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RESIDENTIAL WELL-BEING OF URBAN COMMUNITIES IN DENSELY POPULATED CITIES IN CHINA

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School of Design

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School of Architecture

Residential Well-being of Urban Communities in Densely Populated Cities in China

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A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of
Philosophy

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CERTIFICATE OF ORIGINALITY

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_____(Signed)

WEI Xintong (Name of student)

Abstract

In the process of China's rapid urbanisation, the urban population is increasing rapidly, and densely populated cities are gradually becoming inevitable. The compact urban spatial environment and the large number of permanent residents bring a lot of problems to the residential well-being of urban residents and at the same time affect their sense of well-being and psychological health. Therefore, it is of great social significance to explore how to use urban community environment to intervene in residents' psychological well-being and promote their residential well-being from the perspective of architecture. Research on community environment design strategies for well-being needs to adopt a multidisciplinary cross vision, utilising the theories and methodologies of psychology, sociology, environmental psychology, architecture, philosophy and other multidisciplinary disciplines, to solve the problems of densely populated cities' community environments and to satisfy the residential well-being needs of urban residents. Based on the theoretical foundations of the research on built environment and mental health and the interpretation of the traditional Chinese ethical concept of well-being, this study proposes the design concept, ethical values and procedural methods of design for well-being. Combined with literature research, stakeholder surveys, multi-stakeholder questionnaire surveys and interview surveys and case study analyses, the study explains that the meaning of residential well-being, extracts the key elements affecting the residential well-being of densely populated cities, constructs a fuzzy evaluation model of residential well-being and quantitatively analyses the mechanism of "the built environment - well-being promotion". And then, from the two aspects of the optimization of the physical environment and the creation of non-physical residential well-being, the design concept and the ethical value of design for well-being have been developed. Design for well-being is then proposed as a practical strategy to satisfy the three dimensions of residents' needs for well-being in terms of optimising physical environment well-being and creating non-physical environment well-being.

Drawing on the theories of healthy community and well-being cognition, the study proposes a theoretical basis for the research on the association between residential well-being and environment. Starting from the theory of healthy cities, the study explores how to promote health from the perspective of urban planning and architecture from a macro perspective while also focusing on the relationship between the neighbourhood environment and health from a micro

level and delineates the research scope of the community environment for this study. Based on the research on the impact of the built environment on mental well-being that has been conducted, the importance of the research on the interaction between environment and mental well-being is clarified and it also side by side proves the feasibility of the research on the environmental design intervention on residential well-being, which provides a strong theoretical support for this study. At the same time, the introduction of psychology theory of well-being to clarify the well-being in this study from the value base of objective well-being from Aristotelian. In terms of research methodology and technique, it adopts the subjective well-being line of thought, which focuses on personal well-being. Emotional cognition theory and local attachment theory provide scientific theoretical support for this study's approach to the relationship between residents and community environmental factors.

With the goal of building community environments for well-being, the study puts forward the concept of design for well-being in urban community environments based on the pyramid of human needs and the ethics of living. The ethical value of design for well-being of community environments "living in home - living in peace - living well - living in well-being" is proposed. The design for well-being promotion is the core value and the design for well-being is built around the combination of material, social and spiritual attributes. Also, the implementation method of the design for well-being is discussed according to the sequence of the design for well-being process. Based on the basic theory of design for well-being, the study proposes a conceptual model of "residential well-being", which is used to evaluate whether the quality of the community environment can satisfy the demand for well-being by the results of residents' perception. The study takes the community environment of Shenzhen as an example to demonstrate the process of design for well-being, uses the questionnaire survey method and interview method to analyse the needs and determine the influencing factors of the design for residential well-being in the urban community, quantifies the index weights of the influencing factors of residential well-being by using the hierarchical analysis method and fuzzy comprehensive evaluation method and constructs a fuzzy comprehensive evaluation model of "environment-well-being". The fuzzy comprehensive evaluation model quantifies the mechanism between built environment and well-being promotion, which helps designers deeply understand the complex relationship between environment and well-being. Finally, the study addresses the

environmental problems of densely populated cities communities oriented towards the three dimensions of well-being needs and proposes an overall design strategy based on well-being promotion using survey research and case studies. Also, the study proposes a design for well-being strategy in terms of optimisation of the physical environment for well-being and creation of the non-physical environment for well-being.

From the perspectives of realising the Chinese dream and building a better living environment, this study explores the design for well-being in the context of densely populated cities community environments with the goal of building a well-being high-density urban community environment and the design problem of balancing multi-stakeholders in a limited space to satisfy the well-being needs of residents. The concept and theory of "design for well-being" with the core value of well-being promotion, the construction of a fuzzy comprehensive evaluation model for the environment of densely populated cities from the quantification of the index of "residential well-being" and the interpretation of the mechanism of the built environment and well-being promotion can be applied to the future development of densely populated cities in China. The concept of residential well-being and related theories, the construction of a fuzzy comprehensive evaluation model of high-density urban community environment from the quantification of "residential well-being" indicators and the interpretation of the role of built environment-well-being promotion mechanism can be applied to the future design and renovation of high-density populated cities. Using the organic integration of psychology, sociology, architecture and other disciplines, the study clarifies the role of designers in the process of design for well-being and the delineation of multi-stakeholder responsibilities and proposes procedures and methods from the designers' point of view that can help support the design for well-being of Chinese future urban neighbourhood environments.

Publications Arising from Thesis

Journal paper

Wei, X., Zou, G., Siu, K.W.M. (2022). Multifactors Affecting Residential Well-Being in Urban Communities of Shenzhen Incorporating Intelligent Technologies, *Mobile Information Systems*, 9.

Wei, X., Zou, G., Siu, K.W.M. (2022). Residential well-being of the built environment in urban communities. *Low Temperature Architecture Technology*, 44(12), 30–33. (in Chinese)

Wei, X., Zou, G., Siu, K.W.M. (2023). Environmental design strategies for well-being community based on the theory of emotional cognition. *Contemporary Architecture*, (02), 122-124. (in Chinese)

Conference paper

Wei, X., Zou, G. (2018). Study on Residential well-being and Its Influencing Factors in Urban Residential Areas. *Proceedings of the 14th International Symposium for Environment-Behavior Studies*. EBRA.

Wei, X., Zou, G., Siu, K.W.M. (2019). Identification of Residential Well-Being Factors in Urban Community Design. *AHFE* (15), 490–499.

Wei X., Zou G. (2020). Travel experiences of the elderly in Winter Cities: A case study in Harbin. *Proceedings of the 14th International Symposium for Environment-Behavior Studies*. EBRA.

Wei, X., Zou, G., Siu, K.W.M. (2020). Emotional Factors on Residential Well-Being in Densely Populated Cities. In *ICCREM 2020 - Intelligent Construction and Sustainable Buildings*. American Society of Civil Engineers (ASCE).

Wei, X., Zou, G., Siu, K.W.M. (2021). Influencing Factors of Residential Well-being under COVID-19. *AHFE* (14), 115–124.

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Appendix 1 Summary of design guidelines related to the built environment

Country	Promulgating agency	Design guideline
US	Urban Land Institute,2013	The Principles for Building Healthy Places
	NYC Health Department,2014	Active Design: Community Guidelines
	NYC,2013	Active Design Guidelines: Promoting Physical Activity and Health in Design
	City and County of San Francisco,2011	Better Streets Plan: Policies and Guidelines for the Pedestrian Realm
	Michigan Department of Community Health,2006	Design Guidelines for Active Michigan Communities
China	China Society for Urban Science,2020	Healthy Community Evaluation Criteria T/CECS650-2020,T/CSUS 01-2020
	Shanghai Municipal Administration of Planning and Land Resources,2017	Shanghai 15-minute Community Life Circle Planning Guidelines
United Nations	UN Environment Programme,2018	Sustainable Urban Development and Livable Garden Community
UK	Local Government Improvement and Development and Planning Advisory Service,2010	Community Engagement in Plan Making
	Urban Land Institute,2014	Active by Design: Designing places for healthy lives
	Commission for Architecture and the Built Environment,2007	Space Shaper
Canada	Toronto Public Health,2014	Activity City: Designing for health
	Ontario Professional Planners Institute,2007	Healthy Communities Sustainable Communities
	Ontario Professional Planners Institute,2009	Planning By Design: a healthy communities handbook
	Ontario Professional Planners Institute,2009	The shape of things to come: improving health through community planning
Australia	National Heart Foundation,2009	Healthy Spaces & Places
	National Heart Foundation,2011	Creating Healthy Neighbourhoods
	Department of Local Government,2008	Creating Active Communities: Physical Activity Guidelines for Local Councils
	Heart Foundation,2004	Healthy by Design-Victoria 2004
	Heart Foundation,2009	Healthy by Design- Tasmania 2009
	Western Australian Council of State School Organisations,2009	Healthy Environments Healthy Children

Appendix 2 Results of the path test for the role of environmental satisfaction on residential well-being

	a	b	c'	a*b	c	Conclusion
Greenspace => convenience => residential well-being	0.053	0.093	0.013	0.004929	0.104	Insignificant
Greenspace => comfort => residential well-being	0.184	0.026	0.013	0.004784	0.104	Insignificant
Greenspace=>security=>residential well-being	0.119	0.094	0.013	0.011186	0.104	Partly intermediated
Greenspace => belonging => residential well-being	0.073	0.035	0.013	0.002555	0.104	Insignificant
Greenspace=>pleasure=>residential well-being	0.213	0.199	0.013	0.042387	0.104	Masking
Neighbourhood => convenience => residential well-being	-0.03	0.093	0.16	-0.00279	0.166	Insignificant
Neighbourhood => comfort => residential well-being	-0.032	0.026	0.16	-0.000832	0.166	Insignificant
Neighbourhood => security => residential well-being	0.111	0.094	0.16	0.010434	0.166	Insignificant
Neighbourhood => belonging => residential well-being	0.082	0.035	0.16	0.00287	0.166	Insignificant
Neighbourhood => pleasure => residential well-being	-0.038	0.199	0.16	-0.007562	0.166	Insignificant
Accessibility => convenience => residential well-being	0.54	0.093	0.078	0.05022	0.161	Insignificant
Accessibility => comfort => residential well-being	0.151	0.026	0.078	0.003926	0.161	Insignificant
Accessibility => security => residential well-being	0.069	0.094	0.078	0.006486	0.161	Insignificant
Accessibility=>belonging=>residential well-being	0.008	0.035	0.078	0.00028	0.161	Insignificant
Accessibility=>pleasure=>residential well-being	-0.031	0.199	0.078	-0.006169	0.161	Insignificant
Public spaces and facilities=>convenience=>residential well-being	-0.082	0.093	0.125	-0.007626	0.176	Insignificant
Public spaces and facilities=>comfort=>residential well-being	0.181	0.026	0.125	0.004706	0.176	Insignificant
Public spaces and facilities=>security=>residential well-being	0.005	0.094	0.125	0.00047	0.176	Insignificant
Public spaces and facilities=>belonging=>residential well-being	0.239	0.035	0.125	0.008365	0.176	Insignificant
Public spaces and facilities=>pleasure=>residential well-being	0.076	0.199	0.125	0.015124	0.176	Fully intermediated
Management=>convenience=>residential well-being	0.022	0.093	0.199	0.002046	0.255	Insignificant
Management=>comfort=>residential well-being	0.13	0.026	0.199	0.00338	0.255	Insignificant
Management=>security=>residential well-being	0.052	0.094	0.199	0.004888	0.255	Insignificant
Management=>belonging=>residential well-being	-0.075	0.035	0.199	-0.002625	0.255	Insignificant
Management=>pleasure=>residential well-being	0.199	0.199	0.199	0.039601	0.255	Partly intermediated
Housing quality=>convenience=>residential well-being	0.182	0.093	-0.059	0.016926	0.029	Insignificant
Housing quality=>comfort=>residential well-being	0.211	0.026	-0.059	0.005486	0.029	Insignificant
Housing quality=>security=>residential well-being	0.017	0.094	-0.059	0.001598	0.029	Insignificant
Housing quality=>belonging=>residential well-being	0.121	0.035	-0.059	0.004235	0.029	Insignificant
Housing quality=>pleasure=>residential well-being	0.141	0.199	-0.059	0.028059	0.029	Masking
Culture=>convenience=>residential well-being	0.038	0.093	-0.021	0.003534	0.006	Insignificant
Culture=>comfort=>residential well-being	0.105	0.026	-0.021	0.00273	0.006	Insignificant
Culture=>security=>residential well-being	-0.045	0.094	-0.021	-0.00423	0.006	Insignificant
Culture=>belonging=>residential well-being	0.127	0.035	-0.021	0.004445	0.006	Insignificant
Culture=>pleasure=>residential well-being	0.015	0.199	-0.021	0.002985	0.006	Insignificant

Appendix 3 Results of the path test for the role of positive affect on residential well-being

	a	b	c'	a*b	c	Conclusion
convenience=>greenspace=>residential well-being	0.064	0.013	0.093	0.000832	0.172	Insignificant
convenience=>neighbourhood=>residential well-being	0.05	0.16	0.093	0.008	0.172	Insignificant
convenience=>accessibility=>residential well-being	0.565	0.078	0.093	0.04407	0.172	Insignificant
convenience=>public spaces and facilities=>residential well-being	-0.078	0.125	0.093	-0.00975	0.172	Insignificant
convenience=>management=>residential well-being	0.094	0.199	0.093	0.018706	0.172	Fully intermediated
convenience=>housing quality=>residential well-being	0.304	-0.059	0.093	-0.017936	0.172	Insignificant
convenience=>culture=>residential well-being	0.044	-0.021	0.093	-0.000924	0.172	Insignificant
comfort=>greenspace=>residential well-being	0.193	0.013	0.026	0.002509	0.131	Insignificant
comfort=>neighbourhood=>residential well-being	0.083	0.16	0.026	0.01328	0.131	Insignificant
comfort=>accessibility=>residential well-being	0.13	0.078	0.026	0.01014	0.131	Insignificant
comfort=>public spaces and facilities=>residential well-being	0.185	0.125	0.026	0.023125	0.131	Masking
comfort=>management=>residential well-being	0.102	0.199	0.026	0.020298	0.131	Masking
comfort=>housing quality=>residential well-being	0.182	-0.059	0.026	-0.010738	0.131	Insignificant
comfort=>culture=>residential well-being	0.082	-0.021	0.026	-0.001722	0.131	Insignificant
security=>greenspace=>residential well-being	0.11	0.013	0.094	0.00143	0.13	Insignificant
security=>neighbourhood=>residential well-being	0.036	0.16	0.094	0.00576	0.13	Insignificant
security=>accessibility=>residential well-being	0.055	0.078	0.094	0.00429	0.13	Insignificant
security=>public spaces and facilities=>residential well-being	-0.012	0.125	0.094	-0.0015	0.13	Insignificant
security=>management=>residential well-being	0.051	0.199	0.094	0.010149	0.13	Insignificant
security=>housing quality=>residential well-being	-0.008	-0.059	0.094	0.000472	0.13	Insignificant
security=>culture=>residential well-being	-0.056	-0.021	0.094	0.001176	0.13	Insignificant
belonging=>greenspace=>residential well-being	0.051	0.013	0.035	0.000663	0.089	Insignificant
belonging=>neighbourhood=>residential well-being	0.316	0.16	0.035	0.05056	0.089	Masking
belonging=>accessibility=>residential well-being	0.012	0.078	0.035	0.000936	0.089	Insignificant
belonging=>public spaces and facilities=>residential well-being	0.126	0.125	0.035	0.01575	0.089	Insignificant
belonging=>management=>residential well-being	-0.131	0.199	0.035	-0.026069	0.089	Insignificant
belonging=>housing quality=>residential well-being	0.065	-0.059	0.035	-0.003835	0.089	Insignificant
belonging=>culture=>residential well-being	0.104	-0.021	0.035	-0.002184	0.089	Insignificant
pleasure=>greenspace=>residential well-being	0.493	0.013	0.199	0.006409	0.371	Insignificant
pleasure=>neighbourhood=>residential well-being	0.021	0.16	0.199	0.00336	0.371	Insignificant
pleasure=>accessibility=>residential well-being	0.005	0.078	0.199	0.00039	0.371	Insignificant
pleasure=>public spaces and facilities=>residential well-being	0.282	0.125	0.199	0.03525	0.371	Fully intermediated
pleasure=>management=>residential well-being	0.289	0.199	0.199	0.057511	0.371	Fully intermediated
pleasure=>housing quality=>residential well-being	0.238	-0.059	0.199	-0.014042	0.371	Insignificant
pleasure=>culture=>residential well-being	0.017	-0.021	0.199	-0.000357	0.371	Insignificant

Appendix 4 The questionnaire sample

QUESTIONNAIRE ON RESIDENTIAL WELL-BEING IN THE URBAN COMMUNITY
城市居住区环境幸福感调查问卷

HELLO! THIS QUESTIONNAIRE AIMS TO UNDERSTAND THE RESIDENTS' SATISFACTION AND PERCEPTIONS WITH THE LIVING COMMUNITY ENVIRONMENT, AND TO CREATE A BETTER LIVING ENVIRONMENT FOR THE PUBLIC. I GUARANTEE THAT ALL INFORMATION OF THIS QUESTIONNAIRE WILL BE ONLY USED FOR THE ACADEMIC RESEARCH, AND ANY PERSONAL INFORMATION WILL NOT BE DISCLOSED OR USED FOR OTHER PURPOSES. THANK YOU FOR YOUR COOPERATION! HAVE A NICE DAY!

您好！本问卷为了解居民对于现居住社区环境的满意程度和心理感受进行调查，旨在创造更良好的居住环境，特此保证这份调查问卷所有信息仅作为学术研究使用，您的任何个人信息不会被泄露或用作其他用途，感谢您的配合！

THERE ARE FOUR SECTIONS IN THIS QUESTIONNAIRE. IT MAY TAKE YOU 5-10 MINUTES.
本问卷共分为四个部分，大约会花费 5-10 分钟。

SECTION 1 – BASIC PERSONAL INFORMATION. PLEASE CHOOSE THE CORRECT ANSWER WHICH MATCHES YOUR REAL SITUATION.

第一部分为您的基本信息。请根据您的真实情况勾选对应的答案。

B1: YOUR BIOLOGICAL GENDER 您的性别	<input type="checkbox"/> MALE 男 <input type="checkbox"/> FEMALE 女
B2: YOUR AGE 您的年龄	<input type="checkbox"/> 15-34 <input type="checkbox"/> 35-59 <input type="checkbox"/> > 60
B3: YOUR EDUCATION DEGREE 您的受教育程度	<input type="checkbox"/> 高中及以下 <input type="checkbox"/> 大学本科/大专 <input type="checkbox"/> 研究生（硕士/博士）
B4: WHO DO YOU LIVE WITH? 您与谁同住在这个小区？	<input type="checkbox"/> YOURSELF 自己 <input type="checkbox"/> FAMILY MEMBERS 家人 <input type="checkbox"/> ROOMMATES 合租室友 <input type="checkbox"/> OTHERS 其他
B5: HOW LONG HAVE YOU LIVED IN THIS COMMUNITY? 您在此小区居住了多久？	<input type="checkbox"/> 1 年以内 <input type="checkbox"/> 1-5 年 <input type="checkbox"/> 5 年以上
B6: HOW MANY TIMES WILL YOU USE THE PUBLIC SPACES OF THE COMMUNITY IN A WEEK? 您一周会有几次在此小区内部的公共空间进行活动？	<input type="checkbox"/> 0-1 <input type="checkbox"/> 2-4 <input type="checkbox"/> >5
B7: HOW MANY TIMES WILL YOU USE THE PUBLIC SPACES AROUND THE COMMUNITY IN A WEEK? 您一周会有几次在此小区周边的公共空间进行活动？	<input type="checkbox"/> 0-1 <input type="checkbox"/> 2-4 <input type="checkbox"/> >5

SECTION 2 – YOUR RESIDENTIAL WELL-BEING IN THE COMMUNITY. THERE ARE FIVE LEVELS: VERY HAPPY (5 POINTS), HAPPY (4 POINTS), AVERAGE (3 POINTS), UNHAPPY (2 POINTS), TOTALLY UNHAPPY (1 POINT). PLEASE CHOOSE THE CORRECT ANSWER WHICH MATCHES YOUR REAL PERCEPTIONS. 第二部分请您对在此小区居住的整体幸福感进行评价。幸福感的强烈程度也分为五个等级，非常幸福（5 分），比较幸福（4 分），一般幸福（3 分），不太幸福（2 分），完全不幸福（1 分）。请根据您的真实感受在对应的幸福程度内写“√”。

	VERY HAPPY 非常幸福	HAPPY 比较幸福	AVERAGE 一般幸福	UNHAPPY 不太幸福	TOTALLY UNHAPPY 非常不幸福
<p>Q1: HOW MUCH OF RESIDENTIAL WELL-BEING YOU FEEL WHEN LIVING IN THIS COMMUNITY?</p> <p>您认为您居住在这个小区的整体幸福感如何？</p>					
<p>Q2: WHICH THREE FACTORS WOULD MOSTLY IMPACT YOUR RESIDENTIAL WELL-BEING IN THE COMMUNITY? 在下列因素中您认为最能影响您的居住幸福感的因素，请选择三个因素。</p> <p> <input type="checkbox"/> GREENSPACE 绿化空间 <input type="checkbox"/> UTILITIES 周边公共设施 </p> <p> <input type="checkbox"/> NEIGHBOURHOOD 邻里关系 <input type="checkbox"/> COMMUNITY MANAGEMENT 小区物业管理 </p> <p> <input type="checkbox"/> PUBLIC TRANSPORTATION 周边公共交通 <input type="checkbox"/> QUALITY OF HOUSING 住宅的质量 </p> <p> <input type="checkbox"/> PUBLIC SPACE AND FACILITIES 内部公共空间与设施 <input type="checkbox"/> OTHERS 其他_____ </p>					
<p>Q3: HOW DO YOU RANK THE SENSE OF FIVE EMOTIONS WHEN LIVING IN THE COMMUNITY?</p> <p>请将下列情绪按影响大小进行排序，对您的居住幸福感的影响最大的情绪排为 1，影响最小的为 5。</p> <p> <input type="checkbox"/> SENSE OF CONVENIENCE 便利感(居住在这里我感到出行，生活很方便) </p> <p> <input type="checkbox"/> SENSE OF COMFORT 舒适感(这里的规划布局，设施摆放等让我感到很舒适) </p> <p> <input type="checkbox"/> SECURITY 安全感(这里的治安管理让我感到很安全) </p> <p> <input type="checkbox"/> SENSE OF BELONGING 归属感(居住在这我感到我是小区的一份子，有社区归属感) </p> <p> <input type="checkbox"/> SENSE OF PLEASURE 愉悦感(小区的公共环境，建筑外观等让我感到内心愉快) </p>					

SECTION 3 – SATISFACTION WITH THE COMMUNITY. THE SATISFACTION LEVEL IS DIVIDED INTO FIVE LEVELS: TOTALLY SATISFIED (5 POINTS), MORE SATISFIED (4 POINTS), GENERAL (3 POINTS), LESS SATISFIED (2 POINTS), TOTALLY DISSATISFIED (1 POINT). PLEASE CHOOSE THE CORRECT ANSWER WHICH MATCHES YOUR REAL PERCEPTIONS.

