-environmental policy objectives but also significantly raises property values in the market, thereby fulfilling economic policy aims. The synergy between these improved place qualities and policy objectives justifies using policy arenas to inspire the indicators, ensuring a comprehensive assessment that encapsulates the multifaceted impact of NMIR on place quality and value. Through this lens, the success of NMIR exemplifies the effectiveness of using policy-driven criteria to evaluate urban regeneration.

However, Wuhan's case not only supports the place value theory but also highlights the unique aspects of China's community micro-renewal context. Unlike Carmona's view, which suggests that high-quality places naturally yield social benefits, our study indicates that improvements in environmental quality and social cohesion do not arise solely from quality enhancements. Instead, these gains are achieved through focused, policy-driven efforts that rely on close collaboration between local governments and residents, as recent studies suggested [82,83]. This alignment between policy objectives and community needs offers a fresh perspective on applying the place value theory in similar community renewal initiatives. Furthermore, our study underscores the key role of social capital—social networks, trust building, and community participation—in fostering sustainable development. This finding is supported by other research [84–86], which emphasised the importance of these pillars in urban renewal, thereby broadening the application of the place value theory in China's micro-renewal context.

Therefore, a detailed post-effect evaluation of Wuhan's NMIR is imperative to understand its broader impacts. This evaluation should focus on immediate outcomes and long-term effects on community engagement, environmental sustainability, and economic vitality. Insights from this evaluation, alongside the contrasting views of experts and residents discussed in S4, underscore the need for nuanced strategies in urban regeneration. These diverse perspectives reveal the complexity of aligning NMIR with varied stakeholder needs. The forthcoming section will delve more deeply into policy recommendations and strategic directions, contemplating how future NMIR initiatives can more effectively align with evolving community needs and sustainable development objectives. Such an approach will ensure that urban improvements are responsive but also inclusive and forward-looking.

6.3. Research Implications

Based on the empirical analysis and related discussions, this research offers several recommendations for government authorities and planners, derived from the post-effect evaluation of Wuhan's NMIR projects, to enhance the overall sustainability of future community micro-renewal efforts. Firstly, government authorities need to facilitate the integration of resident and expert perspectives in NMIR projects, particularly during the planning and design stages, as highlighted in S4's analysis. The government should implement policies and frameworks encouraging active community engagement and ensure expert recommendations align with community needs. Initiatives such as public consultations and participatory design workshops are instrumental in capturing a range of viewpoints, thus enriching urban renewal strategies. This involvement addresses issues like social cohesion, where resident experiences often provide invaluable insights that diverge from expert assessments. Such a collaborative approach not only enhances project acceptance but also strengthens its impact, ensuring urban renewal strategies are both technically sound and neighbourhood-focused.

Secondly, the concept of place value should be deeply integrated into urban renewal, focusing on enhancing residents' quality of life and the community environment. This approach demonstrates the need for urban planners to balance environmental, social, and economic aspects, reflecting the core policy goals of sustainable urban development. In Wuhan's NMIR, for example, the enhancement of green spaces uplifted environmental quality and played a crucial role in enhancing social well-being. This improvement in

place quality directly supports policy goals related to social cohesion and environmental sustainability. Governments can further these objectives by creating policies that fund and support projects prioritising such multifaceted values. This holistic approach, where environmental enhancements are coupled with social benefits, demonstrates how improved place quality can fulfil broader policy goals, ultimately contributing to the overall place value. The synergy between place quality improvements and policy goals is a crucial mindset for creating more sustainable urban environments.

Thirdly, government authorities should intensify the implementation of post-effect evaluations in NMIR policy development, particularly emphasising long-term sustainability and the overall growth of communities. As evidenced by Wuhan's NMIR project, this evaluation should extend beyond immediate outcomes to consider the long-term effects on community engagement, environmental sustainability, and economic growth. The mixed responses from residents on social cohesion and balancing aesthetic and functional aspects in Wuhan's NMIR project point to the need for more refined urban regeneration strategies. Urban planners and policymakers can use these insights to develop projects that not only enhance physical infrastructure but also foster social interactions and community well-being. For instance, they could initiate more community-based programs and activities in newly developed green spaces to encourage social cohesion. Furthermore, ongoing monitoring and adjustment mechanisms are vital to adapt urban regeneration efforts to evolving urban landscapes, ensuring they remain relevant and effective.