第三部分为您对于以下社区情况的满意程度的了解。一共分为五个等级，非常满意（5 分），比较满意（4 分），一般满意（3 分），不太满意（2 分），非常不满意（1 分）。请根据您的真实感受选择您的满意程度，在对应的空格里写“√”。

HOW SATISFIED ARE YOU WITH THE FOLLOWING IN THIS COMMUNITY? 您对此小区的以下方面的满意程度是什么？	TOTALLY SATISFIED 非常满意	MORE SATISFIED 比较满意	GENERAL 一般满意	LESS SATISFIED 不太满意	TOTALLY DISSATISFIED 非常不满意
S1: THE AREA OF GREENSPACE 绿化空间（绿色植物的面积，种类等）					
S2: THE NEIGHBOURHOOD QUALITY 邻里关系（与邻居或小区内居民相处）					
S3: THE ACCESSIBILITY TO PUBLIC TRANSPORTATION 公共交通的可达性（距离，交通工具的种类等）					
S4: THE PUBLIC SPACE AND FACILITIES DESIGN IN THE COMMUNITY 小区内部的公共空间和设施设计（活动场地的面积，健身器材的数量，垃圾桶的设置等）					
S5: THE UTILITIES SURROUNDING THE COMMUNITY 小区周边的公共设施（商业，医院，学校等）					
S6: COMMUNITY MANAGEMENT (WASTE, HEALTH, SECURITY) 小区物业管理（垃圾回收，卫生清洁，安全性等）					
S7: THE QUALITY OF HOUSING (LAYOUT, TOWARDS, SOUNDPROOF) 住宅的质量（平面空间，朝向，隔音效果等）					

SECTION 4 – EMOTIONAL LEVEL WHEN STAYING IN THE COMMUNITY. THE LEVELS OF DIFFERENT EMOTIONS ARE ALSO CORRESPONDED TO FIVE LEVELS: VERY STRONG (5 POINTS), STRONG (4 POINTS), AVERAGE (3 POINTS), WEAK (2 POINTS), VERY WEAK (1 POINT). PLEASE CHOOSE THE CORRECT ANSWER WHICH MATCHES YOUR REAL PERCEPTIONS. 第四部分请您对生活在此小区期间产生以下不同情绪的强烈程度进行自我评价。情绪的强烈程度也分为五个等级，非常强烈（5分），比较强烈（4分），一般强烈（3分），比较弱（2分），非常弱（1分）。请根据您的真实感受选择对应的情绪程度。

HOW MUCH OF THE FOLLOWING EMOTIONS YOU FEEL IN THIS COMMUNITY? 您在此小区感受到的以下情绪的强烈程度?	VERY STRONG 非常强烈	STRONG 比较强烈	AVERAGE 一般	WEAK 比较弱	VERY WEAK 非常弱
E1: SENSE OF CONVENIENCE 便利感(居住在这里我感到出行，生活很方便)					
E2: SENSE OF COMFORT 舒适感(这里的规划布局，设施摆放等让我感到很舒适)					
E3: SENSE OF SECURITY 安全感(这里的治安管理让我感到很安全)					
E4: SENSE OF BELONGING 归属感(居住在这我感到我是小区的一分子，有社区归属感)					
E5: SENSE OF PLEASURE 愉悦感(小区的公共环境，建筑外观等让我感到内心愉快)					

OPTIONAL QUESTION: WHAT ELSE DO YOU THINK SHOULD BE ADVOCATED OR IMPROVED IN YOUR COMMUNITY?

【选填】您认为您居住的小区还有那方面需要被提倡或需要改进的呢？

THIS IS THE END OF THE QUESTIONNAIRE. THANK YOU FOR YOUR COOPERATION! HAVE A NICE DAY!

所有问卷已结束，感谢您的配合。祝您生活愉快！

CHAPTER 1 INTRODUCTION

1.1 Background of the study

Since the Chinese economic reform in 1978, China has been in a state of rapid development, with significant growth in GDP. Accelerated urbanization and growth in urban population have been central parts of this process. The result of urbanization is a large increase in the number of people living in crowded spaces and illegal or informal settlements (World Health Organization, 1992). The process of accelerated urban construction brought a series of problems into people's lives and environments and many mental health problems are associated with poor-quality housing (WHO, 1992). Researchers have increasingly recognized that environment plays an important role in public health. In this context, environmental psychology emerged as a distinct approach to the study of human behaviour in 1950s. Environmental psychology is generally defined as the study of interaction between people and their environment (Fridgen, 1984). Some scholars consider environmental psychology as a part of psychology rather than an independent discipline, for it analyses the relationship between experiences, activity of people and physical environment (Fraiberg, 1977). The emergence of environmental psychology began after the Second World War, when people started to think about the role of psychology in architecture and buildings and the impact of environmental variables on human psychology (Vlek, 2000). From the 1970s, American scholars and practicing professionals began to research the environmental factors affecting living standards. By the 1990s, researchers began to focus on a specific city or country (Knox and Taylor, 1995). Moreover, research on the relationship between the quality of living environment and the attitude of residents became popular (Jiboye, 2012), scholars tended

to find out the relationship between physical space and people's subjective attitudes to optimize the space and promote public mental health (Varni et al., 2004; Crouch, 2015).

Besides, there has been considerable evidence showing that people living in urban spaces, in densely populated cities, experience increased rates of stress and depression and the living environment plays an important role in such situations. According to the data as of 2015, the total number of people living with anxiety disorders in the world was 264 million which reflected a 14.9% increase since 2005, while the number of people living with depression increased by 18.4% between 2005 and 2015, because of population growth and aging (World Health Organization, 2017). Furthermore, the report declared that an estimated 4.4% of global population suffers from a depressive disorder and 3.6% from anxiety disorder. The increasing proportion of mental disorders leads to poorer public health outcomes, so global researchers begin to focus on how to improve the public mental health from different research fields. Originally, some small-scale studies were conducted to study the associations between the built environment and mental disorders (Weich, 2002; Araya et al., 2007). Then, in the context of high-density cities, scholars began to study the importance of environment in the improvement of urban living quality, psychological health and well-being of urban residents (Lung et al., 2014; Sansom et al., 2017). Many researchers focus on exploring impact factors of individual's satisfaction with various aspects of their lives, such as job, community and shopping experiences (Diaz & Rhodes, 2018; Park et al., 2018; Yi & Nataraajan, 2018). Also, some studies have focused on the health benefits of certain types of spaces, such as blue and green spaces (Lachowycz et al., 2012; Wheeler et al., 2012; Costello et al., 2019; Cronin-de-Chavez et al., 2019). The discussions of psychological health and well-being mostly focus on concepts such as life satisfaction, quality of life and subjective well-being. However, there are few studies

focusing on the association between the built environment and emotions and on the residential well-being including self-evaluation. Therefore, in the context of the increase of population density and mental health problems caused by rapid urbanization, this study explores the relationship between high-density urban environment and positive mental health, to improve the psychological problems brought by high-density environment through design intervention.

1.2 Gap for this study

Although in the process of exploration, researchers found that some factors in the built environment may affect people's cognitive or psychological aspects, there is a lack of the general understanding of the association between the built environment and mental health. In fact, it is difficult to measure and collect data of the mental health as well as that of physical health, because people's mental state is very complicated, and people often judge their mental health by describing and coding events and feelings. Sometimes, researchers also identify the factors indirectly affecting mental health by studying whether they influence other elements that are closely related to mental health. For example, if the physical activity has been proven to affect the physical health and physical health has been shown to be closely linked to mental health, then the physical activity can be considered indirectly affects the mental health. At this point, the lack of systematic research regarding the factors in the built environment and mental health is a big challenge at the current stage. The aim of this study is to fill in this gap and to explore the current state of the association between the factors in the living environment and residential well-being.

1.3 Aims and objectives

The aim of this study is to build a model of residential well-being and explore design strategies to improve residential well-being in the urban communities. By defining what is residential well-being is, this study aims to understand how subjective and objective factors affect people's subjective well-being in their residential areas in high-density cities. By doing surveys in some high-density cities, this study intends to find the direct and indirect relationships between residential well-being and its influencing factors.

Based on the overall aims, the detailed research area and objectives are as follows:

Explaining the meaning of residential well-being in this study

Exploring the relationship between residential well-being and its influencing factors in urban residential areas

Exploring how to improve the residential well-being in urban residential areas through community design

1.4 Scope and research question

The scope of this study includes the investigation of residential well-being (RWB) of selected residential areas in some high-density cities, the measurement of the influencing factors of RWB model. Many studies of psychosocial problems have sought differences between rural and urban areas, but the diversity of housing and living conditions limits the validity of comparisons (Hardoy et al., 1992). To avoid the limitation in this study, the research subjects are only limited in urban residential areas of high-density cities. This also includes the definition of RWB based

on the relevant studies of subjective well-being, the built environment and life satisfaction, which is essential to the further discussion and final conclusions in this study. Since the concept of “well-being” is complex and influenced by a set of factors, such as income, social status, educational level. Therefore, considering the complexity, this study only focuses on the factors related to residential well-being. In other words, the objective factors explored in this study are those about the built environment which can influence the subjective well-being of individuals living in urban residential areas. Based on the survey results of all the selected case studies, this study aims for a further exploration of the influencing factors of RWB model. The specific selection of case studies will focus on the high-density cities in China mainland, such as Beijing, Shanghai, Shenzhen and Guangzhou. However, consider trying to control the effects of other factors that are not the focus of this study, the study will select some residential areas with similar housing price in densely populated cities as the research subjects.

Regarding the whole content, this study intends to find solutions to the following research questions:

What is residential well-being?

How do multi-factors affect residential well-being in urban residential areas?

How to improve residential well-being in urban residential areas through the community environment design?

1.5 Significance and value

Densely populated urban community is the common living form of large cities in China, so the improvement of its spatial quality and environment is of great significance to most urban

residents in big cities. This research focuses on the relationship between community environment and mental health and provides design strategies to improve the community living environment, which is of great practical significance for the overall healthy development of the city, ensuring the health level of citizens and building a harmonious society.

From the perspective of public health, most urban research focuses on how to promote physical health by intervening in the physical environment. In addition, the Chinese evaluation system of urban living environment has not been established systematically, which mainly focuses on the macro level of region and city. In fact, urban community is the most closely environment related to people's daily life, but most studies of urban community focused on the physical environment and the impact of community planning on the city. City planners or architects paid limited attention to the psychological status of people living in the community. In dealing with these issues and problems, this research makes a conceptual and empirical contribution to the literature related to the space and mental health by providing a perspective of environmental psychology in community environment design. Furthermore, the conceptual contribution of this research is to explore how to evaluate communities by reconstructing the influencing factors of "residential well-being" and the influencing mechanism of living environment on mental health in densely populated urban communities. This research emphasises on the resident-oriented perspective, the microlevel of urban communities and the relationship between the living environment and residential well-being to improve the quality of life. From the practical perspective, aiming to improve the public residential well-being, this research provides guidance and strategies for the future community environment design based on the existing problems and research results of the existing densely populated urban communities in China.

1.6 Structure of the thesis

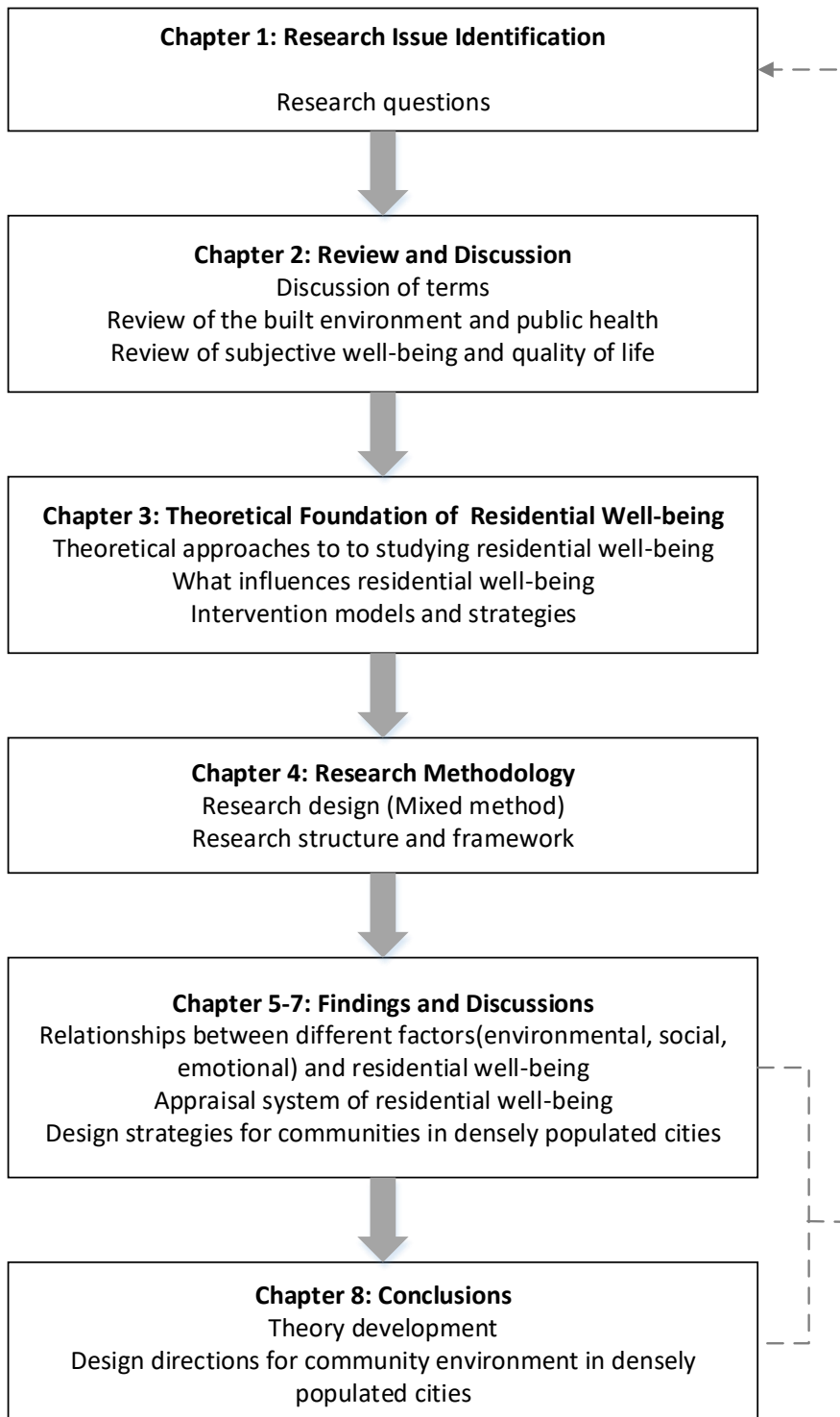


Figure 1-1 the structure of the thesis

CHAPTER 2 LITERATURE REVIEW

2.1 Definitions and discussion of terms

2.1.1 Subjective well-being

In the field of psychology, subjective well-being can be regarded as one of the most classical terms and is widely researched. After subjective well-being was first mentioned in the 1950s, the meaning of subjective well-being is described as a preponderance of positive affect over negative affect (Bradburn, 1969). From a subjective perspective Andrews and Withey (1976) found that most people consider the subjective well-being as the assessment of quality of life which are related to life satisfaction. With the development of research, Diener (1984) proposed that subjective well-being is a comprehensive judgment of individuals on their overall quality of life based on self-determined standards, referring to people's cognitive and affective evaluations of their lives. He also presents that well-being is influenced by components of subjective well-being such as satisfaction with important domains, life satisfaction, low levels of negative affect and positive affect (Diener, 2009). In fact, once the scientists began to study subjective well-being, they considered it as a good status regardless of whether it was the best. Besides that, they always focus on understanding the causes and effects of subjective well-being instead of trying to decide whether it is the most desirable of all states. In this context, most studies trend to find out the causes of it and its outcomes and it also provides a certain research basis and direction for residential well-being.

2.1.2 Quality of life and life satisfaction

Quality of life is generally defined as the overall well-being of individuals and the whole society. The World Health Organization Quality of Life Group (1998) defined QOL as an individual's perception of their position in life in the context of the culture and value systems in which they live. Also, Phillips (2006) considered quality of life as the extent to which people enjoy the living conditions that are benefit to the public health and well-being, relating to economic, cultural, social and environmental factors. Regarding the dimensions of quality of life, there are both objective and subjective aspects including individual's self-assessment and the realistic living conditions (income, social status, living environment). Many scholars focused on people's satisfaction from different aspects of their life as a barometer of quality of life (Sirgy et al. 2000, 2007, 2010), which was also called life satisfaction. They suggested that different satisfaction with various life events could affect the satisfaction with each domain, which led to overall life satisfaction through accumulated emotional changes. In this case, many researchers supported that subjective characteristics could be the measurements of quality of life. These subjective measurements of quality of life were related to the level of satisfaction that people experience about different aspects of their lives, the degree of enjoyment of important possibilities in their lives and individual's perceived well-being (Farquhar, 1995; Galambos, 1997; Raphael et al., 1997). Regarding life satisfaction, an overall evaluation of feelings and attitudes about people's life at a particular point in time (Vassar, 2012), is one of the major indicators of subjective well-being mentioned above. While life satisfaction is usually assessed by self-report, subjective well-being is typically assessed by informant rating. In addition, life satisfaction had been proved to have positive associations with physical status of individuals, including levels of sleep complaints, mortality, state of energy and so on (Chida & Steptoe, 2008; Brand et al., 2010; Haar

& Roche, 2010). In the United States, residents' satisfaction was regarded as one of the evaluation indexes of residential development and an indicator of well-being in Healthy People 2020 (Healthy People, 2011) Therefore, life satisfaction can be considered as a crucial role to have a deep understand of residential well-being, that means environmental satisfactions should be an important component of residential well-being.

2.1.3 Positive affect

Affect is a more general concept than emotion, referring to consciously accessible feelings and includes attitudes, moods and physical sensations. Also, it is often divided to two dimensions, either positive or negative affect in most research. Positive affect is defined as the feelings that reflect a level of pleasurable engagement with the environment (Clark et al., 1989) such as happiness, joy, excitement and contentment. In addition, there are some evident that support positive affect can facilitate approach behaviour (Cacioppo et al., 1999). From this perspective, experiences of positive affect could promote the individual's engagement with the built environment which significantly refers to residential well-being. Also, some evidence suggests that people can improve their emotional well-being by cultivating experiences of positive emotions (Fredrickson & Seligman, 2000). While emotion researchers might argue that individual's emotions, both positive ones and negative ones, evolved to help people assess their emotional status and are therefore all equally desirable in appropriate circumstances, well-being researchers assume that positive emotions are desirable and negative emotions are undesirable (Diener, 2009). In this context, this research considers positive affect or emotions as one of the components of the impact factors of residential well-being rather than negative affect or emotions.

2.1.4 Urban community

Since the social issues concerned in this study are in the context of China, it is hereby stated that the meaning of urban communities in this study is applicable to Chinese laws and social situations. According to Encyclopedia of China, urban community means a complex community composed of a dense population engaged in a variety of non-agricultural Labour within a given area. In the field of population science, urban community is a relatively complete regional social community composed of a certain number and quality of the population living in the city and a variety of social relations and social groups engaged in a variety of social activities. While for environmental scientists, urban community is a certain population group in the city, under certain historical and social conditions, form a certain social relationship, follow certain customs, habits or systems, norms, engage in political, economic, cultural and other activities and occupy a certain region, form a relatively independent social region. Based on the common meaning of above definitions, urban community is considered as a living community with same characteristics in many aspects and composed of some small-scale neighbourhoods.

2.1.5 Densely populated city

Under global urbanization, one of the salient features of Chinese urbanization is the rapid increase of urban population. Densely populated city is a kind of urban form gradually formed in the process of rapid urbanization to meet the living needs of the rapidly growing population. Although there is no exact measurement standard of high-density city in the world, urban population density is applied as the classification standard in the international academic circle. Many researchers chose Hong Kong, Tokyo and Macao as typical cases when studying densely populated problems (Fei &Wang, 2004; Yan &Mao, 2004; Wei &Han, 2004). The population

density of these cities is about 25,000-30,000 people /k m². While Li (2015) believed that cities with a global urban population density of more than 15,000 people /k m² could be regarded as densely populated cities, Wan (2013) considered cities with a building plot ratio of more than 2.0 as high-density cities. Furthermore, Huang and his colleagues (2016) proposed that a research unit of less than 100 hectares could be considered as a densely populated city if the plot ratio is above 2.0.

In this study, population density is considered as the value of a variable, since density depends on the spatial atmosphere created by the built environment and perceptions of residents, which requires comprehensive consideration of building density, plot ratio, building height and population and other factors. Based on the comprehensive consideration of Chinese national conditions, densely populated city in this study is limited as the city in China with a compact building space form in downtown area, in which urban population density is more than 15000 people/k m². Many cities in China such as Beijing, Shanghai, Shenzhen, Guangzhou meet the standard of densely populated city in this study.

2.2 Review of residential environment in Chinese densely populated cities

2.2.1 The studies of urban residential environment in China

Since Chinese reform and opening-up in the 1980s, to meet the needs of economic reform and social structure transformation, the Chinese government introduced the concept of community into urban management for the first time and urban community has become the main form of Chinese daily life. Since then, Chinese scholars have carried out a lot of research based on Chinese conditions and combined with the development theories and practical results of

residential communities abroad. In modern society, urban communities have the closest connection with urban residents, because people spend most of their life in the residential communities. As an important part of the urban community, the residential environment of the urban community closely connects people with the society and becomes an extension of the living room of the residents, which affects their life satisfaction. Foreign scholars proposed some opinions on residential environment based on their studies. Asami (2001) proposed that residential environment usually refers to the sum of all kinds of environments surrounding living and living space, including natural conditions, various facilities conditions and regional social environment, etc. Talen (2006) as an urban planner believe that the living environment consists of three independent dimensions: the residence, the physical spatial structure of the living community and the neighbourhood, which represents the social dimension. Therefore, the research scale of residential environment is usually an independent city or the level of streets, communities and buildings within the city and the research scope also focuses on the physical and social environment of the city. The scope of the residential environment also has different classification in the opinions of Chinese scholars. For example, Chinese scholar Zou (2000) proposed that residential environment could be divided into ecological environment, living environment and psychological environment according to function. Among them, the living environment includes internal environment of residence, infrastructure, regional economic, cultural and educational environment, greening environment, recreation environment, public security level and so on. Besides, Deng (2016) proposed another composition of the spatial perspective, dividing the residential environment into internal space environment and external space environment. The internal space environment mainly refers to the family living environment where the individual lives, while the external space environment mainly refers to

the external living environment surrounding where the individual lives, including physical environment and immaterial environment.

Regarding the evaluation of residential environment, Chinese scholars also carried out many studies focusing on different perspectives of residential environment. Chen (1987) proposed to evaluate the quality of residential environment from eight aspects, including work, study, recreation, kitchen and toilet, housework, walking, sleep and outdoor activities. GIS was also applied as an analysis method to evaluate the environmental performance of the residential area (Chai et al., 2003; Jing et al., 2014). Zhao et al. (2013) divided the influencing factors into five indexes from the perspective of the impact of environment on life, including life convenience, leisure convenience, residential comfort, environmental friendliness and life safety. Huang (2015) believes that the evaluation of living environment should be conducted from both objective measurement and subjective cognition. The objective measurement focuses on the results of specific values, while the subjective cognition requires the cooperation of residents with relevant surveys.

2.2.2 The characteristics of residential community in Chinese densely populated cities

China is the country with the largest population in the world. Under the background of the continuous urbanization process, the population rapidly gathers to cities, which led to the increasing scale and density of the urban population. Based on this point, the residential population of urban communities presents the phenomenon of high-density clustering, which is also one of the most important characteristics of residential communities in Chinese densely populated cities. Also, the development of densely populated cities made residential

communities more and more densely built, to meet the rapid growth of urban population. Moreover, the available land resources of the outdoor public space of the residential community are severely compressed, which made the per capita public space area of the community residents reduce a lot. On this basis, the existing public space is often swallowed by the urgent shortage of parking lots or other new development activities for maximum benefits and the surviving public space is scattered and limited in area that could not fully play the function of public space for leisure and communication. According to Zhang and Huang (2013), Chinese populated densely communities are still influenced by modernism concept, in the form of slate-style buildings and super-large blocks. The public space utilization rate of the community centre is not high, because it is far away from the walking range of residents without a good space atmosphere. Based on this point, the public space of the new high-density urban community has the characteristics of diversified functions and three-dimensional space development. Due to the scarcity of public space in populated densely communities, some new space types have been developed to obtain more space resources, which borrow space from the ground or underground and form a three-dimensional space system. Furthermore, the space functions are mixed, office, entertainment, leisure, exhibition and other activities are integrated in the same space to adapt to the diversified social development, forming a multi-functional neutral space to meet the different needs of residents of different ages, genders, hobbies and incomes at different times. Compared with the traditional community, the public space of populated densely community needs to accommodate more people's activities with less space, so it needs to adopt the method of breaking up into parts, providing more complex functions and activity facilities and setting them in different levels according to the service radius, to facilitate residents to carry out various communication activities within the walking range.

Besides, to cope with the large-scale concentration of population and to alleviate the limited land resources in cities, Chinese populated densely cities generally adopt the strategy of concentrated and compact development and intensive use of land resources. This is specifically reflected in the further expansion of the height and volume of community buildings. More and more high-rise and super high-rise residential buildings have led to a higher plot ratio as one of the characteristics of residential community in Chinese densely populated cities. Urban communities with high plot ratios can maximize the use of land, which is conducive to improving the efficiency of community space utilization and creating a vibrant community atmosphere. However, while the high population density and high floor area ratio meet the living problems of larger population, many studies proposed that the excessively high building height and excessively large building volume can bring negative perceptions to the community residents, leading to a series of physical and psychological problems (Wang et al., 2005; Zhong et al., 2010).

2.3 Review of well-being

2.3.1 The difference between well-being and happiness

The origin of well-being can be traced to philosophers Aristotle (2001) and Jeremy Bentham (1982) and their respective conceptualizations of eudaimonia and hedonia. In modern eudaimonic accounts, well-being is variously defined as functioning well in health (Ryff & Keyes, 1995), satisfying self needs (Maslow, 1943; Deci & Ryan, 1985) and living a life focused on what is intrinsically worthwhile (Ryan, Huta, & Deci, 2008). However, contemporary conceptualizations of well-being from the hedonic perspective emphasize balancing pleasure and pain, inheriting Bentham's claim that being well stems from feeling good. Well-being has inter-

related definitions with different foci and perspectives. Modern positive psychologists have advocated translating eudaimonia as happiness, while philosophers and linguists have argued that since the meaning of eudaimonia is much greater than a matter of positive emotion, it should be translated as well-being (Wierzbicka, 1999). Sociologists have often used happiness to study social issues with the aim of ensuring that the greatest number of people achieve the greatest happiness. With the continuous development of human cognition and philosophical theory, the concept of happiness gradually transformed from the original meaning of a pure happy feeling into a more complex concept. In some sociological and economic studies, happiness has roughly the same meaning as well-being, including not only people's positive emotions but also satisfaction with their lives (Carson, 2013; Guha & Carson, 2014; Clark et al., 2018). Thus, the meaning of well-being is broad and can be widely applied in various fields, whereas happiness is more commonly studied in psychology and sociology as a positive feeling.

In the field of psychology, well-being is understood as a complex concept which relates to individuals' subjective feelings. Thus, many psychologists have studied its meaning and characteristics to gain a deeper understanding of it. Yet confusion remains as to the difference

Table 2-1 Dictionary definitions of well-being and happiness

Dictionary	Well-being	Happiness
Cambridge Dictionary	the state of feeling healthy and happy	the feeling of being happy
Oxford Dictionary	the state of being comfortable, healthy or happy	the state of feeling pleasure or being satisfied that something is good
Macmillan Dictionary	the satisfactory state that someone or something should be in, that involves such things as being happy, healthy and safe and having enough money	the feeling of being happy

between well-being and happiness, which will be explained in this section by exploring the definitions of these two terms. Table 2-1 shows the definitions of well-being and happiness in different English dictionaries.

Well-being is mostly described as a positive state where one is satisfied with one's living situation. Many adjectives with positive affect are used to explain well-being. However, happiness, as the noun related to the adjective 'happy', is explained in the sense of feeling pleasure. Although both terms are defined as a state in the Oxford Dictionary, well-being contains the meaning of happiness and, thus, happiness can be regarded as part of the emotional aspect of well-being. In addition, the Psychology Dictionary gives a more specific definition of well-being that includes a state of happiness, being pleased and content, low degrees of anguish, generally positive physical and cognitive health and attitude or good quality of life. Thus, dictionary definitions provide the main components of well-being with a psychological focus on emotions and the individual experience or assessment of life, which can be seen as the result of a combination of hedonism and eudaimonism.

However, when translated from English into Chinese, happiness and well-being have the same meaning as 幸福 – an individual's inner satisfaction due to the realization of or proximity to the ideal – which is more inclined towards Aristotle's eudemonics. From a Chinese cultural perspective, 幸福 can be understood as yearning for a better life by dividing the term into the verb 幸 and the noun 福. According to the Xinhua Dictionary, 幸 means being pleased or having the good fortune to do something, while 福 means blessing or happiness. In recent English articles, Chinese scholars have tended to use well-being to represent a broader meaning of 幸福 with multiple dimensions. Although some Chinese psychologists commonly used the expanded

meaning of happiness to frame well-being (Deng, 2012; Yang et al., 2015), happiness is now widely understood as an emotional aspect in measuring well-being (Ma, 2015; Wang et al., 2015). In sum, happiness and well-being are considered to have similar meanings in some psychological and sociological studies in both Chinese and English. However, happiness is seen most often as the emotional process of achieving well-being and well-being tends to be widely accepted in more research fields, which will be discussed in the next section.

2.3.2 The status of well-being in mental health

With novel Coronavirus sweeping the world, THE World Health Organization (WHO) is asking people to pay attention to the impact of social alienation caused by epidemic isolation on people's mental health and needs, as well as the psychological impact on special groups such as the elderly and children. In fact, mental health data are difficult to measure and collect because people's mental states are so complex that it is difficult to set a clear standard to judge what constitutes mental health. People often judge their mental health by describing and encoding events and their feelings. Also, scholars proposed some different definitions and understandings of mental health, in addition to support that mental health refers to the individual should have a basic cognitive ability, the harmonious interpersonal relationship, good social adaptation ability pause effective ability to regulate mood (Li, 2018),, most scholars (Wang, 2018; Xiao et al., 2017) generally agreed that mental health is a continuous and positive and optimistic state of mind, as an important part of public health

In addition, mental health is considered to develop one's state of mind to the best within the range of not contradictory with others' mental health physically, mentally and emotionally (Zhou, 2015). Wang and his colleagues (2016) judged mental health based on a negative state without

mental illness and a positive psychology with subjective well-being. Also, some scholars (Zhou et al., 2017) proposed mental health as the overall evaluation, in one's life consists of self-concept of cognitive and emotional and mental health of the subjective field. The influencing factors of mental health are related to individual biological factors and explicit social environmental factors, both of which are individual responses to the environment (Qi & Wang, 2013). Some researchers considered well-being to be a concept in the field of positive psychology, which means something positive in mental health. Similarly, the judgment of well-being is mainly the result of subjective cognition, it is difficult to have a specific standard to quantify well-being directly.

2.3.3 Well-being research in different fields

Mental health is currently a hot topic in many fields and this concept has developed over time, becoming increasingly directed towards well-being. New psychiatric research is focusing to a greater extent on well-being by strengthening positive experiences rather than by limiting treatment to reducing or removing the illness or symptoms. In other words, many studies on well-being tend to consider it as a positive primary indicator of mental health and are increasingly adopting an overall well-being perspective by assessing multiple life domains, including measures of functional status, access to resources and opportunities and a sense of well-being (Keyes, 2013). This section will discuss the application of well-being in research in different fields and explore scholars' understandings of well-being with various foci.

In positive psychology, scholars prefer to explore subjective well-being in daily life by collecting self-report data from participants about how happy or satisfied they are. Until recently, psychological studies focused on specific and often only emotional aspects of well-being instead

of including functioning well in life (Zubrick & Kovess-Masfety, 2005). Psychologists are also interested in how life experience affects well-being, especially children's well-being, which is closely related to self-actualization (Land, 2012). Psychologists also often use well-being to create models of mental health and to measure positive mental health (Keyes, 2005; Tennant et al., 2007) and study how well-being promotes learning and work (Seligman, 2011). However, as Corral-Verdugo and his colleagues (2015) recently pointed out, positive psychology has underestimated the role of environmental factors as basic determinants of well-being, in comparison with individual factors, such as behaviours and emotions (Lyubomirsky et al., 2005). This opens space for the development of a comprehensive conceptualization of well-being and its application in other fields.

Sociologists and economists prefer to explore the impact factors of well-being from a social perspective through cross-sectional, longitudinal and experimental studies. Their reason for studying well-being is to assess the performance of a society and determine how the society is meeting human needs. On one hand, they have provided the assumption that well-being levels can reflect a country's progress by serving as a social indicator, like income and education levels (Diener, 2009) and they have explored approaches to promoting well-being from a social perspective, such as social support or political economy (Frey et al., 2013; Song et al., 2013). On the other hand, a growing body of evidence is showing that well-being is positively associated with personal factors, such as good relationships, productivity and creativity; social behaviours; and life expectancy (Lyubomirsky et al., 2005; Chida & Steptoe, 2008; Dolan et al., 2008; Diener et al., 2010; Dang et al., 2014). Layard (2011) proposed adopting an interdisciplinary perspective to analyse the limitations of mainstream economics in understanding what makes

people happy, and he provided practical suggestions for how to place well-being at the core of social and economic policies.

Physiologists and medical scholars pay little attention to the nature of well-being and focus instead on the impact of mental and physical illness on well-being and how to promote well-being by reducing disease and disability. Some scientists have explored the effects of various diseases on patients' well-being and factors impacting the well-being of people with specific diseases, such as hypertension, stroke and diabetes (Wei, 2012; Kubzansky et al., 2018; Qiao, 2019; Che et al., 2020). In recent research, medical scientists in China have opted to study the kind of environment or treatments that can promote patients' well-being, relating more to functioning well or reducing negative emotions during illness (Yang et al., 2019; Xue et al., 2020; Wang, 2020). However, the various conceptualizations of well-being in different fields have led

Table 2-2 Application of well-being in different fields

Field	Focus	Measurements
Psychology	Hedonic: Life satisfaction and affect Eudaimonic: Self-actualization and life domains	Hedonic: Satisfaction with life, absence of negative affect and presence of positive affect (Diener et al., 1985) Eudaimonic: Self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life and personal growth (Ryff, 1989; Ryff & Keyes, 1995)
Sociology	Quality of life and social support	Physical health, psychological state, social relationships and relationship to salient features of the environment (WHOQOL Group, 1998)
Economy	The progress of nations and performance of societies	Aggregate happiness index (e.g. optimism about the future, stress, income and employment; Frey et al., 2013; Graham & Pinto, 2019; Krueger, 2017)
Physiology & Medicine	Health-related quality of life and functioning wellness	Multiple aspects of health and functioning (e.g. physical or mental health and integrated personality; Palombi, 1992; Roscoe, 2009)

to confusion as to how to properly measure well-being within a specific research context. Table 2-2 shows the applications of well-being in these fields, including the applied foci and approaches to measuring well-being. Scholars have also differentiated various types of well-being in recent years. For example, Kelley-Gillespie (2009) proposed six types of well-being reflecting major life domains in terms of health-related quality of life, especially for the elderly – namely, social well-being, physical well-being, psychological well-being, cognitive well-being, spiritual well-being and residential well-being. Similarly, Rath and Harter (2010) summarized five components of well-being within the research on work and social environments which are under our control as human beings – namely, social well-being, career well-being, financial well-being, community well-being and physical well-being.

2.4 Summary

Foreign research on human habitat, environmental psychology and subjective well-being has an early origin, but the evaluation of the living environment mainly focuses on the influencing factors of residents' life satisfaction for the neighbourhood environment and its quantitative research, while the influencing factors of life satisfaction are mostly originated from the objective conditions, such as the income of residents, the socio-economic environment, etc. and less involved in the subjective factors, such as the degree of well-being, safety, comfort, etc. The possible reason for this is that subjective factors are difficult to specifically quantify the study and they are affected by too many factors to control the variables, but from the perspective of people-oriented considerations, the construction of the living area environment has a close relationship with the well-being in life and well-being contains two parts: satisfaction and emotion, so they should all be taken into account in the scope of the study. Environmental psychology of foreign research is relatively mature, in recent years the main research direction is

still the relationship between human behaviour and environmental issues, has broken through the traditional environmental psychology is mainly the study of human cognitive research on the environment, the focus of the research is also placed on the interaction between people and the environment.

While the domestic research on environmental psychology is mainly focused on the impact of man-made environment on human psychology and behaviour, most of the theoretical knowledge learned from abroad is still in the learning stage and the domestic theoretical construction is insufficient. China's research on the evaluation of the living environment began in the nineties, mainly focusing on the evaluation and analysis of the human environment. Among them, Wu Liangyong (2001) is the earliest domestic scholar to carry out theoretical and empirical research on the habitat environment, but he still believes that "the establishment of evaluation standards for the habitat environment is still a difficult work and requires a long process", which shows the enormity and necessity of the research on the habitat environment. After that, relevant research results gradually increased. For example, Yu (2001) conducted theoretical discussions on the connotation and evaluation method of the habitat environment, established a habitat environment evaluation index system and took Shanghai as an example to explore the mechanism of changes in the habitat environment. Wang Ming and his colleagues (2016) also conducted research on the theory and method of habitat evaluation and did empirical analysis work with Hangzhou, Nanjing and Beijing as examples respectively. In addition, some scholars, such as Zhang and Liu (2005), have also analysed the advantages of residential space location and the evaluation of intra-city residential environment. However, at present, the theories on urban living environment evaluation in China are still immature, mainly focusing on the more macro level of regions and cities and the evaluation method system is still not systematically established. Overall, to

enhance the residents' sense of well-being and improve the quality of life, it is necessary to start from the micro level, starting from densely populated cities communities, to study the relationship between the residents' residential well-being and the living environment and there is a relative lack of research in both domestic and international literature on evaluating the urban community environment from the perspective of subjective well-being by focusing on the human being and making design strategy guidance for it.

From the previous research background and review, the demand and urgency of Chinese urban residents for a healthy life is increasing day by day and there is a close relationship between the urban built environment and human health. In addition, researchers and scholars in related disciplines have gradually shifted their research focus from the static physical space environment to the people and environment research, which is closely related to the society around the needs of human beings. Under the living form of densely populated cities communities, from the psychological level, the complex and dense living space environment produces stimuli for residents that are not conducive to improving the satisfaction level of residents' daily healthy life. However, compared with foreign communities, China's densely populated cities communities have their own unique patterns and characteristics, but there is a lack of systematic and in-depth analyses. In addition, for the qualitative research on the theoretical relationship between the living environment and mental health and the logical relationship between the spatial environment and well-being, relevant domestic research is in its infancy and there is a lack of comprehensive and systematic theoretical and empirical research. This study takes Chinese densely populated cities communities as an example, and it is of strong practical and theoretical significance to study the relationship between the living environment and residents' mental well-being based on residential well-being.

CHAPTER 3 THEORETICAL FOUNDATION FOR RESEARCH ON THE BUILT ENVIRONMENT AND WELL-BEING

3.1 Impact of the built environment on well-being

Scholars from different countries have different views on the definition of the built environment. Some scholars believed that the built environment mainly refers to the places that can be adjusted and controlled by artificial design, renovation and construction of public space and buildings inside the city (Cervero & Kockelman, 1997). Also, other scholars (Handy et al., 2002) put forward a similar concept, believing that the built environment is a variety of buildings and places built and renovated by human beings, as well as the environment that can be changed by policies and human behaviours.

Regarding the elements of the built environment, Chinese scholars (Feng et al., 2009) proposed that the elements of the built environment include residential planning indicators and specific environmental and landscape elements. The planning indicators refers to the layout location, space and road scale, surrounding greenness rate, link radius or distance of the public space and pedestrian system of the residential area, while environmental and landscape elements refer to the paving materials, green vegetation, seat furniture, fitness facilities, sign signals, lighting equipment, etc. Handy and his colleagues (2005) considered that the factors to measure the quality of the built environment were complicated. In addition, the built environment elements can be divided into three levels: land use, transportation organization and space design level, relating to the subjective and objective characteristics of the physical environment in which people live, work and play (Frank & Engelke, 2005) Specifically, they proposed that land use includes the spatial distribution of land use with different functions and transportation

organization includes the connectivity between different locations and the accessibility of destination. Space design level is related to various factors that affect individual spatial perception and attraction (Frank et al., 2005) The study on the elements of the built environment, from the macro level, mainly reflected in the overall function layout of the city, the spatial configuration of facilities and other aspects; On the middle level, it mainly focuses on regional functional characteristics, population and building density, road accessibility, etc. At the micro level, the research focuses on the form and function of buildings, accessibility of various facilities, block scale, etc. Studies on the built environment and behaviours have been developed and enriched and its influencing factors range from the initial "3D" factors including Density, Diversity and Design (Cervero& Kockelman, 1997), developed into a highly recognized "5D" factors adding Destination accessibility and Distance to public transit (Ewing & Cervero, 2001).

The relationship between human and environment has always been the focus of attention of scholars from all walks of life. The rapid development of environmental psychology also indicates that the scientific community is gradually deepening its research on the relationship between human living environment and human behaviour. Environmental psychology focuses more on the methodology of using a holistic perspective to study the impact of human behaviour in social and cultural environments and regards human behaviour, environment and psychology as an organic whole that functions together and is interrelated. In addition, there is considerable evidence of a link between the built environment and public health and a growing number of medical scientists and planners believe that the built environment is an important aspect of public health. While establishing a cause-and-effect relationship between the built environment and health is not easy, many of the findings rely on data from observational epidemiological studies that highlight the link between the built environment and health (Won &Ory, 2016; Lee

&Maheswaran, 2011). Although many studies have focused more on the relationship between the built environment and physical health than mental health, such as well-being, increasing awareness of the importance of healthy urban planning has led researchers to focus on the relationship between various types of physical space and individual mental health. Against this background, there is still some evidence to support the idea that design changes in the built environment can affect people's mental health (Pineo, 2012; Moore et al., 2018). In other words, recent research has tended to identify interactions between physical factors and mental health outcomes. For example, objective measurements of neighbourhood aesthetic quality and green space in residential environments were positively associated with higher levels of mental health (Bond et al., 2013; Van et al., 2015). Similarly, some scholars (Gong et al., 2016) proposed in their study that neighbourhood quality, green space quantity and land use structure were related to psychological stress. In addition, some studies prove the correlation between environment and mental health or well-being through people's behavioural activities as intermediary factors. It is found that those who participated in recreational physical activity experienced improvements in their mental and emotional health (Dergance et al., 2003). Some scholars believe that walkable communities are positively correlated with face-to-face social interaction and community satisfaction, thus improving overall subjective well-being (Jun & Hur, 2015). Factors such as strong infrastructure, including greater access to shops, services and public spaces and good mixed land use also indirectly affect the mental health and overall well-being of residents by promoting walkability in the community (Koohsari et al., 2014; Lee & Moudon, 2006; Moudon et al., 2007). The structural equation model was applied to exploring the relationship between neighbourhood physical environment and residents' psychological feelings, which helped to reach the conclusion that community appearance and walking ability can effectively affect

residents' recreational well-being (Kwon et al., 2019). These evident showed that community planners and architects can take advantage of the actual environment design of community intervention to improve residents' overall sense of happiness and life satisfaction, the built environment's influence on mental health include direct effects and indirect effects through health behaviours, which provided a strong theoretical support for the hypothesis of this research.

3.2 Conceptualizing well-being in urban studies

In urban studies, most of the research thus far has focused on the design of the physical environment and planning of urban annular space and well-being has not been readily associated with physical space and the environment. As the scope of urban studies has been limited to those related to planning or design, these studies have adopted the perspective of architects or urban planners. However, with the growing trend of conducting interdisciplinary studies and focusing on people's reflections on life, urban studies scholars became interested in well-being. As sociologists have found well-being to be highly dependent on social connections and cohesion and local amenities, there is increasing evidence that social connections may be shaped by characteristics of the built and social environments (Talen, 1999; Duany et al., 2010). Although the World Happiness Report 2020 (Helliwell et al., 2020) makes few references to specific living conditions, such as housing and the city, some researchers conducting urban studies have directed their attention to well-being and especially its relationship with the built environment. In the following subsections, the application of well-being in urban studies will be discussed from the perspective of social and physical aspects relating to architecture and urban planning, represented by social connections and the physical environment.

3.2.1 Well-being and the physical environment

According to Petermans (2020), architects recognized an opportunity for design when they realized that intentional activities could influence well-being. Many studies devoted to architectural design have focused on how to design a building or the interior environment for well-being, especially in the context of healthcare centres or waiting rooms (Vuong, 2014; Payne et al., 2015). Minucciani and Saglar (2020) discussed different interior design approaches for promoting well-being and provided a framework for well-being in interiors that can be used as an evaluation method for existing environments and a roadmap for designing new living environments. When scholars extend their research to the environment outside the building, they tend to investigate the relationship between physical space and well-being at the community level, aiming to optimize the space and promote public mental health. Since studies in other fields have provided considerable evidence to support the connections between dimensions of the physical environment and well-being in urban studies, Cloutier et al. (2013) proposed that community amenities may directly shape well-being from the perspective of urban development. In addition, research has shown that some basic physical characteristics of neighbourhoods regarding space connections, such as green space, transport accessibility and the availability of public spaces, are important for individual well-being, especially among seniors (Nancy et al., 2009; Choi, 2013). Based on the above findings, current urban design at the city or neighbourhood level is more concerned with well-being by shaping spaces and amenities as the goal of urban development, whereas design for well-being has emerged in the past decades.

During this same period, Chinese architects introduced well-being as a new theme of urban design and began exploring design approaches and projects oriented towards well-being from the

perspectives of urban public space, building renovation and ancient city rebirth. For example, Ye (2012) advocated the creation of space design for well-being by exploring the characteristics of public space with the attribute of well-being and proposed some urban public space planning strategies at the macro level. Moreover, some studies have applied well-being to practical projects in architectural and planning design, such as a community building on Tianzhong old street in Zhanghua and a city park in Datong (Liu et al., 2016; Ou & Liu, 2019). In the Chinese context of ‘new-type urbanization’, planners have applied well-being in land spatial planning, explored the impact factors of well-being (Chen et al., 2020) and explained the impact mechanism and elements of the spatial form of traditional villages on the well-being of residents to shape urban designs (Gao, 2019). When exploring the physical factors that affect people’s sense of well-being, scholars have also paid attention to green spaces, community amenities and transportation planning (Chen & Ning, 2015; Lin, 2019; Wang et al., 2020; Wei et al., 2020).

In exploring well-being in cities or buildings, architects and urban planners gradually realized that, in addition to the interaction between people and the environment, many factors beyond the physical environment inevitably affect human beings, since they are part of a society. Therefore, the social environment cannot be ignored when exploring well-being in urban studies.

3.2.2 Well-being and social connections

For several decades, there have been lively debates about the trends of well-being and the social environment in both sociology and urban studies. In contrast to the focus on social capital in sociology, urban studies scholars have investigated the impact of social connections, including social relations, policy and the cultural atmosphere, on well-being related to architecture or urban

planning, of which workplace well-being, residential well-being and community well-being are three representative types.