7. Conclusions

The recognised significance of neighbourhood micro-renewal (NMIR) lies in its effectiveness in enhancing residents' quality of life, boosting social capital, and beautifying living environments, particularly in older urban housing estates where infrastructure is ageing and functionalities are declining. However, a gap persists in evaluating the effectiveness and performance of NMIR initiatives, particularly in early commodity-housing estates. This study addresses this need by assessing NMIR's impact on place quality and developing a structured evaluation method. Our approach, based on a comprehensive methodological framework, examines four key arenas—health, society, economy, and environment—that are crucial to residents' daily lives and central to government objectives. Employing a four-stage process, our methodology combined indicator selection through desk research, stakeholder consultations, prioritisation using the Analytic Hierarchy Process (AHP), synthesis through Fuzzy Comprehensive Evaluation (FCE), and comparative analysis. This process led to the development of 6 primary and 22 secondary indicators, with an assessment of satisfaction from both residents and experts. It thoroughly evaluates NMIR's immediate physical changes and broader social and environmental impacts in urban neighbourhoods.

The research's key findings respond to its objectives, revealing NMIR's substantial impact on urban living. Notable improvements were observed in residential property quality, public facilities, and environmental quality, enhancing aesthetics and functionality. However, the study also identified challenges such as construction disruptions and parking and pedestrian infrastructure issues. The influence on social cohesion varied, with physical improvements not always correlating with stronger community bonds. These results underscore NMIR's multifaceted influence, highlighting significant progress in environmental and security improvements, while also revealing areas needing further attention, particularly in social cohesion and infrastructural development. The varied outcomes suggest the necessity of an integrated approach in future NMIR projects. This research enriches the understanding of NMIR's impact on place value and broadens academic discourse on a crucial residential category in contemporary China. By focusing on 'place value', the study offers insights into how NMIR initiatives are aligned with resident needs and policy goals.

The research also encountered several limitations. First, the limited number of experts available for consultation and scoring narrowed the range of professional perspectives. Second, insufficient personal networks and time constraints resulted in limited interaction

with residents on site. While the 28 interviews provided a broad spectrum of insights, we acknowledge that a larger sample size could potentially capture additional nuances. Third, the absence of ongoing NMIR projects during the fieldwork, as all projects were completed, restricted our direct observation of community activities and stakeholder engagement. Additionally, the impact of external factors, such as the COVID-19 pandemic on residents' participation in NMIR activities, merits deeper exploration, especially concerning pandemic-related lockdowns in China. Future research could thoroughly review various urban renewal mechanisms to enhance the applicability and understanding of NMIR evaluations in different urban contexts.

Appendix A

Table A1. Profile of the research participants.

Group	Cd.	Position	Profile	Participated in Scoring?
District Government	D1	Section Director	Bureau of Housing Management at district level; housing development and management specialist; over 20 years of working experience.	No
	D2	Senior Officer	Commission of Development and Reform; urban renewal specialist; over 10 years of experience managing renewal projects of different scales.	No
	D3	Section Director	Branch of Natural Resources and Planning Bureau at sub-district level; urban planning specialist; 20 years of experience in planning; implemented over 20 NMIR projects.	Yes
Municipality	M1	Senior Officer	Bureau of Natural Resources and Planning; urban renewal specialist; over 15 years of working experience; participated in drafting guidelines for NMIR in Wuhan.	Yes
	M2	Section Director	Bureau of Public Security; security management and urban planning specialist; over 10 years of experience in urban safety and security planning.	No
Academia	A1	Professor	Professor in urban planning and design, University A; specializing in participatory design and community well-being; over 30 years of research and teaching experience.	Yes
	A2	Professor	Professor in urban planning and design, University B; specializing in sustainable design and low-impact urban development; over 15 years of experience researching sustainable urban renewal strategies.	Yes
	A3	Professor	Professor in architecture, University A; specializing in residential architecture design; over 10 years of experience in residential community planning and design.	No
Planning Practice	P1	Director	Independent design consultancy; urban design specialist; over 10 years of experience in urban design practice; over 5 years of experience in NMIR projects.	No
	P2	Senior Planner	Planning & Design Institute; urban renewal specialist; over 20 years of experience in planning and design; over 5 years of experience in NMIR projects.	Yes

Table A2. Profile of the societal interviewees.