In specific contexts, like the workplace and residential communities, the interpersonal dimension captures the impact of social integration and positive relations with others and focuses on the comfort that someone feels with being a part of this context and performing a social role. For example, in conceptualizing workplace well-being, Bartels et al. (2019) emphasized the impact of social interactions as the interpersonal dimension within the workplace that influences one's ability to flourish. Similarly, scholars have focused on the effects of neighbourhood cohesion, perceptions and stress in exploring residential well-being or life satisfaction related to living status (Montprtit et al., 2015; Mouratidis, 2019; Ruiz et al., 2019). These affective neighbourhood characteristics influence residents' senses of security belonging as well as their self-identity realization in their residential community. In the Chinese context, scholars have explored the effects of social support and community within the residential neighbourhood on the well-being of specific disadvantaged groups, such as the elderly and migrants (Zhang, 2016; Yan et al., 2017; Liu et al., 2018; Liu et al., 2019). In addition, the field of urban studies has become increasingly focused on policy support, for example, in the domains of socioeconomic deprivation, social justice and design policies (Baba et al., 2017; Foster et al., 2019; Mouratidis, 2020). To make spaces more equitable in terms of promoting the well-being of those who are disadvantaged, planners have been striving to identify and address the issues that stand as obstacles between disadvantaged groups and their enjoyment of urban spaces or facilities (Pretty et al., 2007). Furthermore, empowerment is considered an effective approach for solving inequity and improving health and well-being through the promotion of public participation in the community (Baba et al., 2017). Foster et al. (2019) explored and confirmed the correlation

between policy compliance in apartment design and residential well-being. Moreover, Burgess and colleagues (2015) explained how to assess the impact of public policy on well-being in healthy planning. In recent years, some policies and guidelines published by the Chinese government, such as Healthy China 2030, have redirected the research undertaken by Chinese planners and architects towards health and well-being. However, there are few studies on the relationship between policy and well-being in terms of architecture and urban planning in the Chinese context. Some scholars have studied the impact of policy on well-being from the perspective of spatial inequality. For example, Zhang and Tang (2019) proposed that equity in public leisure space positively impacts well-being.

Table 3-1 Key social dimensions and specific foci of three types of well-being

Type	Key social dimensions	Foci
Workplace well-being	Social interactions	The quality of relationships with coworkers and leaders
Residential well-being	Positive relations and policy support	Neighbourhood cohesion, resources and perceptions; design policy
Community well-being	Community culture	Cultural participation, cultural viability and tolerance of immigrants

Culture is an issue that sociological studies have explored deeply, since the cultural atmosphere determines how people in different countries experience and understand well-being, but culture has received less attention in research on urban planning and architecture. In urban studies, culture is considered as a social outcome within a certain scope of community. Social integration, as mentioned above, explores individuals' connections with the society, while culture relates to social connections at the collective level. According to Ferraro et al. (2016), the role of culture in informing understandings and practices of well-being has received scant attention. However,

Blessi et al. (2016) discussed the role of culture in urban life and proposed some cultural policies to improve well-being. Furthermore, some planners have paid attention to factors related to community culture when studying the impact factors of community well-being, such as cultural participation, cultural viability and tolerance of immigrants (Cox et al., 2010; Davern et al., 2011; Kee et al., 2019). Although few urban studies have considered the Chinese cultural context, culture can be regarded as a new dimension of well-being in urban studies, as people attach importance to cultural participation. Table 3-1 summarizes the key social dimensions and specific foci of three typical types of well-being. As the above review shows, policy support, social relations and community culture basically cover most dimensions related to social connections in well-being for urban studies.

In this study, what constitutes well-being and situate this concept within the urban studies

Fig.3-1 A model for conceptualizing well-being in urban studies

context will be reconsidered to develop a construct based on common characteristics in the literature. The relevant applications and elements mentioned above indicate that the component of well-being necessarily involves the impact of personality. To address this point, a conceptualization of well-being is offered that incorporates the contexts of architecture and urban planning into current theory on well-being in urban studies. In combination with hedonism and eudaimonism, this study suggests that well-being in urban studies with a synthetic nature consists of two key components: satisfaction of the personal environment and the overall result of positive affect. These components reflect what it means to have optimal space and enjoy an optimal state when living in a place. In line with the Chinese way of understanding 幸福, this study believes that well-being can be divided into ‘well’ and ‘being’. In the Cambridge Dictionary, ‘well’ refers to a good way or a satisfactory standard, while ‘being’ indicates the state of existing. Therefore, in most urban studies, to explore the relationship between humans and the environment, the decomposed ‘well’ can be understood as ‘well in the built environment’, while ‘being’, as the part representing the affective state, can be regarded as ‘being positive’. The built environment is composed of physical and social aspects. Human affect can produce the two positive emotions of ‘well in the physical environment’ and ‘well in social connections’ through self-evaluation and self-actualization. In addition, the multiple dimensions of common characteristics evident in the reviewed literature show connections between ‘well’ and ‘being’. Finally, the model for conceptualizing well-being in urban studies is obtained as shown in Figure 3-1. This model can help architects and planners better understand the connotation of well-being in urban studies and the association between well-being and the built environment. In detail, this model provides two directions for architects and urban planners that they can design for improving well-being, based on the interactions between ‘well’ and ‘being’. The first is to affect

residents' perception result of being content by changing the design of different aspects in physical environment and finally to improve well-being in cities. The second is to influence residents' perception result of being pleased through the formulation of policies and the creation of cultural atmosphere.

3.3 Interventions

3.3.1 *Eco-system of health and community*

In 1978, World Health Organization (WHO) put forward the concept of Healthy Community, emphasizing on achieving the goal of "Health for All" and announced the WHO Initiatives on Healthy Cities and Village in 1986 to promote the theoretical development and practical research of healthy cities. Scholars have gradually realized in their research that the development of healthy cities is not only related to social sanitation and human health. McMullan proposed that the ecosystem of healthy cities should include the health and integrity of the artificial and natural environments, the health of urban residents and the health of the social environment. After a lot of practical exploration, the World Health Organization further defined a healthy city as a process of continuous development, development of the natural and social environment and continuous expansion of social resources for improving the health and health of residents.



Fig.3-2 The model of healthy cities (Hancock, 1993)

Hancock proposed a healthy city model as Figure 3-2, which connects the three main factors of a

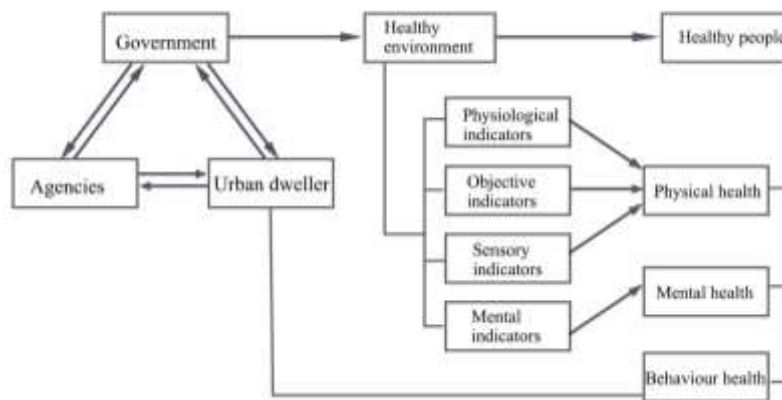


Fig.3-3 Mechanisms of action for healthy cities (Liang& Qu, 2003)

healthy city, community, environment and economy and proposes the impact of the interaction of these three factors on health. The construction of healthy cities in China began in the 1980s. With the in-depth research cooperation with the World Health Organization, the concept of healthy cities in China is constantly changing. By July 2016, the Guiding Opinions on the Development of Healthy Cities and Healthy Villages issued by the State Council of China emphasized that healthy cities should include healthy society and health. Key areas such as environment, healthy people, health services, health culture. Regarding the definition of "healthy city", Chinese scholar Xing believed that a healthy city is an integrated city formed by a combination of policies that are conducive to healthy Behaviours and living conditions and environmental support. As Figure 3-3 shows, Liang Hong and others believe that a healthy city is a healthy environment as a support system, a healthy social relationship as a guaranteed link, a healthy population as the goal and an organic whole formed by the interaction of the three elements of health.

3.3.2 Evelyne de Leeuw's meta theory of healthy city

The meta theory of healthy cities is an approach to promoting the development of healthy cities proposed by Evelyne (2005) in Shanghai Healthy City International Forum. Figure 3-4 shows the framework of meta theory, which consists of three important components, including long-term and short-term determinants of health, long-term and short-term

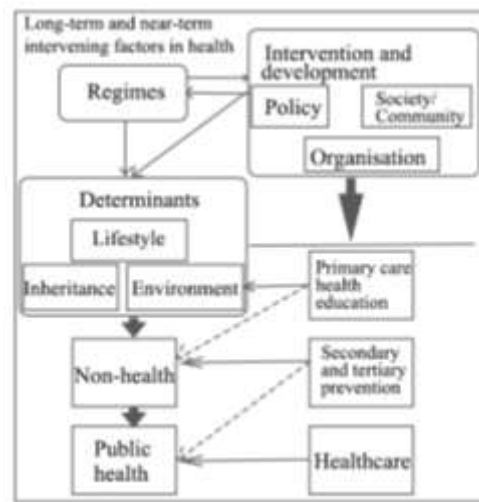


Fig.3-4 The meta-theory of healthy cities (Evelyne et al., 2016)

interventions for health and known effects. Among them, the determinants of health themselves include the influence of genetics, lifestyle and environment, but the meta theory believes that these three factors do not play the same important role in determining health. Everyone is a unique existence, so health appears to be affected by a combination of these determinants to varying degrees. Moreover, determinants can be constrained by regulations and the influencing extent to which researchers observe and measure the effects of a determinant on health is the result of regulations that exist in the given environment. Intervention factors and regulations are in a mutually restrictive relationship and intervention factors include factors related to policy, organization and social/community. Evelyne also argued that in the traditional view of health determinants, the role of healthcare (sometimes called health systems) is on an equal footing with the three determinants mentioned above. They differ in nature, however, as the health-care process affects health status, its nature as guiding principles makes its intervention factors more

purposeful than the other three determinants. In this point, health-care process is classified as a part of intervention factors in meta theory model. In addition, the health-care process corresponds to the hierarchy of consequences resulting from the determinants of health.

3.3.3 Strategies in cognitive theory of emotion

Emotions and feelings are generated in the process of people's cognitive activities.

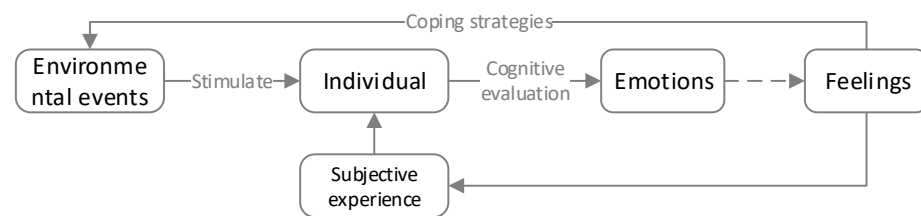


Fig.3-5 The mechanism of Lazarus cognitive evaluation theory

They are people's

reactions to the relationship between objective things and individual needs. Emotion is formed by individuals based on multiple emotional accumulation, while feeling is also expressed in the form of emotion, which is a long-term emotional state. According to cognitive psychology (Zaki et al., 2012), emotion is a complex emotional state generated by an individual under the action of external stimulus and is a physiological and psychological state after the comprehensive processing of stimulus source information. The cognitive theory of emotion emerged in the second half of the 20th century and took many forms. Schachter believed that the essence of emotion is a kind of experience, and the generation of emotion is the result of environmental events, physiological state and cognitive process. In addition, Arnold proposed that emotion is the result of cognitive evaluation and evaluation has an emotional experience component. Also, Lazarus (1991) proposed a theoretical mechanism based on the theory of Arnold to explain the relationship between emotion and motivation and tried to explore the reason for people to act.

Lazarus argued that emotions are the product of the interaction between individual and environment and are expressed through the accumulation of feelings over time. Moreover, emotions can be regarded as the evaluation of perception and individual psychological structure is an important condition of cognitive factors. As Figure 3-5 shows, the interaction between individuals and the environment is completed through stimulation, evaluation and coping. An indispensable process in the emotional cognitive theory is evaluation, which means emotions are derived from people's positive or negative evaluation of situations, events or environments. In this theoretical mechanism, people need to constantly evaluate the relationship between stimulus events and their feelings, to finally form corresponding feelings through long-term emotional accumulation. The object of emotional evaluation is the events in the internal or external environment that are meaningful to the individual, of which the internal environment is subjective experience, while the external environment is the surrounding environment and events other than the individual.

3.3.4 Insights from existing models and strategies

Based on Hancock's model, this research integrates the interaction of environment, psychology and individuals to propose a basic model for studying well-being. This research advocates the idea of people-oriented in sustainable development and studies the residential well-being of urban

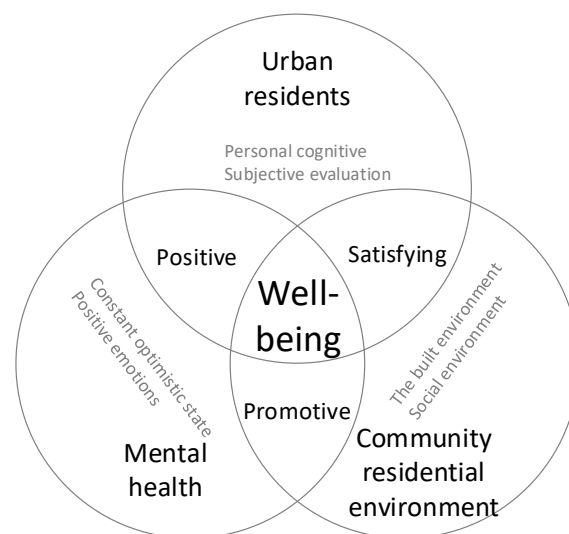


Fig.3-6 The model of well-being in urban studies

residents from the community level. As shown in Figure 3-6, urban residents, community residential environment and mental health, as three factors related to well-being, exert an influence on well-being through complex interaction. Specifically, as mentioned a good community residential environment could improve the degree of mental health through the built environment and the social environment and mental health affects the urban residents' cognition of well-being through continuous optimistic state and positive emotional expression. Furthermore, positive mental health status improves urban residents' satisfaction with the community environment through subjective evaluation. Therefore, the model reflects the interaction between human, environment and mental health in influencing well-being.

In addition, based on the meta theory of healthy city proposed by Evelyne, a simplified version for urban studies is summarized below to guide the study on relationship between environment and health (as Figure 3-7). The simplified version of the model agrees with the interpretation of relationship between regulation, determinants and intervention factors proposed by Evelyne. Regulation inevitably limits health determinants and intervention factors and intervention factors influence determinants to some extent while negatively affecting regulation. When research focuses on urban communities, genetics as uncontrollable factors cannot be changed, but lifestyle and environment could influence

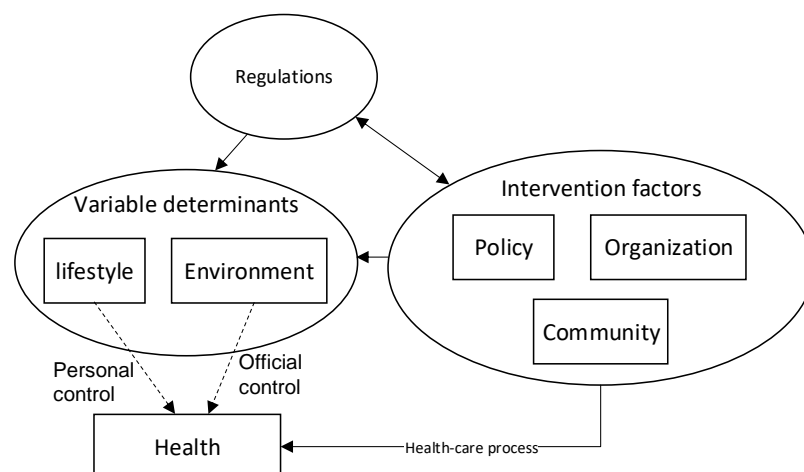


Fig.3-7 The simple model of meta theory in this study

people's health through personal or official control. Thus, lifestyle and environment retention are considered as variable determinants in this model, although their specific mechanisms of influence on health need to be further investigated. Besides, as Evelyne claimed that policy, organization and community affect health through interventions in different levels of the health-care process. So, the health-care process is an important process of intervention in health and the comprehensive effects of intervention factors are applied to health.

3.4 Person-centred research

Person-centred approach was founded by Carl Ransom Rogers (1902–1987), an influential psychologist and co-founder of humanistic psychology. Rogers (1980) proposed that individuals have resources in themselves for self-understanding and to change their self-concepts, basic attitudes and self-directed behaviours and these resources can be tapped if a definable climate of facilitative psychological attitudes can be provided. The exploration of this climate has always been the study of individuals, although its initial application was mainly in the field of psychology and has gradually been applied to other fields. There has been a recent increase in the use of person-centred research strategies in the study of commitment theory and in environmental behaviour research more generally (Wang & Hanges, 2011; Zyphur, 2009). According to Joseph and Murphy (2013), the aim of person-centred research is to encourage bridge building between psychologists and other field scholars to advocate a new inclusive approach. Moreover, it offers a vision for understanding human distress by a non-medical approach. In contrast to other studies, the person-centred approach considers the possibility that the sample might reflect multiple subgroups characterized by different sets of parameters. In other words, person-centred research considers individual variation within a system of variables, which means variables can combine differently for some types of individuals than they do for

others (Marsh et al., 2009). The advantage is that individual characteristics or Behaviours are treated more comprehensively, focusing on a comprehensive system of variables rather than a decentralized one. Furthermore, person-centred approaches can explain complex interactions between variables that are difficult to detect or explain by variable-centred approaches. Therefore, person-centred research appears well suited to addressing research questions regarding how similar patterns of variables operate in subgroups of individuals and to testing theories related to the psychological or emotional aspects of people. Person-centred research can be applied as an approach for designers to deepen the emotional needs and psychological states of human, as well to adapt to the increasing attention on individuals in this society. Designers can provide appropriate intervention measures to impact the inappropriate environmental perceptions based on the psychological feelings of individuals. In addition, through a person-centred approach, designers should understand the complex and dynamic interrelationships between individuals, environment and society, rather than focusing on just one aspect.

In the study of healthy cities, sustainable development is reflected in how health interventions permeate the natural and social systems in which people live and at the community level, sustainable development can

be reflected in satisfactory
neighbourhood

environments and

atmospheres. Hugh Barton,

Executive Director of the
World Health Organisation



Fig.3-8 Habitat Circle Model of Health Impacts (Barton et al., 2003)

and others have used ecological methods, combined with the idea of people-centred sustainable development, to establish a "circle" model of sustainable human settlements that affects human health and well-being from the perspective of the relationship between human health and the overall human settlements system (see Figure 3-8). The four circles, namely, community, local activities, built environment and natural resources, make all the peripheral circles into a mutually influential and closely integrated human environment, reflecting the idea of sustainable development, while at the same time jointly determining the health and well-being of people in the core circle.

3.5 Community-based research

Community-based research (CBR), as a research paradigm, has garnered significant attention and application in addressing multifaceted social issues, particularly those pertaining to racial and class inequalities, violence, socioeconomic disparities, and environmental degradation. Its widespread adoption over the years, as documented by Smith (2012), underscores its efficacy in fostering understanding and catalysing change within complex social landscapes. The conceptualization of 'community' in CBR transcends mere geographical boundaries, as highlighted by Springer and Skolarus (2019), embracing a more nuanced understanding that encompasses shared identities rooted in race, gender, religious beliefs, and sexual orientations. This broader definition underscores the importance of recognizing the diverse and intersectional nature of communities and their associated challenges.

CBR, interchangeably referred to as community-centred or community-wide research, has gained prominence across disciplines such as education, sociology, design, and public health. Its collaborative nature, as emphasized by Israel et al. (1998), ensures that community members,

organizations, and researchers work equitably, fostering a sense of ownership and accountability in the research process. This collaborative framework not only enhances the credibility and relevance of findings but also promotes sustainable interventions that are tailored to the unique needs and contexts of communities.

The process of multi-stakeholder participation in CBR is fundamental to its success. It involves direct engagement with community groups, leveraging their stakeholders and lived experiences to inform research design, data collection, analysis, and implementation of interventions. Through this process, CBR aims to effectuate change within communities, either directly through targeted interventions or indirectly by influencing intermediary factors that shape community dynamics. At a macro level, CBR initiatives often commence with targeted interventions aimed at improving individual lifestyles and behaviours, subsequently scaling up to encompass broader city-wide or regional impacts.

One of the key strengths of CBR lies in its ability to capture nuanced individual needs within a community context, allowing for the collection of rich, context-specific data. This granular level of analysis is crucial for understanding the strengths, resources, and vulnerabilities that exist within a given community. By harnessing this information, CBR facilitates the development of targeted interventions that are both effective and culturally appropriate, thereby enhancing the likelihood of positive outcomes and fostering long-term sustainability.

Furthermore, CBR emphasizes the importance of reflexivity and continuous feedback loops, ensuring that research findings and interventions are iteratively refined based on community feedback. This adaptive approach fosters a culture of learning and improvement, allowing CBR projects to evolve and respond to emerging challenges and opportunities within communities.

In conclusion, community-based research represents a powerful tool for addressing complex social issues, promoting equity, and fostering sustainable change. Its collaborative framework, nuanced understanding of community, and emphasis on continuous learning and improvement make it an invaluable approach for researchers, practitioners, and community members alike.

3.6 Residential well-being in this study

3.6.1 Definition of residential well-being in this study

Although Kelley-Gillespie referred residential well-being as a dimension of quality of life in her research, which is similar with residential well-being to some extent. However, there is no one universal definition of Residential Well-Being no matter in psychology or sociology. Based on the previous discussions, this study believe that Residential Well-Being can be defined: Residential Well-Being (RWB) is a comprehensive judgment result of both the individual's

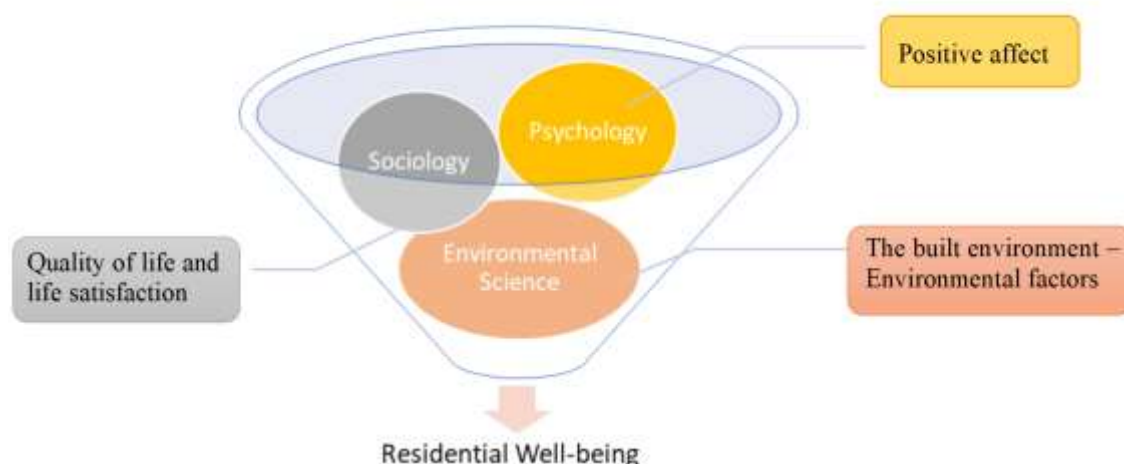


Fig.3-9 Supporting domains of Residential Well-Being (RWB)

overall satisfaction with the built environment and subjective positive affect concerning the subjective well-being in the built environment.

3.6.2 Construct of residential well-being

In the Dictionary of Public Health, systems theory is the branch of scholarly inquiry that examines phenomena to find out whether and how they are related and define the underlying natural systems that govern their activities (Miquel & John, 2018). The system here is defined as a set of dimensions relating to the Residential Well-Being. In this context, the general system theory emphasizes the importance of the interactions between people and components of the built environment. Under the big Residential Well-Being marquee, there are three significant supporting domains – sociology, psychology, and environmental science, using multiple theoretical perspectives to interpret Residential Well-Being, showing in Figure 3-9. Also, all the related concepts such as subjective well-being, the built environment, positive affect, quality of life and life satisfaction are included in the whole system.

The research tends to find out the causes of the phenomena by applying the bottom-up theory. Regarding life satisfaction, Sirgy and other researchers support that satisfaction with specific experiences or life events

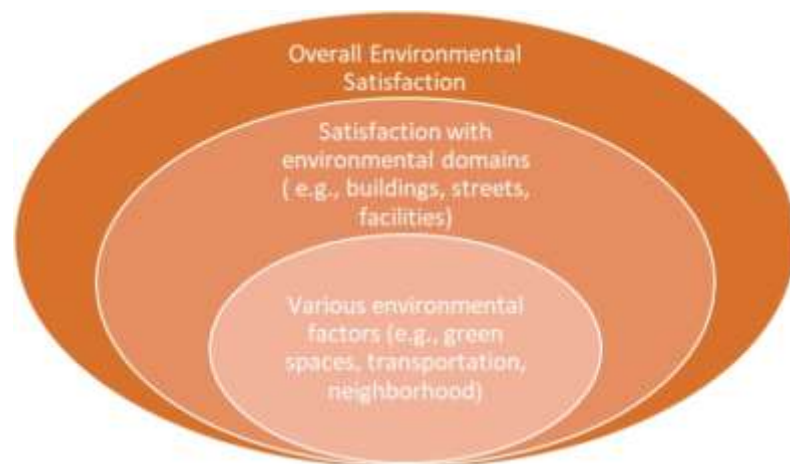


Fig.3-10 Environmental satisfaction hierarchy model

leads to overall life satisfaction (Choi et al. 2007; Sirgy et al. 2010). The basement of this theory is that overall life satisfaction is related to the satisfaction with those domains or experiences of life. Similarly, the research concerning Residential Well-Being might focus on environmental satisfaction, which is a part of life satisfaction, highlighting individual's satisfaction with the built environment. It can be explained by the environmental satisfaction hierarchy model (Figure 3-10).

Bottom-up theory can be applied to Residential Well-Being which is influenced by various domains such as psychological aspects and environmental ones. These domains are composed of sub-domains which are impacted by specific experiences within the domains. The subjective and objective indicators at the bottom of the model can be considered as the tools of measurement of Residential Well-Being, reflecting the multiple needs of individuals (Figure 3-11). It also means that the Residential Well-Being is constructed from the individual's perspectives and related to people's concerns. In other words, when the specific indicators become greater, the actualization of Residential Well-Being (RWB) can be considered as greater.

The construct of Residential Well-Being which is driven by three well-established theoretical bases—systems theory, bottom-up theory, appraisal theory of emotion, is a combination



Fig.3-11 Residential Well-Being (RWB) hierarchy model

of deductive and inductive modes of thinking. It also means that these theories support the conceptualization of the Residential Well-Being construct. The systems theory highlights the importance of the interaction between concepts related to human and the built environment such as positive affect, subjective well-being, quality of life and environmental factors. Under the concept of Residential Well-Being, Figure 3-12 shows a comprehensive model of RWB by mingling concepts together.

In addition, the bottom-up theory explains a hierarchy model of Residential Well-Being which is shown in Figure 3-12, supporting the approaches for measuring RWB. Residential Well-Being as a comprehensive concept is influenced by both subjective and objective indicators at an individual level. In other words, it shows an inductive approach based on theoretical validation.

At last, in the context of Residential Well-Being construct, appraisal theory of emotion gives evidence supporting to the bottom-up theory. It supports that emotions are extracted from people's evaluations or explanations of events or experiences. In other words, people are likely

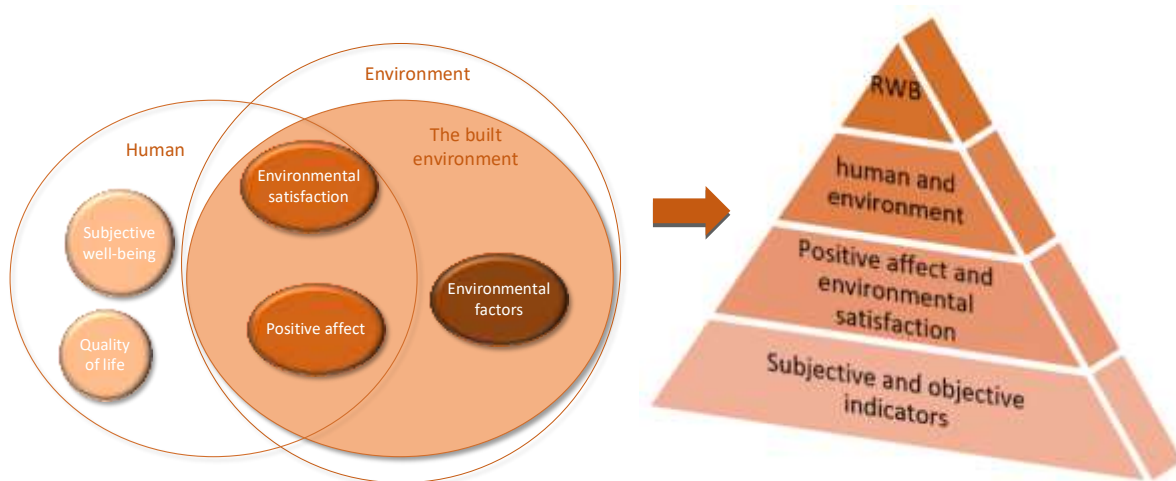


Fig.3-12 Construct of residential well-being

to feel Residential Well-Being when the positive affect and environmental satisfaction reach a certain level. Individual's emotional affect is considered as an important part as the objective factors related to the built environment.

3.7 Summary

This chapter has reviewed the impact of the built environment on well-being from different perspectives, the approaches to influencing well-being, the models and strategies for interventions, person-centred research and community-based research.

In the theoretical combining, it was found that people's concern for health gradually changed to mental health in favour of psychological health based on purely physical health, which, to a certain extent, guided the direction of this study. In addition, this chapter explores the research focus on built environment elements and mental well-being and existing research on the impact of the built environment on mental well-being, to clarify the importance of research on the interaction between the environment and mental well-being and to demonstrate that interventions on the physical environment can effectively affect people's life satisfaction and overall well-being, providing strong theoretical support for this study. Based on the above theories and research, this study takes well-being as the goal and takes urban residents as the research object to explore the interaction between their mental health and the community living environment. The discussion on well-being provides theoretical and philosophical support for the analysis of residential well-being in this study and makes it clear that the "well-being" in this study follows the Aristotelian "objective well-being" in terms of values and adopts the "subjective well-being" line of thought in terms of the research methodology and technique. In terms of research methodology and technique, it adopts the "subjective well-being" line of thought, focusing on

personal well-being. The cognitive theory of emotion analyses the interaction between human beings and the environment through emotions from the perspective of cognitive psychology and agrees that individuals express their perceptions of the surrounding environment through cognitive appraisal and cognitive appraisal as the basis for the composition of emotions can be quantified, which is helpful for the study of the interrelationships between the emotions generated by human beings for the community living environment and the environmental elements in the external environment and is the basis for the study of the "objective well-being" in this study. It is also the focus of this study on the emotional balance component of "residential well-being".

With the support of the above theoretical foundation, this study will focus on the impact of community environment on human psychological well-being from a micro perspective, integrate the relationship between environment, psychology and human beings, analyse the influencing factors and evaluation indexes of residential well-being, establish a theoretical system of community well-being environment and explore in depth the mechanism of the impact of community environmental elements on residential well-being.

CHAPTER 4 RESEARCH METHODOLOGY

4.1 Introduction

Basic research is concerned with the refutation or corroboration of theories that explain how the social world operates, why social relations are as they are, while applied research is always directed towards a specific problem in practice (Neuman, 2011). As the primary objective of this study is to examine social relations between people and their environment, with a particular focus on well-being in relation to fundamental knowledge and theories of psychology and sociology, this study can be categorised as basic research but not applied research. Furthermore, correlational studies are a type of study that can be applied to explore the relationship between influencing factors and residential well-being. This research tends to identify how the relationship works and build theoretical explanations. Based on this study, there is the potential to change the design methods of urban residential areas from the perspective of improving RWB, which is also a combination of design and psychology.

In addition to discussing the dimensions of research, the paradigm is also an essential part that must be considered before starting a research project. At the macro level, the research paradigm can influence the beliefs and direction of the entire research project and guide the way researchers understand and address the problems. Initially, most research follows the positivist and constructivist approaches, while pragmatism emerges as a deconstructive paradigm from philosophy and social science after that period. This research selects pragmatism as the research paradigm because it focuses on the truth regarding the research questions under investigation (Tashakkori & Teddlie, 2003). As a problem-oriented philosophy, this research is oriented towards the identification of a feasible solution to address the mental problems in urban

residential areas in high-density cities. Mixed methods studies are the products of the pragmatist paradigm, which combines the qualitative and quantitative approaches within different phases of the whole research process. This research employs mixed methods studies as a research methodology to organise different methods.

Although there are many differences between qualitative and quantitative research, they complement each other as well. While quantitative research measures variables and draws conclusions linked to general causal explanations, qualitative research applies logic in practice and explains the causes for specific situations. To achieve both aims and avoid the limitations of each method, the exploratory mixed methods approach must be employed in this study. This involves analysing quantitative data after collecting qualitative data from the study. About the qualitative process, this research tends to seek to ascertain the meaning of residential well-being by employing explanatory techniques and to collect qualitative data about impact factors by using exploratory techniques in the former part of this research. Furthermore, to gain insight into individuals' subjective reactions and attitudes towards residential environment design, exploratory techniques will be employed towards the conclusion of this research. In contrast to the subjective aspect, the exploratory techniques will be employed throughout the main body of the research, with the objective of developing impact factor models of residential well-being. As quantitative methods are employed to quantify subjective attitudes and feelings through mathematical data analysis, with the objective of testing the hypotheses proposed in the qualitative process, it can be concluded that qualitative methods are used to provide details about human emotion and personality characteristics, which are subjective in this research. Conversely, quantitative methods are applied to derive important factors from research data and mathematical analysis in an objective mode.

4.2 Pragmatism as the research paradigm

Paradigm is considered as a system of thinking, a basic orientation to theory and research (Chen et al., 2009). Denzin and Lincoln (2005) define paradigms as the researcher's net that holds the ontological, epistemological and methodological beliefs and the "taken for granted" aspect of a paradigm is called the first principles. Paradigms which are defined as the worldviews or belief systems to guide researchers are also an essential term of academic research (Lincoln et al., 1994). The correct choice and understanding of philosophical orientation are of extreme importance to allow the selection of the most convenient methodology to facilitate the gathering of the relevant data (Remenyi et al., 1998; Blaxter, 2004), especially as poor understanding of philosophical issues can seriously lower the quality of the research (Hong et al., 2006). Based on this point, the first essential step to begin scientific research is to choose an appropriate research paradigm which can support the way to conduct a research process or methodology. It can also help researchers to believe what kind of methods or strategies could get the knowledge at the end of the research. In addition, the correct selection of philosophical orientation can be a strong basement of the research and can indirectly impact our understanding of the social phenomena.

This research chose 'pragmatism' as the research paradigm since it combines the positions of both positivism and interpretivism. While positivism support that some natural science methods can be used to investigate the knowledge of social reality, interpretivism states that detailed observations or interviews could help people understand how they maintain and view the real world. Differed from two paradigms, Pragmatism is a philosophical movement that states beliefs and theory as being related to our practical surroundings in the world (Allen et al., 2015; Maul et al., 2017). Having studied the different philosophical approaches and considered the nature of the current research, an overall view of a resident's feelings and perception is necessary to get a

better understanding of all the residents' views and attitudes of the community design. Based on this, this research required the participation of a large population sample, which will create large amounts of numerical and statistical data and information, so the quantifiable analysis will be needed in this research. Except that, the interpretations of residents' views and expectations about the future community are also an important part of this research since it can provide some possibilities or potential strategies of the future community design. When considering all these factors, pragmatism is the most appropriate philosophical paradigm to support the research steps and meet the objectives of the current research.

4.3 Research design

4.3.1 Overview of research design

The systematic process of solving a research problem is referred to as research methodology (Sahu, 2013). It typically encompasses a series of distinct phases, during which specific methodologies or techniques are selected in a logical and systematic manner to address the research problem at hand. A sound research methodology can assist researchers in conducting their research in a logical and reasonable manner. The term 'paradigms' is defined as the worldviews or belief systems that guide researchers (Lincoln & Guba, 1994). Three major paradigms are recognised in the social sciences as the positivist, empiricist and pragmatism approaches. The positivist paradigm emphasises the use of quantitative methods, while the empiricist paradigm prioritises qualitative methods. Mixed methods, which represent the product of the pragmatism paradigm, combine elements of both quantitative and qualitative approaches. This section will focus on three types of research: quantitative research, qualitative research and mixed methods research.

Qualitative research is employed for exploratory studies in which little prior knowledge exists, as well as for in-depth investigations of the less tangible precursors of behaviour, such as attitudes, feelings and motives, among respondents (Silverman, 1997). Furthermore, qualitative research is characterised by an emphasis on the assessment of quality using words, images and descriptions, thereby enabling researchers to explore how people structure and subjectively understand their daily lives (Berg, 2012). Furthermore, qualitative approaches are oriented towards interactive processes and the construction of social reality, which are largely informed by logic in practice.

The objective of quantitative research is to measure objective facts by focusing on variables (Berg, 2012). As quantitative researchers prioritise the precise measurement of variables and the testing of hypotheses that are linked to general causal explanations, the collection of data is considered an essential step in the quantitative research process, occurring prior to measurement (Neuman, 2011). Furthermore, the reconstructed logic is applied in a more systematic manner, which results in highly organised research.

In contrast to the exclusive focus on a single methodology, mixed methods research integrates both quantitative and qualitative research approaches to enhance the comprehension of the subject matter under investigation. Mixed methods research is defined as the product of the pragmatist paradigm and the combination of qualitative and quantitative approaches within different phases of the research process (Bryman, 2006). To a certain extent, mixed methods research can be seen to encompass the strengths of both quantitative and qualitative approaches. Quantitative approaches are known as statistical analysis, which can make the hypotheses more generalisable. In contrast, qualitative approaches produce expressive data that can provide

descriptive details and a deep understanding of the study in question, allowing for a more nuanced examination of the research.

4.3.2 Research framework

The research employs three distinct phases, each employing both quantitative and qualitative approaches. These phases are structured in a hierarchical manner, with each subsequent phase building upon the previous one (see Figure 4-1). The initial phase of the research is concerned with elucidating the meaning of residential well-being (RWB). The subsequent phase is dedicated to the measurement and construction of theoretical models of RWB. The final phase of the study employs qualitative approaches to derive design strategies.

The initial phase of the study is a qualitative exploration of the meaning of residential well-being

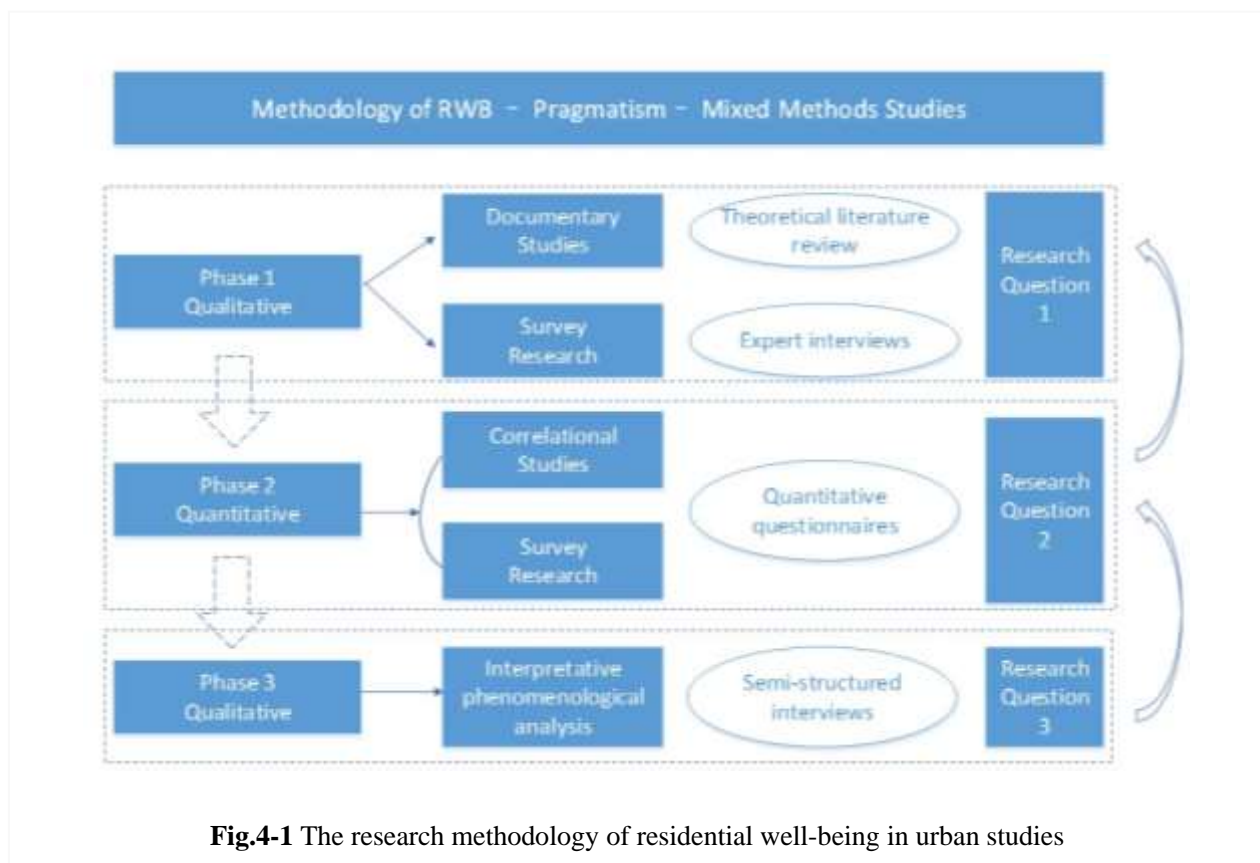


Fig.4-1 The research methodology of residential well-being in urban studies

and the environmental factors and individual feelings that may influence RWB in urban residential areas. This is achieved through documentary studies and survey research. The analysis of a multitude of previous documents, which contain a plethora of information about the phenomenon or concept under investigation, is referred to as a documentary study. This approach enables the study to define RWB and identify potential impact factors. The objective of survey research is to investigate and establish meaningful variation in populations (Jansen, 2010), which can then be used to identify further information or potential factors influencing RWB among individuals residing in urban residential areas. In this phase, the theoretical literature review and qualitative questionnaires can be employed as research techniques to collect qualitative data from previous literatures and respondents.

Considering the findings of the initial phase, it is recommended that the second phase employ quantitative methods to assess the attitudes and sentiments of individuals. This necessitates the conversion of subjective attitudes into objective, quantifiable forms. Correlational studies and survey research can be employed to collect quantitative data from residents residing in the sample urban residential areas. The hypothesis that both objective environmental factors and subjective emotional factors can affect the residential well-being of individuals in urban residential areas should be tested by analysing the data. Moreover, statistical data analysis is employed to construct mathematical models of the relationship between residential well-being and its impact factors, with the objective of elucidating the distinctive attributes of different variables.

In the third phase, interpretative phenomenological analysis can be employed to elucidate the experiences and sentiments of residents in urban residential areas, as it is a methodology that

prioritises subjectivity and the individual's personal perception of the environmental design. The use of in-depth interviews as a research technique in this study is intended to facilitate an in-depth understanding of RWB in urban residential areas and to identify the specific environmental design elements that can enhance the residential well-being of residents. Furthermore, semi-structured interviews can be conducted in a manner that allows for the exploration of specific topics and the acquisition of supplementary data throughout the inquiry process.

4.3.3 Phase one: Documentary studies & Survey research

The initial phase of the study is designed to examine the evolution of subjective well-being definitions and the historical perspectives that have informed research on urban living environments. This will involve a comprehensive review of the literature and the identification of the specific research content that will be addressed in this study. It is of the utmost importance to gain a profound comprehension of the concept of residential well-being and to provide a definitive definition at this stage, which serves as the cornerstone of the study. Furthermore, a precise definition of the key term can facilitate the narrowing of the research area and scope. A theoretical literature review is employed as a research technique because residential well-being is a multifaceted concept that cuts across various research domains. It is therefore essential to gain a comprehensive understanding of all the related fields. Furthermore, a theoretical review can identify the factors that influence residential well-being and indicate which of these should be tested in subsequent phases. As residential well-being is a complex and multifaceted concept, theory triangulation is employed to gather qualitative data encompassing previous documents and definitions of related concepts from sociology, environmental science and psychology. Once

the data has been inducted, it is necessary to demonstrate a reasonable definition and understanding of residential well-being in this phase.

Furthermore, survey research is employed in this phase. To ascertain the professional perceptions of potential impact factors on residential well-being, stakeholder interviews are employed as a research technique. By conducting interviews with stakeholders who possess a profound understanding of and extensive knowledge in the fields of psychology and sociology, it is anticipated that the research will yield novel and meaningful insights that extend beyond the scope of the literature review. Furthermore, the researcher can obtain authentic data regarding the environmental factors that residents prioritize and their actual sentiments by administering questionnaires to respondents residing in diverse residential areas across most Chinese cities. The objective of this study is to ascertain the factors that contribute to residents' positive perceptions of their living environment. Rather than imposing a predefined framework for residential well-being, the most effective and efficient approach is to utilise questionnaires to elicit the individual's subjective experience of well-being (Pavot & Diener, 1993). Furthermore, the use of online questionnaires with open-ended questions allows for the collection of qualitative data in a more convenient manner. This is also a methodological triangulation, whereby different methods are employed to collect data, with the aim of enhancing the validity of the research. The study presents a specific definition of residential well-being and a list of potential impact factors of residential well-being, derived from the combination of the results of a literature review and survey research. These findings serve as a guiding framework for the subsequent study.

4.3.4 Phase two: Correlational studies& Survey research

In this phase, quantitative research methods are employed. The most direct way of obtaining information about human needs and attitudes to urban residential areas is to interview residents directly and to conduct surveys on their daily lives. In Phase One, the study should propose several hypotheses to be tested in this phase. These include the factors that influence residential well-being in an ideal situation and the relationship between objective environmental factors and different emotional factors of individuals. This pertains to the field of psychology, and thus, correlational studies are employed to analyse the correlations between different variables through multiple variable analysis. Additionally, the objective is to estimate the extent to which the values for different factors are related in psychology. As the objective of this phase is to develop a model of residential well-being, a case study is not an appropriate methodology for investigating specific phenomena in specific cases. Moreover, field research is not an appropriate methodology in this context, as it focuses on the status of individuals in a natural setting over an extended period. In contrast, this phase is concerned with identifying general tendencies and facts. In sociology, survey research can be employed to describe trends in the data and to measure important attitudes and feelings of individuals. Furthermore, statistical analysis can be employed to ascertain variables and attributes within the context of quantitative questionnaires, thereby facilitating the construction of mathematical models of residential well-being. As correlational studies and survey research are interdependent across different research fields, this phase combines two research methods for the purpose of achieving the same goal. Correlational studies focus on exploring relationships between two or more variables, excluding cause-and-effect relationships. In contrast, survey research describes objective tendencies in the data using correlational and regression analysis, rather than offering rigorous explanations.