Group	Cd.	Profile
Resident	NR1	Homeowner, female, 70 years old, secondary school, retired, income below city median. Living in Shuilu for 22 years.
	NR2	Homeowner, male, 52 years old, bachelor's degree, income around city median. Living in Shuilu for 17 years.
	NR3	Tenant, female, 37 years old, bachelor's degree, income above city median. Rented in Shuilu for around 5 years.
	NR4	Homeowner, male, 45 years old, master's degree, income above city median. Living with parents in Shuilu for around 3 years.
	NR5	Homeowner, male, 36 years old, bachelor's degree, income around city median. Living in Huajinghuayuan for 8 years.
	NR6	Tenant, female, 42 years old, bachelor's degree, income above city median. Rented in Huajinghuayuan for around 3 years.
	NR7	Homeowner, male, 61 years old, high school, retired, income below city median. Living in Huajinghuayuan for 20 years.
	NR8	Homeowner, male, 24 years old, master's degree, income around city median. Living in Huajinghuayuan for 18 years.
	NR9	Tenant, female, 78 years old, illiterate, has no income. Rented in Huajinghuayuan for around 5 years.
	NR10	Homeowner, male, 74 years old, high school, retired, income below city median. Living in Jiangjunxincun for over 30 years.
	NR11	Tenant, male, 49 years old, high school, income below city median. Rented in Jiangjunxincun for around 6 years.
	NR12	Homeowner, female, 55 years old, bachelor's degree, income around city median. Living in Jiangjunxincun for 15 years.
	NR13	Tenant, male, 33 years old, master's degree, income around city median. Rented in Jiangjunxincun for around 2 years.
	NR14	Tenant, female, 80 years old, secondary school, retired, income below city median. Rented in Qingcuiyuan for 5 years.
	NR15	Homeowner, female, 46 years old, bachelor's degree, income around city median. Living in Qingcuiyuan for 15 years.
	NR16	Tenant, female, 69 years old, illiterate, has no income. Rented in Qingcuiyuan for around 3 years.
	NR17	Homeowner, male, 40 years old, master's degree, income above city median. Living in Qingcuiyuan for 12 years.
	NR18	Homeowner, female, 38 years old, master's degree, income above city median. Living in Huanggangyuan for 13 years.
	NR19	Homeowner, male, 58 years old, bachelor's degree, income above city median. Living in Huanggangyuan for 10 years.
	NR20	Tenant, male, 27 years old, master's degree, income around city median. Rented in Huanggangyuan for around 2 years.
	NR21	Homeowner, male, 77 years old, high school, retired, income below city median. Living in Huanggangyuan for 18 years.
	NR22	Homeowner, female, 42 years old, master's degree, income above city median. Rented in Huanggangyuan for 4 years.
Community-based organisation	CO1	Community worker, member of neighbourhood committee in Shuilu, female.
	CO2	Community worker, head of neighbourhood committee in Huajinghuayuan, female.
	CO3	Community worker, member of neighbourhood committee in Huajinghuayuan, male.
	CO4	Community worker, deputy head of neighbourhood committee in Jiangjunxincun, male.
	CO5	Community worker, member of neighbourhood committee in Qingcuiyuan, female.
	CO6	Head, self-management group of Huanggangyuan, male.

Note

1. Guidelines for the design of micro-upgrading of Guangzhou old community: https://www.gz.gov.cn/550590033/2.2/201808/2c367695f0b84d8ea8aa367561c9c158/files/74ab3a190e4e40f28b33c0cfd4ecc3f7.pdf, accessed on 18 June 2021; Guidelines for the micro-reconstruction planning of communities in Wuhan: https://zrzyhgh.wuhan.gov.cn/xxfw/ghzs/202105/t20210517_1699705.shtml, accessed on 17 May 2021; Guidelines on the "three microgovernments" in Shanghai: https://www.shyp.gov.cn/shypq/xwzx-ypyw/20191202/345553.html, accessed on 2 December 2019.

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