About the specifics of the quantitative questionnaires employed in this phase, single-item measures of residential well-being and satisfaction represent the culmination of the self-reported assessment conducted via a 5-point Likert scale. Furthermore, multiple-item measures refer to the 20-item Affectometer (Kammann & Flett, 1983) as a measure of SWB and the Satisfaction with Life Scale (Diener et al., 1985), a five-item measure of global life satisfaction. Furthermore, although self-report of global SWB and life satisfaction may be influenced by transient factors, a considerable amount of evidence demonstrates that subjective well-being is a stable state, with measures of it exhibiting considerable temporal reliability (Headey & Wearing, 1989). All the questions regarding satisfaction levels and feelings about the living environment in the initial section are closed-ended, as this format is more conducive to respondents providing accurate and coherent responses (Neuman, 2011). The use of SPSS as a data analysis technique allows for the examination of the correlational relationships between residential well-being and different variables, which should be divided into three levels according to the strength of the correlations. Regression analysis allows the weights of different variables to be measured, which can then be used to build impact factor models of residential well-being in high-density cities.

4.3.5 Phase three: Interpretative Phenomenological Analysis

Once the theoretical models of residential well-being have been constructed, the research can proceed to address design issues in the real environment. Three similar methodologies in psychology may be employed, namely observations, interviews and qualitative analysis, including grounded theory, phenomenology and ethnography. Grounded theory is a methodology that aims to develop theory from data and explain the phenomenon. This phase of grounded theory is particularly suited to understanding individuals' experiences in residential areas, which

aligns well with the characteristics of phenomenology. This allows for the induction of design strategies from the perspective of improving residential well-being. Furthermore, ethnography is concerned with the relationships between people and cultures in a long-term study. However, this study is considered to explore what people perceive by interpreting their living experiences. Consequently, phenomenology is more appropriate for this study than grounded theory or ethnography.

In this phase, interpretative phenomenological analysis is employed as a research method within the context of phenomenology. The rationale for selecting this methodology is that it facilitates the design and execution of small-scale qualitative research, which is well-suited to elucidating individuals' experiences of residing in their residential environment. Furthermore, semi-structured interviews are employed as a research technique to collect data directly. The use of semi-structured interviews allows for the conversations to be guided by a structured framework, while also providing the opportunity to gain further insights that may not be accessible through more structured interview techniques. Regarding the nature of the questions posed in the interviews, the majority are open-ended to ascertain the extent to which a change in the living environment might enhance subjective well-being and other emotional factors. The use of images of different sample designs allows respondents to gain a more intuitive perception of the living environment, thereby facilitating the identification of those designs that enhance their residential well-being. The analysis of the data represents a significant challenge in this phase, as researchers must endeavour to render the meaning of the conversations more comprehensible by interpreting them in accordance with their own understanding. The objective of interpretation is to elucidate the subjects' personal perceptions and the ways in which they perceive different living environments.

4.4 Research techniques

4.4.1 Field observations

According to Daston and his colleagues (2011), observation was considered as an essential method for gaining knowledge from being a flourishing epistemic genre during the seventeenth and eighteenth centuries. In this study, observations were carried out to explore the actual situations of the built environment and use behaviour of residents in different urban communities. In a way, observation was marginal to the Aristotelian notion of science and based on deduction from first principles that certain knowledge consists of general causal explanations. The method of data collection known as observations was defined by Marshall and Rossman (2011) as the systematic description of events and behaviours in the social setting chosen for study. Generally, observations aim to collecting real data without influencing or interacting with subjects in time and space. Babbie (2011) indicated the importance of observing in a non-intrusive way because people may take some unusual behaviours or actions when they notice the observer. The conservations were conducted on weekdays, weekends and holidays in selected urban communities. Regarding the environmental dimension, the observation focused on the actual situations of the community, including aspects such as greening, building density, public facilities within the community and in the surrounding area, transportation accessibility, open space planning and building information. Furthermore, the research area included the greenspace, open space, streets within each residential community and the infrastructure surrounding the residential community in accordance with residents' routes during their daily activities. This enabled the observers to obtain general information from the built environment. Photos were taken as the recording technique because it can minimize the impact on daily life of residents. Brief notes and sketches were quickly recorded to complement the photos to complete the

information. Residents and the built environment were viewed as an indivisible and interacting whole during the observation.

Additionally, Beins (2013) posited that field observations could be employed to address contemporary situations and human behaviour in their entirety. Researchers collect contextual data pertaining to the built environment with the objective of observing and recording the actual behaviours of people within the built environment. It should be noted that this method does have certain limitations. The objectivity of conclusions drawn from observation can be criticized, because observers are limited by their subjective knowledge and interests which may affect their analysis and interpretation. Discussions and reflections are supportive to some extent; however, they cannot eliminate subjectivity and prejudice. Compared with video recording, taking photos in field observation can minimize the interference to residents' living environment and reduce the possibility of ethical issues related to privacy. Most of the residents being photographed were informed and their consent was obtained, however, for those who did not wish to be photographed, descriptive notes were made to supplement the data to treat respondents with respect.

4.4.2 Questionnaires

Questionnaires, as a survey instrument of collecting people's opinions, are flexible in the sense that a wide range of information can be collected. Moreover, it is cost-effective, time-efficient for both researchers and respondents since it can be conducted by email, face-to-face and telephone settings. Also, it can cover a large group to collect an amount of data at the same time, which is friendly to individual researchers and easy to administer. Besides, for the interviewees, filling in the questionnaire allows them to choose answers freely and they do not have to worry

about the interpersonal problems when communicating with others. It can also give respondents enough time to understand the questions and give their correct judgment, which can ensure the accuracy and authenticity of research data to a certain extent, although subjective differences cannot be avoided in understanding of questions. According to Menter and his colleagues (2011), although some practical research applying questionnaires is relatively small-scale, surveys do make larger samples possible. However, the respondents identified for a survey are often a random sample, it is difficult to judge subjects' motivation, honesty, memory and ability to respond. The respondents may take different opinions from those who do not response, thus biasing or skewing the findings. To overcome partly difficulties or disadvantages of questionnaires, administering the questionnaires face to face can collect higher quality data rather than leaving the respondents to self-complete.

In this study, questionnaires are used to collect satisfaction with living environment and evaluations of personal emotional intensity, to objectively study subjective perceptions on living environment and explore the relationship between them and residential well-being.

4.4.3 Interviews

As a means of supplementing the questionnaire to obtain data, face-to-face interviews can be applied before designing the questionnaire and after collecting the answers of questionnaire, further clarifying questions can be asked to elaborate on respondents' answers from questionnaires. Interviews allow researchers to collect non-verbal data such as emotions and gestures. For example, they can see whether a particular question makes the respondents nervous or unhappy, or whether they respondents are defensive or rejected when some words were spoken. Furthermore, interviews are more flexible than questionnaires especially when the

research questions are less accurately defined. In this study, interviews can be used to adjust the questionnaire before large-scale investigation to ensure that the questions in the questionnaire can be accurately expressed. Also, interviews with residents in advance can make targeted adjustments to the content of the questionnaire, so that the collected data can better solve the research problems. When the community environmental design strategy is proposed based on the data analysis results, the interview can provide a broader direction and possible new ideas, so that the research conclusions can truly reflect the actual living needs and emotional experience results of residents, which is conducive to the development of an innovative community environmental design strategy oriented by emotional promotion.

4.4.5 Data collection and analysis

The collection and analysis of data can be conducted in different phases. However, for the purpose of comprehensive understanding, the data must be merged for analysis. In this study, qualitative data were collected from multiple sources, including observation, documentation, questionnaires and interviews. The initial influencing factors of residential well-being were extracted from the effective information of the observation of residents' daily behaviours and conclusions verified in previous literature. According to Baxter and Jack (2015), data collection and analysis occur concurrently in qualitative studies, several categories of the built environment-related elements were summarized into the first version of the questionnaire. After that, the influencing factors in the questionnaire were adjusted through the questionnaire data recovered from the pre-survey and face-to-face interviews with residents and the final survey questionnaire was formed. Qualitative data were also collected after quantitative data analysis to

be interpreted and used by researchers for potential reasons for the results of data analysis and further explanations on the research conclusions.

Quantitative data were generated and analysed from questionnaires. The questionnaire was divided into four sections to measure the perceptions of residents, including individual information, the overall residential well-being, satisfaction of residents in the physical environment of the residential area and emotion evaluation of living in the environment. Among them, the satisfaction level and emotional intensity were measured on a 5-point Likert scale, ranging as: satisfaction / full compliance (5 points), more satisfactory / more consistent (4 points), general (3 points), less satisfied / less than (2 points), dissatisfied / Not at all (1 point). SPSS was applied to analyse the correlations and multiple regressions between items of the questionnaire. This study estimated models to identify environmental, emotional and personal factors that influence expression results of residential well-being. Since personal factors cannot be controlled in fact, respondents were confined to similar neighbourhoods or the same community to ensure that they lived in highly similar the built environment. In addition to conducting correlation analysis on the well-being of residence and various influencing factors by Pearson correlation analysis, multiple regression analysis was also conducted on independent variables related to dependent variables. Besides, the correlation analysis was conducted between emotional factors and environmental satisfactions to interpret the further relationships on two aspects.

4.5 Reliability and validity

Reliability concerns the extent to which a test or measurement received the same results when it is repeated (Carmines& Zeller, 1979). As Stanley (1971) posited, the extent of chance error may vary considerably, yet it is pervasive to some degree. Nevertheless, it is important to note that

while repeated measurements of the same phenomenon may never precisely replicate each other, they do tend to show consistent results across different measurements. This tendency is known as reliability. When it comes to validity, people often describe indicators of an abstract concept as valid because they help us understand the abstraction by measuring it. Consequently, while reliability is concerned with the specific attributes of empirical indicators, namely the extent to which they provide consistent results in repeated measurements, validity is concerned with the key relationships between concepts and indicators.

Triangulation is applied to validate constructivist research related with epistemology in the social science (Golafshani, 2015). The advantage of triangulation is that it leads to a reliable and confident result of phenomenon by engaging multiple methods for overcoming the limitations of a single-method approach and providing a fully explanation on the complexity of human behaviours or perceptions (Cohen et.al.,1994). Theory and methodological triangulation were selected for this study according to Denzin and Lincoln (2018) from four types of triangulations. Theory triangulation refers to approaching the research with various theoretical points of view and multiple perspectives. In this study, theory triangulation was used in building a theoretical model of residential well-being, involving multiple theories related to emotion, psychology, health and environment. Methodological triangulation requires to exploring data by applying multiple methods which must be selected with an eye to their theoretical relevance (Denzin, 1970). For example, observations, interviews and questionnaires were conducted in the same residential areas in this study.

4.6 Summary

The systematic process of solving a research problem is referred to as research methodology (Sahu, 2013). It typically encompasses a series of distinct phases, during which the most appropriate methodologies or techniques are selected in a logical and systematic manner. A sound research methodology can assist researchers in conducting their research in a logical and reasonable manner. The term 'paradigms' is defined as the worldviews or belief systems that guide researchers (Lincoln & Guba, 1994). Three major paradigms are known in the social sciences as the positivist, empiricist, and pragmatism approaches (Lincoln & Guba, 1994). The positivist paradigm emphasises the use of quantitative methods, while the empiricist paradigm prioritises qualitative methods. Mixed methods, which represent the product of the pragmatism paradigm, combine elements of both quantitative and qualitative approaches. This section will examine three types of research: quantitative research, qualitative research and mixed methods research.

Qualitative research is employed in exploratory studies where prior knowledge is limited and in-depth studies of the less tangible precursors of behaviour, such as attitudes, feelings and motives, are required (Silverman, 1997). Furthermore, qualitative research is characterised using words, images and descriptions to assess the quality of phenomena. This approach allows researchers to explore how people structure and subjectively understand their daily lives (Berg, 2012). Furthermore, qualitative approaches are oriented towards interactive processes and the construction of social reality, which are largely informed by logic in practice.

In contrast, quantitative research is aimed at measuring objective facts by focusing on variables (Berg, 2012). As quantitative researchers prioritize the precise measurement of variables and the

testing of hypotheses linked to general causal explanations, measurement is regarded as a pivotal step in the quantitative research process, occurring prior to data collection (Neuman, 2011). Moreover, it employs a greater degree of reconstructed logic, thereby ensuring that the research is highly organised in an idealised form.

In contrast to the exclusive focus on a single methodology, mixed methods research integrates both quantitative and qualitative research approaches to enhance the comprehension of the subject matter under investigation. Mixed methods research is defined as the product of the pragmatist paradigm and the combination of qualitative and quantitative approaches within different phases of the research process (Bryman, 2006). To a certain extent, the mixed method is designed to incorporate the strengths of both methods. Quantitative approaches are known as statistical analysis, which can make the hypotheses more generalisable. In contrast, qualitative approaches produce expressive data that can provide descriptive details and a deep understanding of the study in question, allowing for a more nuanced examination of the research.

CHAPTER 5 APPRAISAL SYSTEM OF RESIDENTIAL WELL-BEING

5.1 Mechanisms inherent in the evaluation of residential well-being

A review of the literature on the built environment and mental health in Chapter 2 and an analysis of residential well-being in this chapter reveals that the impact of the built environment on the human psyche is complex and indirect, meaning that the built environment often requires a series of mechanisms of action to affect residential well-being. Some research results have provided theoretical support for the influence of the built environment on life satisfaction. Campbell's model (Figure 5-1) suggests that life satisfaction stems from an individual's perception of exposure to the built environment to the point of generating a response and

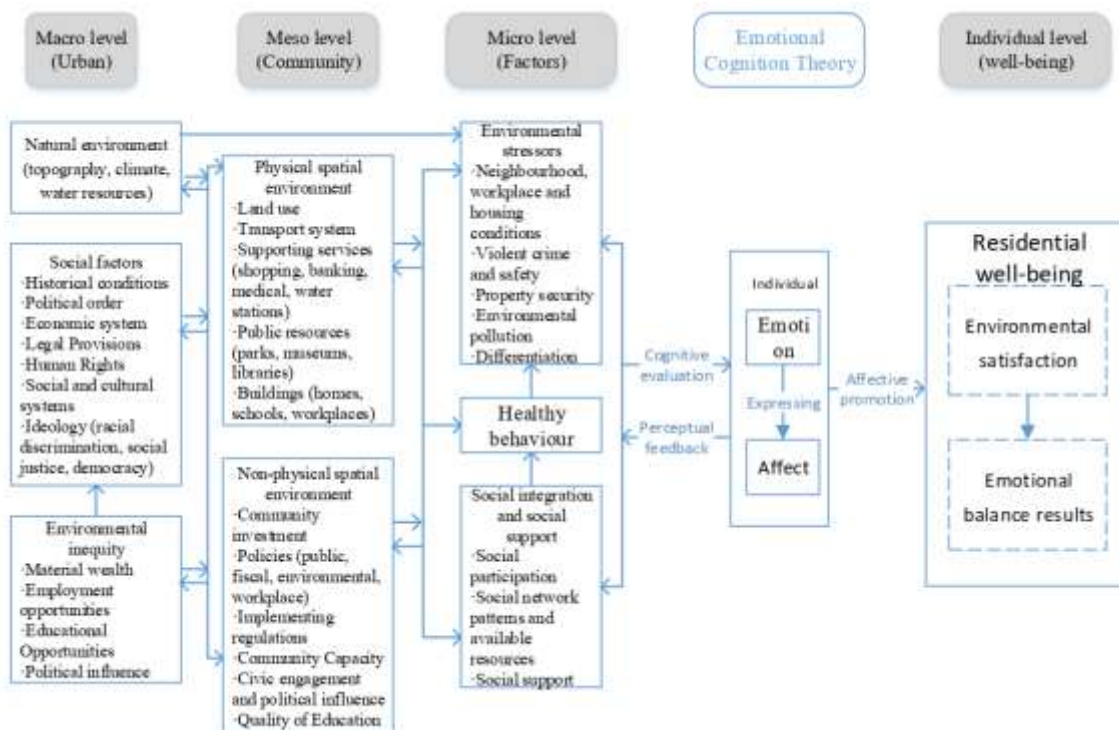


Fig.5-1 Mechanisms for the impact of the built environment on well-being (Adapted from Schulz and Northridge, 2004)

forming satisfaction with a specific domain. The objective the built environment becomes the perceivable the built environment by producing stimuli to the person and the satisfaction with a particular aspect of the environment is formed through the person's individual attributes and experiences and finally becomes a part of life satisfaction. And synthesizing Arnold's action sequence and Lazarus's emotional cognition theory, based on the health influence mechanism proposed by Schulz and Northridge (2004), it is possible to derive a motivational relationship about the relationship between the built environment and emotion. As shown in Figure 5-1, events in the built environment cause people to generate perceptions, generate emotions by virtue of individual subjective experience combined with perceptions and the gradual accumulation of emotions generates emotional needs and form evaluations of events in the environment based on emotional needs combined with individual attributes. The community in this study, as a meso-level research object, can contribute to the micro-factors affecting residential well-being in multiple ways and through these micro-influences as environmental stimuli. Following the mechanism of environmental-emotional influence, individual emotions are influenced through cognitive appraisal, which are then expressed as a variety of emotions and are closely related to individual residential well-being by means of emotional facilitation in terms of two aspects, namely, environmental satisfaction and emotional balance results, respectively. Among them, emotional facilitation is a means to promote individual emotional expression through the coordination of various elements, as well as a process that prompts people to maintain and enhance their own well-being.

5.2 Pre-preparation for the evaluation of residential well-being

5.2.1 Analysis of well-being needs of community residents

In the study of improving the built environment for health, major countries around the world have promulgated design guidelines to promote active living. Among them, the Ten Principles of Healthy Environment Construction promulgated by the Urban Land Department of the United States and the Healthy Space and Place promulgated by Australia, as national design guidelines, have experienced a wealth of empirical studies, so they have great authority and universality. Figure 5-2 lists the environment-related design guidelines covered by these two guidelines and summarizes the needs related to community living from the level of community living environment, including natural needs, social needs, safety needs, aesthetic needs, transportation needs, identity needs and life service needs. In addition to national design guidelines, many scholars have concluded from previous empirical studies or scientific theories that the universal needs of residential Behaviour are applicable to most residential communities.

From the perspective of well-being needs, residents' needs are divided into material needs, social needs and spiritual needs. For residential well-being, these needs all stem from residents' perception of the community living environment, that is, the needs of community residents for different environmental elements. For example,

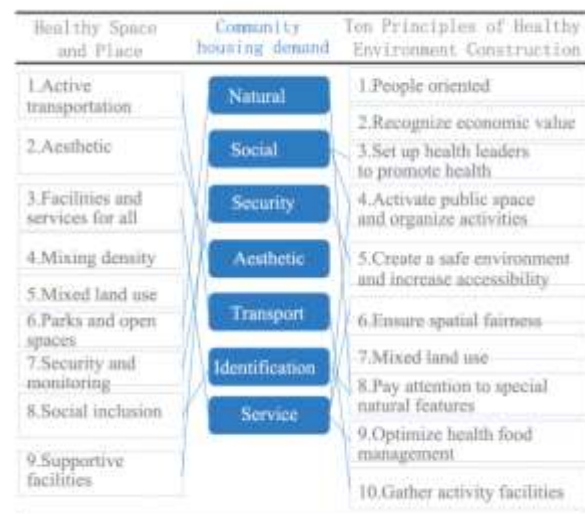


Fig.5-2 Residential needs covered by state-level design guidelines

transportation needs can be seen as residents' demand for community transportation space; Social needs refer to the needs of residents as a member of the community for opportunities to communicate with other social natural persons such as community public space and community interaction activities and these needs are also subordinate to social needs. In the community living life, the natural needs are the residents' needs for the opportunity to contact the natural environment in the community or the accessibility of green space in the community. Life service demand refers to the demand for supporting facilities or living service space in the community, which can be regarded as material demand. In addition, living in a specific environment for a long time will inevitably lead to different psychological emotions, such as security, community belonging, which belong to spiritual needs. Based on the above discussion, the needs of community residents for a happy living environment can be summarized as follows:

(1) The demand for the physical environment

This includes the residents' needs on whether the houses they live in can be sheltered from wind and rain, whether the community's landscape green space is sufficient and whether the public facilities are complete and other material space can meet the residents' living well-being. At the same time, it also requires the material environment construction in the community to make the residents reach a certain degree of satisfaction, to promote the improvement of residential well-being.

The need for social environment

This includes the needs of community residents for social activities such as communication activities in the community, cultural atmosphere in the community, personal interpersonal relations in the community and whether there is enough social space in the community to provide

these social activities. Residents need to meet the social needs of people in the living environment to maintain physical and mental health, but also to meet the diverse social needs of residents of different ages in the community.

The need for spiritual environment

The feeling of "home" has always been an important goal in the construction of residential environment in China, which should take care of the emotional needs of community residents and create positive emotions such as psychological security, belonging and comfort for residents, to meet the pursuit of living well.

Well-being needs of community residents are mostly based on the construction of community environment. Therefore, clarifying the specific influencing factors of residential well-being provides a feasible path for how to use the built environment to meet the well-being needs of community residents and lays a foundation for exploring the complex relationship between environmental factors and well-being.

5.2.2 Determining the influencing factors of residential well-being evaluation

In the context of community environment, architects and urban studies scholars have been engaged in interdisciplinary research in recent years, beginning to focus on people's reflections and feelings about life and there is growing evidence of a correlation between well-being and the built environment. According to a 2018 report by the World Health Organization, the form of community, housing quality, utility and transport services, public green space, street safety and social cohesion associated with the urban the built environment may affect mental health to varying degrees. In addition, many studies have shown that certain elements of the living

environment can affect mental health or well-being, but most of these studies only focus on one specific aspect and cannot cover the full range of factors in the built environment. For example, some studies have shown that the aesthetic quality of the community and the amount of green space in the living environment are positively associated with higher levels of well-being (Bond et al., 2013; Gong et al., 2016). Several other studies have investigated the effects of changing housing quality on the mental health and well-being of adults and older adults, with some basic physical features of a community, such as green space, accessibility to transportation and availability of public space, having a clear impact on personal well-being, especially among older adults. In addition, Pollock et al. (2006) proposed that the interaction between physical and mental health, as well as changes in the residential environment, such as the distance between the home and public transportation or surrounding facilities, can be considered as indirect factors affecting mental health. Weinhardt et al. (2017) studied the relationship between the experience of using public facilities and mental health and conducted field surveys in communities and face-to-face interviews with property managers and residents according to the problems found. It can be known that property management has a great impact on well-being, such as garbage classification management and planning of parking Spaces in

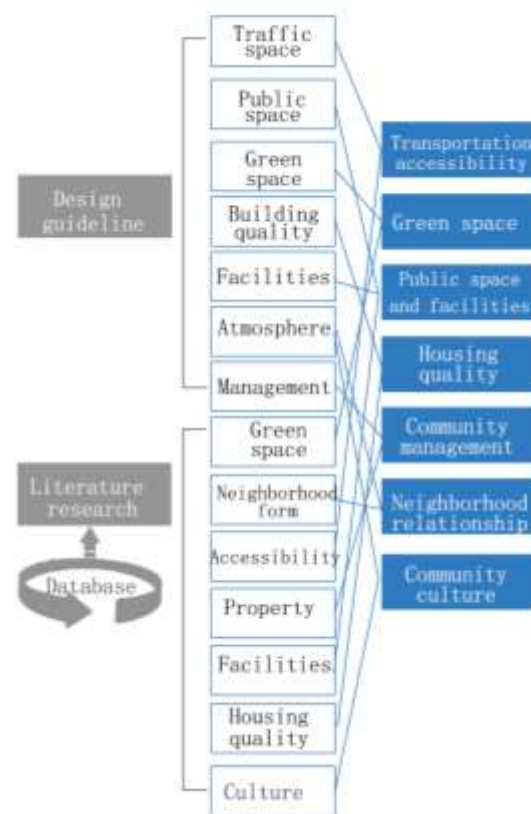


Fig.5-3 Community environment elements

communities. Based on the influence factors of residential well-being in the built environment mentioned above, seven categories of elements are summarized, including green space and neighbourhood relationship (Bond, 2013& Gong, 2016), accessibility of transportation (Pollock, 2006), community public space and facilities" (Weinhardt, 2017), community culture (Kee et.al., 2019), property management from the results of the interviews and housing quality (Rafaely, 2018& Tao, 2018). Combined with the seven the built environment elements summarized in the design guidelines above, the seven community environment elements shown in Figure 5-3 are finally determined by summarizing and combining similar element categories.

This study does not focus on a single factor of living environment but explore a variety of environmental factors that affect residential well-being, especially the emotional factors related to psychological aspects. As mentioned above, residential well-being is subjective. The emotional aspect of residential well-being is measured by the evaluation of people's self-emotional state and only the positive emotion is concerned based on the positive attribute of residential well-being. Positive emotions are defined as feelings and emotions that reflect the degree of pleasant contact with the environment, such as well-being, joy, excitement and satisfaction. Emotion is a part of human being and is defined as the mental state brought about by subjective feelings. In addition, there is some evidence that positive emotions can promote positive social Behaviour, so it can be argued that the experience of positive emotions can promote an individual's interaction with the built environment, thus significantly affecting residential well-being. In addition, some evidence suggests that people can improve their well-being by cultivating experiences of positive emotions. According to the book "Environmental and Ecological Psychology", community belonging was first proposed by Sarason in 1974, representing the need sharing and emotional connection among members and the mutual

influence between individuals and communities. In 1996, Plas and Lewis supported the effect of physical environment on community belonging by conducting qualitative research on communities in coastal towns. In addition, the cultural atmosphere and organizational activities of the community are also

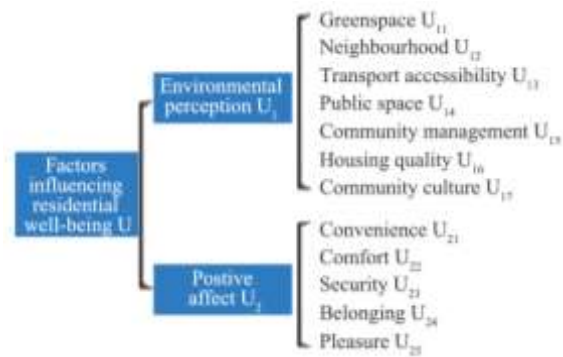


Fig.5-4 A collection of factors influencing residential well-being

important factors affecting the sense of community belonging. Based on the 2018 World Well-being Database and World Well-being Report, well-being is measured by positive emotions such as pleasure, relaxation, comfort, enjoyment, security and well-being. Based on the above review and combined with the elements related to community design, this study summarizes five typical positive emotions that residents may have in the community environment, namely, security, community belonging, convenience, comfort, etc. And pleasure. To sum up, Figure 5-4 summarizes the set of influencing factors of residential well-being in community environment from the environmental perception level and the positive emotion level respectively, which helps to establish the foundation of the subsequent relationship model.

5.2.3 Residential well-being survey questionnaire design

(1) Survey questionnaires distributed to community residents

As the purpose of this study is to enable residents to report what makes them feel good about their living environment, rather than allowing researchers to define residential well-being for them, questionnaires are the most efficient and effective way to gain personal experience of

residential well-being. In addition, while self-reports of overall subjective well-being and life satisfaction may be influenced by transient factors, there is considerable evidence that subjective well-being is a stable state and measurements of it show considerable temporal reliability. All questions in the main body of the questionnaire about the level of satisfaction and feelings about the living environment are closed questions because they are easier to answer and can reduce the number of irrelevant or confusing answers. According to the evaluation factors of residential well-being summarized in the previous section, this study conducted a questionnaire design of residential well-being in communities of densely populated cities.

Five scholars in different research fields were simulated and interviewed for several rounds of modification and the final questionnaire covered four aspects: the basic information of the respondents, the evaluation of the overall residential well-being, the evaluation of the satisfaction of environmental factors and the identification evaluation of the description of different emotional states. The purpose of this study is to reveal the multi-factor correlation of residential well-being in urban communities. However, when people are asked about a particular emotional or environmental factor, they answer the first question that comes to mind, ignoring why they answered the way they did and whether it was accurate. To avoid preconceptions, respondents were first asked about their overall residential well-being, rather than their views on a single factor, while providing a clear explanation of what residential well-being meant. To explore the relationship between residential well-being and environmental factors, respondents were asked to assess their satisfaction with six different types of environmental factors. Some examples were given in the description of each type to avoid confusion.

Given how people perceive emotions, it's possible that when people are directly asked about a particular emotion, they may interpret its meaning differently, which may have somewhat affected the validity of the findings. Therefore, this study used corresponding state descriptions instead of direct emotional statements to avoid misunderstanding and respondents were asked to evaluate their degree of agreement with different descriptions, rather than the intensity of their emotions. At the same time, to emphasize the investigation subject of this study, important evaluation factors are marked with bold and different colours to facilitate respondents to accurately find the investigation focus.

Respondents' responses were evaluated on a 5-point Likert-scale. They were asked to rate the following:

- a) Overall residential well-being, rated on a strong scale from 1 (very unhappy) to 5(very happy);
- b) Rate the level of satisfaction with six community environments on a scale of 1(very dissatisfied) to 5(very satisfied)

S1: green space U_{11} (the area of green plants in the community, planting types, etc.)

S2: Neighbourhood relationship U_{12} (relationship with neighbours or residents in the community)

S3: Accessibility of public transport U_{13} (distance from the gate of the community to the bus station, types of transport available, etc.)

S4: Design of public space and facilities within the community U_{13} (area of activity venue, number of fitness equipment, setting of garbage cans, etc.)

S5: Community management U_{15} (property management, garbage recycling, sanitation, etc.)

S6: the quality of the house U_{16} (layout, orientation, sound insulation, etc.)

S7: Community culture U_{17} (community activities, community atmosphere, etc.).

c) Self-rate the level of positive emotional agreement generated during the residence, on a scale of 1 (strongly disagree) to 5 (strongly agree)

E1: Living here I feel travel, life is very convenient U_{21} (Convenience)

E2: I feel very comfortable with the layout and facilities here U_{22} (Comfort)

E3: Living here makes me feel safe U_{23} (Security)

E4: Living here, I feel that I am a member of the community and have a sense of community U_{24}
(Belonging)

E5: Living in such an environment makes me feel pleasant inside U_{25} (Pleasure)

In addition, to obtain the importance of different positive emotions to residential well-being, a ranking question is added to this part: Please rank the above five positive emotions according to their importance to residential well-being (1 is the most important -- 5 is the least important).

The following methods were used to collect questionnaire data. The first way is to set up a online questionnaire and send it to the residents' network contact group to facilitate the respondents to fill out the questionnaire in their free time. To ensure the authenticity of the collected data, a question is added into the online questionnaire to screen unqualified questionnaire data and exclude respondents who do not live in the sample community. In addition, there is a submission limit for online questionnaires, which can only be submitted once per account. The second method, which is more efficient for researchers, involves randomly distributing questionnaires in common areas of the community on weekday evenings. In addition, to improve the validity of the study, questionnaires were randomly distributed on different floors of each building in each residential community.

(2) Questionnaires sent to stakeholders

The influence factors on residential well-being are the cognitive level of atmosphere and the emotional level. Among them, the emotional level belongs to the subjective self-report, which needs to rely on the real feelings of residents to judge the impact of this level on residential well-being. However, the cognitive level not only refers to the residents' satisfaction with the community environment, but also involves the objective state of the community the built environment. To ensure the fairness and objectivity of the evaluation results, this study adopts

Tab.5-1 Scoring Sheet for stakeholders

	Built environment perception results				Positive emotional expression results			
Built environment perception results	1							
Positive emotional expression results					1			

	Green space	Neighbourhood	Public transport accessibility	Public spaces and facilities	Property management	Housing quality	Community culture
Green space	1						
Neighbourhood		1					
Public transport accessibility			1				
Public spaces and facilities				1			
Property management					1		
Housing quality						1	
Community culture							1

	Convenience	Comfort	Security	Belonging	Pleasure
Convenience	1				
Comfort		1			
Security			1		
Belonging				1	
Pleasure					1

Scale: 9-a is definitely more important than b; 7-a is very important than b; 5-a is more important than b; 3-a is slightly more important than b; 1-a is as important as b; 1/3-a is slightly less important than b; 1/5-a is less important than b; 1/7-a is very unimportant than b; and 1/9-a is definitely less important than b.

the method of multi-subject participation in the evaluation and organically combines the internal evaluation of community residents with the external evaluation of stakeholders in related fields. On the one hand, community residents participate in the evaluation as users of the community environment, which is convenient to proactively discover and solve problems in practice. At the same time, comprehensively absorbing the participation of external evaluation subjects can accept and internalize the experience found in previous studies and avoid the limitations of self-evaluation alone. The research adopted the analytic hierarchy process (AHP), combined with the stakeholder questionnaire and adopted Saaty's 1-9 scale method to develop a questionnaire as shown in Table 5-1.

5.2.4 Residential well-being research object selection

(1) Investigate the choice of community

To prove the rationality of the above multi-factors, several small-scale residential communities in a community in Shenzhen are chosen to conduct practical research and take this as an example to explore the relationship between community environment and well-being. First, Shenzhen (a densely populated city in China) is chosen as the target city because it has witnessed some of the most rapid and advanced infrastructure development in China in recent years. In Shenzhen, there are many newly built small - scale residential areas. By studying them, this study hopes to find ways to improve the ongoing urbanization process. Among the many residential communities in Shenzhen, HW community is the ideal object of our study. The HW community (below) has a short history. Built in 2004, the community is progressing rapidly. Since 2004, 11 high-rise commercial and residential complexes have been built, most of which meet our selection requirements as follows:

First, these communities have a relatively organized property management system, which excludes some older residential complexes. Second, a clear distinction was made between the internal and external areas of the selected community to ensure that subjects could understand the questions about the division of areas in the questionnaire. Third, to avoid the influence of uncontrollable factors such as community culture and geographical location, different residential quarters within the same community are chosen for practical research. Fourth, housing prices have a certain restricting effect on residents' personal economic status, social status, quality of life and other related factors. Therefore, to ensure the wide applicability of the research results,

the housing prices of the selected residential areas are within a certain range (based on the average housing prices in Shenzhen).

Based on the above considerations, 6 residential communities in HW Community are selected, Bao 'an District, Shenzhen and coded them as communities 1-6 for ethical and privacy considerations. Figure 5-5 shows the geographic location of the residential quarters within the selected HW

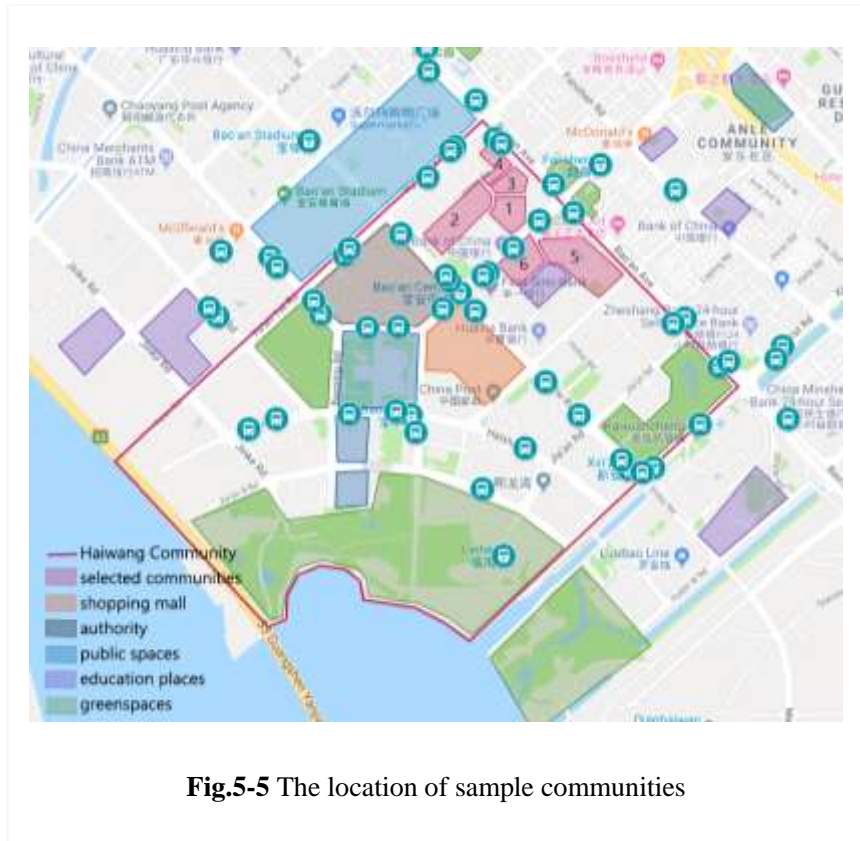


Fig.5-5 The location of sample communities

community and an overview of their surroundings. There are 6 metro stations in the HW community, more than 30 bus stops and more than 10 bus stops in the surrounding area. In addition, there are many green spaces and public spaces in and around the HW community, with a large shopping mall located near the selected residential area. Outside the HW community, there are a number of sports clubs and Bao 'an Stadium, which is only about a 15-minute walk from the selected residential area.

(2) Selection of scoring stakeholders

As mentioned above, the evaluation of residential well-being in this study involves multiple stakeholders. Therefore, the stakeholder group set up when issuing the questionnaire consists of 12 people, including 2 from the field of architecture, 2 from the field of urban planning, 2 from government departments, 2 from community workers and 4 from the field of psychology. When collecting the stakeholder questionnaire, the main purpose and content of the study were explained to the relevant stakeholders by email, telephone, and the questionnaire was sent to the stakeholders online or in person. To ensure the accuracy of the score content, the score data of 12 stakeholders were collected within 24 hours after each stakeholder made clear the research content and the purpose of the questionnaire.

5.2.5 Acquisition and collation of survey data

(1) Results of community residents' environmental perception data

First, to ensure the reliability of the collected data, the reliability and validity of all the questions in the 270 questionnaires are analysed. The obtained data results were shown in Table 5-2. The KMO test result was above 0.9 and the Bartlett test result showed great significance. It shows that the validity of the questionnaire is suitable and there is correlation between the variables.

Tab.5-2 Reliability and validity analysis of the questionnaire

Number of questions	Cronbach's α	KMO	Bartlett's test of sphericity df
20	0.895	0.909	190 (p=0.000***)

In the process of sorting out the questionnaire data, the three most important environmental

Tab. 5-3 Results of the analysis of selection of environmental factors

	Green space	Neighbourhood	Public transport accessibility	Public spaces and facilities	Property management	Housing quality	Community culture
Frequency	119	88	128	163	196	100	16
Percentage	44.1%	32.6%	47.4%	60.4%	72.6%	37%	5.9%
Weighting	0.147	0.1087	0.158	0.201	0.242	0.1233	0.02
Hierarchical weights	0.0735	0.0543	0.079	0.1005	0.121	0.0617	0.01

factors affecting residential well-being selected by residents and the data ranking the importance of positive emotions were statistically analysed and the weight distribution of environmental factors and emotional factors for community residents was obtained respectively. According to the definition of residential well-being in this study, the influence of satisfaction with environmental factors and the perceived expression of positive emotions on residential well-being accounts for 0.5 each. First, the data sorting results of environmental factors are shown in the following table. The weights are obtained according to the frequency and normalization of each environmental factor, as shown in Table 5-3. The hierarchical weights of each environmental factor are obtained according to the weights of the environmental perception layer.

For the ranking results of positive emotions, the importance weights are assigned to them in the order from 1 to 5, respectively, as 10, 7, 5, 3 and 1. After statistics, the weight sum of the emotional factors in Table 5-4 is obtained and the weight of each emotional factor is obtained after normalization. The hierarchical weight of each emotional factor is finally obtained according to the weight of the positive emotion layer.

Tab. 5-4 Results of the analysis of ranking of emotional factors

	Convenience	Comfort	Security	Belonging	Pleasure
Frequency of Sort 1	93	30	102	28	17
Frequency of Sort 2	48	61	71	37	53
Frequency of Sort 3	47	78	45	43	57
Frequency of Sort 4	46	64	26	37	71
Frequency of Sort 5	36	37	26	28	72
Sum of importance weights	1675	1346	1846	1042	1111
Hierarchical weights	0.1193	0.0959	0.1315	0.0742	0.0791

(2) Stakeholder rating data results

Due to differences in professional perspective and scoring ability, the researchers divided the weight of the scores of the 12 stakeholders consulted according to experience, including 4 stakeholders in the field of architecture and urban planning (0.4), 4 government departments and community workers (0.2) and 4 psychologists (0.4). The judgment matrix of pairwise comparison is established by combining the 9-level scale method, as shown in formula 5-1 and the specific calculation process is described in the following.

$$P = \begin{bmatrix} V_{11} & V_{12} & \cdots & V_{1n} \\ \vdots & & \ddots & \vdots \\ V_{n1} & V_{n2} & \cdots & V_{nn} \end{bmatrix} \quad (5-1)$$

U_i 、 U_j (i,j=1,2,3,...,n)- influencing factors at this level;

V_{ij} - the relative importance of U_i to U_j

P - The weight judgment matrix of influencing factors composed of V_{ij}

In the weight analysis, the weight judgment matrix (P_1 and P_2) of the environment perception layer and the emotion expression layer are listed respectively according to the formula and then the weight judgment matrix (P) of the influencing factors of residential well-being is listed and finally a complete weight model is formed. The determination of weight can be reduced to the process of calculating the maximum eigenvalue and eigenvector of the judgment matrix. The

eigenvector represents the weight of the influence of each factor at this level on a factor at the previous level and the result is generally obtained by the root method. First, the product M_i of each row of elements of the judgment matrix are computed:

$$M_i = \prod_{j=1}^n V_{ij} \quad i = 1, 2, \dots, n$$

Then, calculate $\bar{W}_i = \sqrt[n]{M_i}$ and normalize the vector \bar{W} to get the eigenvector W_i (see Formula 5-2) :

$$W_i = \frac{\bar{W}_i}{\sum_{j=1}^n \bar{W}_j} \quad (5-2)$$

Finally, equation 5-3 to calculate the maximum eigen root of the weight judgment matrix is as follows:

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^n \frac{(AW)_i}{W_i} \quad (5-3)$$

λ_{max} - the largest characteristic root

$(AW)_i$ - the I-th element of the vector AW, which is also the comprehensive weight vector of the influencing factors

W_i - the priority weight vector of each influencing factor

n - The number of influencing factors

After the matrix is constructed according to the above method, the consistency test of the subjective judgment matrix is also needed when calculating and determining the weight. The so-called consistency test means that when stakeholders judge the importance of indicators, each score needs to be consistent and there will be no contradictory results. Although in real life, due to external factors such as the diversity of understanding of matrix content by stakeholders in various fields and the complexity of things themselves, it is not practical to require the complete consistency of the judgment matrix, to ensure the effectiveness of analytic hierarchy process and the rationality of data analysis results, the judgment matrix needs to meet the general consistency. Conformance checks are also usually done in tandem with the importance ranking step. In the

process of calculating the importance ranking of indicators, $(\lambda_1, \lambda_2, \dots, \lambda_n)$ is characteristic of

matrix P root, satisfying $V_x = \lambda_x$, $V_{ij} = 1$ and $\sum_{i=1}^n \lambda_i = n$. When the weight judgment matrix is

completely consistent, $\lambda_1 = \lambda_{max} = n$ and the other eigen roots are 0. When the weight

judgment matrix is not completely consistent, it satisfies $\lambda_1 = \lambda_{max} > n$ and $\lambda_2, \lambda_3, \dots, \lambda_n$

satisfies the formula $\sum_{i=2}^n \lambda_i = n - \lambda_{max}$.

According to the above conclusions, when the weight judgment matrix cannot guarantee the complete consistency, the consistency of the judgment matrix can be tested by the change of the eigen roots of the judgment matrix. Consistency test formula 5-4 is as follows:

$$CR = \frac{CI}{RI} \quad (5-4)$$

CR- to compare the random consistency ratio of the judgment matrix;

CI - consistency index of comparison judgment matrix;

RI - the priority weight vector of each influencing factor is a random consistency index, which is related to the order of the comparative judgment matrix.

The consistency index CI of the judgment matrix is used to measure the degree of deviation of the judgment matrix and to check the consistency of decision makers' judgment thinking. The calculation method is shown in Formula 5-5:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (5-5)$$

The closer the CI value is to 0, the better the consistency of the judgment matrix. When

$CR < 0.1$, or $\lambda_{max} = n$, $CI=0$, it can be considered that P has satisfactory consistency, otherwise it is necessary to adjust the elements in P to make it have satisfactory consistency.

After the data of 12 stakeholders are obtained, the weight distribution of each influencing factor of residential well-being can be obtained by normalization processing according to their weights.

Here, the scoring data of an architectural stakeholder is taken as an example. Table 5-5,5-6,5-7 respectively gives the statistical results and weight distribution of the architectural stakeholder's score and Table 5-8 shows the summary results of the individual weight of the stakeholder. The similar calculations were made for the results of the questionnaire for other stakeholders.

Tab.5-5 Matrix of weights of top-level influences on residential well-being ($\lambda_{max} = 2.0000$; $CR = 0$)

	Environmental perception layer	Positive affect layer	Weights (W_i)
Environmental perception layer	1	1	0.5
Positive affect layer	1	1	0.5

Tab.5-6 Matrix for weighting influences in the positive affective layer ($\lambda_{max} = 5.1514$; $CR = 0.0338$)

	Convenience	Comfort	Security	Belonging	Pleasure	Weights (W_i)
Convenience	1	1/3	1/5	1/7	1/3	0.0474
Comfort	3	1	1/3	1/3	1	0.1218
Security	5	3	1	1/3	3	0.257
Belonging	7	3	3	1	5	0.4653
Pleasure	3	1	1/3	1/5	1	0.1085

Tab.5-7 Matrix of weights of influencing factors in the environment perception layer ($\lambda_{max} = 7.4051$; $CR = 0.0496$)

	Green space	Neighbourhood	Public transport accessibility	Public spaces and facilities	Property management	Housing quality	Community culture	Weights (W_i)
Green space	1	3	3	1	3	1/3	3	0.1898
Neighbourhood	1/3	1	1	1/3	1	1/3	1	0.0712
Public transport accessibility	1/3	1	1	1/3	3	1	3	0.1236
Public spaces and facilities	1	3	3	1	5	1	5	0.2422
Property management	1/3	1	1/3	1/5	1	1/5	1	0.0519
Housing quality	3	3	1	1	5	1	7	0.2714
Community culture	1/3	1	1/3	1/5	1	1/7	1	0.0499

Tab.5-8 Data weighting results for the stakeholder

Influencing factors	Individual weights	Affiliation hierarchy weights
Green space	0.1898	Environmental perception layer 0.5
Neighbourhood	0.0712	
Public transport accessibility	0.1236	
Public spaces and facilities	0.2422	
Property management	0.0519	
Housing quality	0.2714	
Community culture	0.0499	Positive affect layer 0.5
Convenience	0.0474	
Comfort	0.1218	
Security	0.257	
Belonging	0.4653	
Pleasure	0.1085	

5.3 A fuzzy evaluation model of residential well-being

Based on the previous preparation, the collected data will be statistically analysed scientifically. Firstly, based on the theory of emotional cognition belonging to the previous question and the summarized internal mechanism of community the built environment affecting well-being, the

Tab.5-9 Results of Pearson correlation analysis

	Green space	Neighbourhood	Public transport accessibility	Public spaces and facilities	Property management	Housing quality	Community culture
Residential well-being	0.661 0.000***	0.542 0.000***	0.511 0.000***	0.726 0.000***	0.738 0.000***	0.602 0.000***	0.468 0.000***
	Convenience	Comfort	Security	Belonging	Pleasure		
Residential well-being	0.483 0.000***	0.661 0.000***	0.602 0.000***	0.655 0.000***	0.732 0.000***		

model of the intrinsic relationship between community environment and residents' perception is established and the intrinsic complex mechanism of influence is explained through data analysis. On this basis, the fuzzy comprehensive evaluation method and the hierarchical analysis method are used to establish the fuzzy comprehensive evaluation model of residential well-being, which is used to judge the level of residential well-being in different communities or neighbourhoods. Before constructing the evaluation model of residential well-being, each evaluation factor is

relevant to the evaluated object. According to the correlation analysis of the 270 data collected from the residents' questionnaire, the results are shown in Table 5-9, the seven influencing factors in the environmental perception layer and the five influencing factors in the positive emotion rubbing have a strong correlation with the residential well-being, from which the construction of the evaluation model can be carried out.

5.3.1 An evaluation set for residential well-being

(1) The set of evaluation factors

First, the set of evaluation factors of residential well-being is established. U is the set of factors influencing the residential well-being of the evaluated community, including U_1 and U_2 as the evaluation level factors influencing residential well-being, respectively.

$U = \{ U_1 \text{ (the built environment perception result), } U_2 \text{ (positive emotion expression result)} \}$

U_1 (environment perception layer) = $\{ U_{11}$ (green space), U_{12} (neighbourhood), U_{13} (public transportation accessibility), U_{14} (public space and facilities), U_{15} (property management), U_{16} (housing quality) $\}$

U_2 (Positive affective layer) = $\{ U_{21}$ (Convenience), U_{22} (Comfort), U_{23} (Security), U_{24} (Belonging), U_{25} (Pleasure) $\}$

(2) The set of evaluation ratings

For the residential well-being rating scale set $V = (V_1, V_2, V_3, V_4, V_5)$, where V is the set of rubrics for the evaluation of residential well-being and V_1 to V_5 are the rating scales for evaluating the factors influencing residential well-being, which vary according to the different tiers of factors. The environmental perception layer expresses the judgment of U_1 (environmental perception layer) from very dissatisfied, less satisfied, generally satisfied, more satisfied and very satisfied, respectively. The positive affective layer, on the other hand, ranged from very disagreeable, not too agreeable, generally agreeable, relatively agreeable and very agreeable, expressing the judgment of U_2 (positive affective layer). The final rating levels reflected in the evaluation results of residential well-being are very high, relatively high, generally high, relatively low and very low, reflecting the overall level of residential well-being in that community. Therefore, the set of evaluation ratings of residential well-being in this study is

$V = (\text{very low, relatively low, generally high, relatively high, very high}).$

5.3.2 A fuzzy matrix of residential well-being

First, a one-factor rubric is established as below, as a fuzzy mapping from U to $F(V)$.

$$f: U \rightarrow F(V), \forall U_i \in U$$

$$U_i \rightarrow f(U_i) = \frac{r_{11}}{V_1} + \frac{r_{12}}{V_2} + \dots + \frac{r_{1n}}{V_m}$$

$$0 \leq r_{ij} \leq 1, 1 \leq i \leq n, 1 \leq j \leq m$$

In fuzzy comprehensive evaluation, the degree of affiliation is used to indicate the degree to which the evaluation object (residential well-being) belongs to the set of rubrics (very high, relatively high, generally high, relatively low, very low). The degree of affiliation usually lies between 0 and 1, where 0 indicates a complete mismatch or complete non-affiliation and 1 indicates a complete match or complete affiliation. The fuzzy relationship can be induced from $f(U_i)$ and the following fuzzy relationship matrix formula (5-6) is obtained.

$$R = \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{pmatrix} \quad (5-6)$$

R is the one-factor judgment matrix and r_{ij} represents the affiliation of the evaluated object to the fuzzy subset of V_i rank from the influencing factor U_i .

In this study, a 12*5 fuzzy relationship matrix consisting of all evaluation indicators of residential well-being can be obtained from 270 residents' questionnaires as follows.

$$R = (r_{ij})_{12 \times 5} = \begin{pmatrix} 0.026 & 0.074 & 0.23 & 0.326 & 0.344 \\ 0.004 & 0.048 & 0.267 & 0.378 & 0.304 \\ 0.007 & 0.011 & 0.093 & 0.396 & 0.493 \\ 0.048 & 0.119 & 0.307 & 0.278 & 0.248 \\ 0.007 & 0.107 & 0.281 & 0.281 & 0.259 \\ 0.019 & 0.137 & 0.27 & 0.311 & 0.263 \\ 0.004 & 0.048 & 0.267 & 0.378 & 0.304 \\ 0.007 & 0.004 & 0.078 & 0.322 & 0.589 \\ 0.015 & 0.052 & 0.293 & 0.326 & 0.315 \\ 0.019 & 0.022 & 0.2 & 0.389 & 0.37 \\ 0.026 & 0.037 & 0.315 & 0.311 & 0.311 \\ 0.044 & 0.093 & 0.256 & 0.326 & 0.281 \end{pmatrix}$$

Among R , each row represents the affiliation of an evaluation indicator U_i to an evaluation level V and each row sums to 1. For example, U_1 represents the green space, r_{11} represents the percentage of very dissatisfied, r_{12} represents the percentage of not very satisfied, r_{13} represents the percentage of generally satisfied, r_{14} represents the percentage of more satisfied and r_{15} represents the percentage of very satisfied. As a result, (U, V, R) constitutes a fuzzy comprehensive evaluation model of residential well-being.

5.3.3 Multi-stakeholder determination of weight sets for evaluation factors

The evaluation level of residential well-being is categorized into the expression of positive emotions and the perception of the built environment. According to the results of the community residents' survey, the weight of the built environment perception level on residential well-being depends on the correlation between the community residents' satisfaction with each environmental element and their residential well-being. The weight of the positive emotion expression hierarchy depends on the results of residents' ranking of the five positive emotions affecting residential well-being. In response to the data from the stakeholder questionnaire, the hierarchical analysis method was used to compare the influencing factors according to the degree of importance attached to different influencing factors by multiple

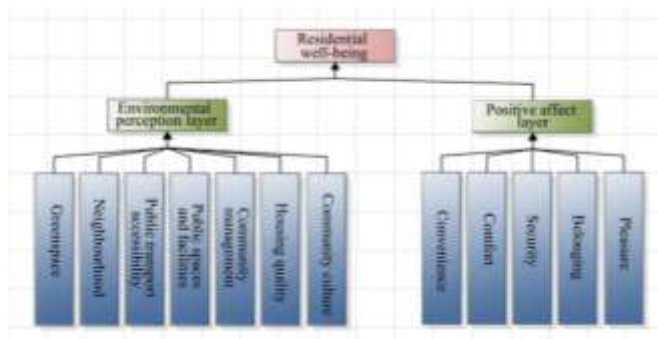


Fig.5-6 A hierarchical tree model of factors influencing residential well-being

stakeholders based on their respective professional perspectives. Hierarchical analysis is a combination of qualitative and quantitative decision analysis method to solve complex problems, using the experience of stakeholders in different fields to judge the relative importance of each influencing factor to achieve the goal and reasonably give the weight of each factor, the decision-making or evaluation process hierarchical and quantitative. In the hierarchical tree model shown in Figure 5-6, the sum of weights of each layer is 1 and the weight of each sub-evaluation factor comes from the allocation of evaluation factors in the upper layer. If the weight of the 1st tree structure of the 2nd layer, which is the environment perception layer, is W_{11} , the weight of the sub-influence factors belonging to the environment perception layer is calculated as in Equation (5-7):

$$W_{11} = \sum_{k=1}^{n_{1j}} W_{1jk} \quad (5-7)$$

Based on the questionnaire data rated by 12 stakeholders, the process of data analysis was applied to determine the weights of each factor using the hierarchical analysis method using YAAHP. According to the method of determining the weights described in the previous section, the weights of the 12 stakeholders were calculated separately, converted according to the proportion of stakeholders in different fields and ensured that the sum of the weights of each level was 1. Finally, after consistency test, the weight distribution of the factors influencing the residential well-being can be obtained as shown in Table 5-10, 5-11, 5-12.

Tab.5-10 Results of weight distribution of influential factors in the top layer of residential well-being

	Architecture and urban planning total weight (0.4)	Government and community total weight (0.2)	Psychology total weight (0.4)	Final weight allocation
Environmental perception layer (W_1)	1.75	1.75	0.7917	0.34167
Positive affect layer (W_2)	2.25	2.25	3.2083	0.65833

Tab.5-11 Results of weight allocation of influencing factors in the environment perception layer

	Architecture and urban planning total weight (0.4)	Government and community total weight (0.2)	Psychology total weight (0.4)	Normalised weight	Hierarchical weight (W_{1j})
Green space	0.6786	0.3342	0.5478	0.13935	0.047611715
Neighbourhood	0.2893	0.5249	1.0667	0.161845	0.055297581
Public transport accessibility	0.4381	0.4544	0.2917	0.0957	0.032697819
Public spaces and facilities	0.9231	0.5876	0.3216	0.15385	0.05256593
Property management	0.2766	0.6641	0.7351	0.134375	0.045911906
Housing quality	1.2045	1.0286	0.8101	0.25289	0.086404926
Community culture	0.1898	0.4062	0.227	0.06199	0.021180123

Tab.5-12 Results of the weight distribution of influencing factors in the positive affective layer

	Architecture and urban planning total weight (0.4)	Government and community total weight (0.2)	Psychology total weight (0.4)	Normalised weight	Hierarchical weight (W_{2j})
Convenience	0.2541	0.4	0.3043	0.07584	0.049927747
Comfort	1.1114	0.9757	0.6582	0.225745	0.148614706
Security	0.8043	1.2555	1.5158	0.294785	0.194065809
Belonging	1.3834	1.0485	1.2776	0.318525	0.209694563
Pleasure	0.4468	0.3203	0.2441	0.085105	0.056027175

Since the residents are the users of the community environment, the results of the community residents' perception of the environment should be integrated into the model before determining the final model, so the results of the analysis of the community residents' perception of the environment need to be added based on the results of the stakeholder scores. Since the results of residents' perception are more subjective, 0.8 weight is given to the results of stakeholder ratings and 0.2 weight is given to the results of community residents' perception. As a result, the weighted results of the relationship between community environment and residential well-being

are shown in Table5-13, 5-14, 5-15.

Tab.5-13 Top-level hierarchical weighting results for residential well-being

	Environmental perception layer	Positive affect layer
Stakeholders	0.34167	0.65833
Residents	0.5	0.5
Weights	0.3733	0.6267

Tab.5-14 Hierarchical weighting results for the environment satisfaction layer

	Green space	Neighbourhood	Public transport accessibility	Public spaces and facilities	Property management	Housing quality	Community culture
Stakeholders	0.0476	0.0553	0.0327	0.0526	0.0459	0.0864	0.0212
Residents	0.0735	0.0543	0.079	0.1005	0.121	0.0617	0.01
Weights	0.0528	0.0551	0.042	0.0621	0.0609	0.0815	0.0189

Tab.5-15 Hierarchical weighting results for the positive affect layer

	Convenience	Comfort	Security	Belonging	Pleasure
Stakeholders	0.0499	0.1486	0.1941	0.2097	0.056
Residents	0.1193	0.0959	0.1315	0.0742	0.0791
Weights	0.0638	0.1381	0.1816	0.1826	0.0606

The final set of weights for the influencing factors of community residential well-being can be obtained as below.

$$W = \begin{Bmatrix} 0.0528 & 0.0551 & 0.042 & 0.0621 & 0.0609 & 0.0815 & 0.0189 \\ 0.0638 & 0.1381 & 0.1816 & 0.1826 & 0.0606 \end{Bmatrix}$$

$$\sum_{i=1}^{12} w_i = 1$$

5.3.4 A fuzzy comprehensive evaluation model of community residential well-being

A suitable synthesis operator is used to synthesize the weight set W with the fuzzy relationship matrix R to obtain the fuzzy comprehensive evaluation result vector of each evaluated object B. Since the weighted average type of fuzzy operator can comprehensively utilize the indicator

weights and the input data information, this study adopts the M (*, +) fuzzy operator. Finally, the fuzzy comprehensive evaluation model of residential well-being, see equation (5-7).

$$\begin{aligned}\bar{B} &= W \circ R = \{W_1, W_2, \dots, W_{12}\} \begin{pmatrix} r_{11} & r_{12} & \dots & r_{15} \\ \vdots & \vdots & \ddots & \vdots \\ r_{121} & r_{122} & \dots & r_{125} \end{pmatrix} \\ &= (\bar{b}_1, \bar{b}_2, \bar{b}_3, \bar{b}_4, \bar{b}_5) \quad (5-7)\end{aligned}$$

$\bar{b}_i (i = 1, 2, \dots, n)$ is obtained from the jth column operation of W and R, which indicates the degree of affiliation of the evaluated object to the fuzzy subset of V_j rank from the overall view.

The calculation of the fuzzy operator M (*, +) is shown in Equation (5-8).

$$\bar{b}_j = \sum_{i=1}^m (w_i \cdot r_{ij}) \quad (5-8)$$

$$\bar{b}_j = \max_{1 \leq i \leq m} \{w_i, r_{ij}\}, j = 1, 2, \dots, n$$

After normalization to get $B = \{b_1, b_2, b_3, b_4, b_5\}$, the level of residential well-being in this community can be determined by the law of maximum affiliation.

In this study, the data from 270 questionnaires were obtained as shown in Table 5-16 and the level of residential well-being of most of the residents in this community can be determined as very high by the law of maximum affiliation. To get the score of residential well-being, after

assigning values of 10, 30, 60, 80 and 100 to each of the five evaluation levels using the principle of weighted average, the score of residential well-being can be obtained as 77.474.

5.3.5 Results of fuzzy Comprehensive evaluation of residential well-being in sample communities

Using the above fuzzy evaluation model of residential well-being to evaluate the questionnaire data of the residents of seven different neighbourhoods respectively, to ensure the privacy of the residents of the neighbourhoods with a, b, c, d, e, f, g instead of the name of each neighbourhood, to get the following fuzzy comprehensive evaluation results.

$$B_a = \{0.013, 0.074, 0.344, 0.447, 0.122\}$$

$$B_b = \{0.073, 0.088, 0.337, 0.320, 0.181\}$$

$$B_c = \{0.013, 0.067, 0.459, 0.326, 0.135\}$$

$$B_d = \{0.014, 0.046, 0.215, 0.334, 0.391\}$$

$$B_e = \{0.086, 0.144, 0.273, 0.352, 0.145\}$$

$$B_f = \{0, 0.012, 0.022, 0.222, 0.744\}$$

Tab.5-16 Fuzzy evaluation results of residential well-being from questionnaires

Rating levels	B_j	Value
Very low	0.02	10
Comparatively low	0.057	30
Fairly high	0.25	60
Higher	0.336	80
Very high	0.337	100
Residential well-being score	77.474	

$$B_g = \{0.002, 0.048, 0.247, 0.463, 0.239\}$$

In essence, the resultant level of the fuzzy evaluation implies the proportion of the overall evaluation level of residential well-being among the interviewed residents. For example, the fuzzy evaluation result of residential well-being in neighbourhood a is relatively high and the evaluation score is calculated to be 70.933 after assigning values according to the evaluation level, which is between generally high and relatively high. This result is also consistent with the self-reported score of residents. Combining the fuzzy comprehensive evaluation results of the principle of maximum affiliation and the principle of weighted average, the five score ranges under the principle of weighted average are set to correspond to the five evaluation grades, which are 50 points and below representing very low residential well-being, 50-60 (excluding 60) indicating relatively low residential well-being, 60-70 (excluding 70) representing generally high residential well-being, 70-80 (excluding 80) representing residential well-being is relatively high and 80 and above represents very high residential well-being. Table 5-17 demonstrates the results of the fuzzy composite evaluation of the residential well-being of the evaluated communities.

Tab.5-17 Comparison of fuzzy evaluation results of residential well-being in seven communities

Evaluated communities	Maximum affiliation principle	Weighted average principle	Resident self-report scores
Community a	Comparatively high	70.933	3.563
Community b	Average high	64.012	3.395
Community c	Average high	69.252	3.514
Community d	Very high	80.233	4
Community e	Comparatively high	64.216	3
Community f	Very high	93.846	4.75
Community g	High	77.296	3.786

5.4 Relevance of "the built environment – well-being promotion" in Urban Communities

There is a complex association between urban community environment and residential well-being and there is a nested relationship between its influencing factors, which influences the role of each happiness influencing factor to present the characteristics of both cause and effect. From the previous relationship between urban community environment and residential well-being, community environment mainly affects residential well-being through two paths: the satisfaction of residents with environmental elements and the positive emotions generated by residents. In the first path, environmental elements will directly stimulate residents' satisfaction with various aspects of the community environment and at the same time, environmental elements will indirectly affect the residential well-being of community residents by stimulating residents to generate positive emotions. In the second path, residents stimulated by the community environment to produce positive emotional expression can directly affect residential well-being, while the expression of positive emotions will also prompt residents to produce cognitive evaluations of the community environment, i.e., satisfaction with environmental elements, thus indirectly affecting residential well-being. Therefore, this study adopts mediating effect analysis to explain the complex relationship

between the role of residents' satisfaction with the environment and positive emotion expression on residential well-being. The flow of the analysis of

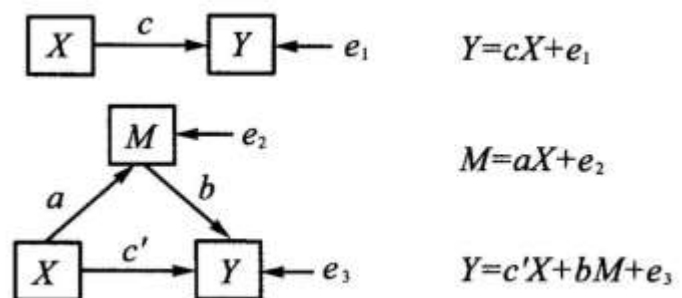


Fig.5-7 Mediation effects model

mediating effects (see Figure 5-7) is as follows:

(1) Identify variable Y, variable X and mediating variable M,

(2) Construct the mediating effect model, respectively,

Model 1: $Y = cX + e_1$, regression model construction of independent variable X with dependent variable Y.

Model 2: $M = aX + e_2$, the independent variable X and the mediating variable M for regression model construction.

Model 3: $Y = c'X + bM + e_3$, independent variable X and mediating variable M together with dependent variable Y for regression model construction.

Where the relationship between the effects is $c = c' + ab$ and the magnitude of the mediating

effect is measured by $c - c' = ab$.

(3) Calculate the coefficient of mediating effect according to the above model. The mediating effect in the traditional sense for exploring which variables are influencing the process X to Y, requires that the coefficient c must be significant. The mediation effect in the broader sense (also known as the masking effect), which explores how the variables do not affect the process from X to Y, does not require the coefficient c to be significant because there may be an indirect effect (ab) with a sign opposite to the sign of the direct effect (c'), resulting in a situation where the effect is masked, it's also known as the masking effect.

(4) After completing the analysis of mediation effect, follow the process of causal step-by-step

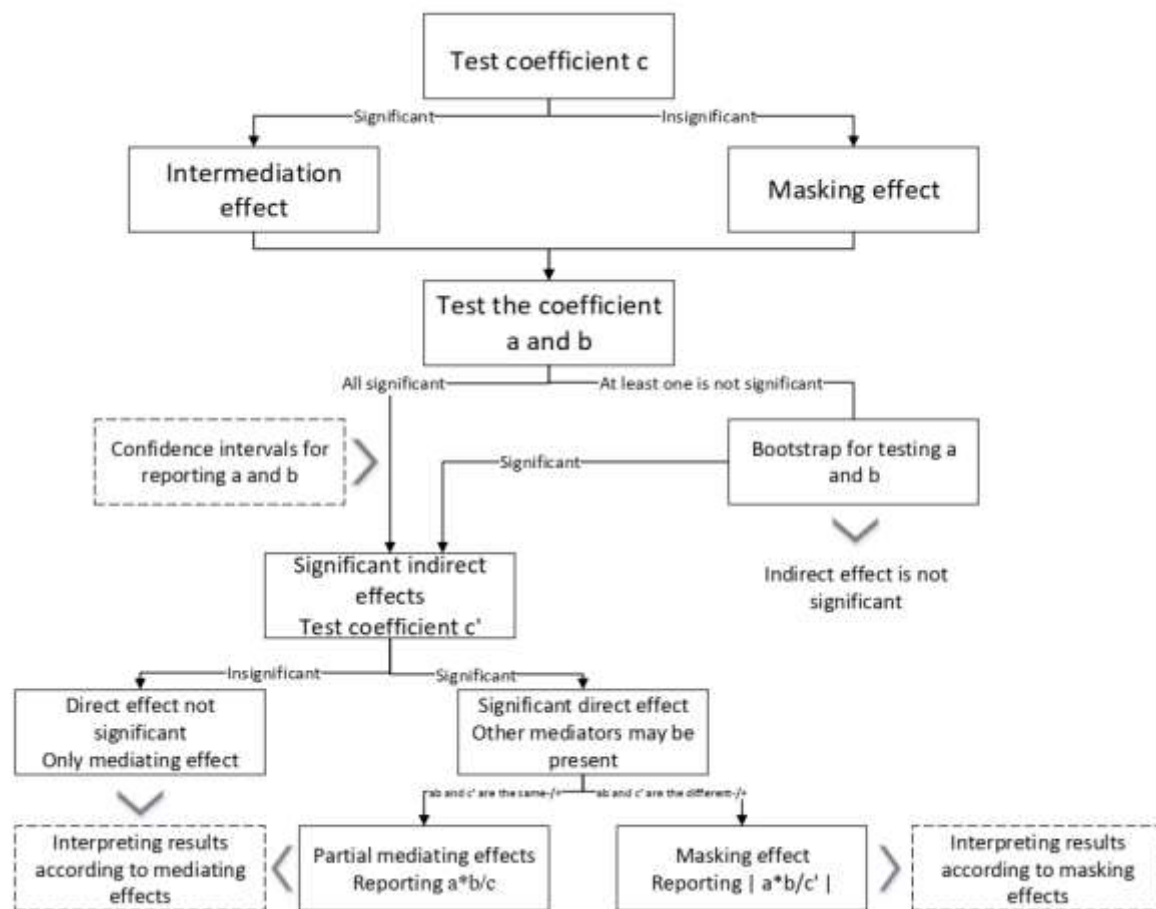


Fig.5-8 Flowchart for mediation effect analysis and testing (Wen & Ye, 2014)

test improvement method (Figure 5-8) to test the mediation effect of each paragraph and at the same time, the effect share can be further analysed. If it is full mediation, the effect share is 100%. If it is partially mediated, the effect share is calculated as: $a*b/c$. If it is a masking effect, the effect size is the ratio of the mediating effect to the direct effect, which is calculated as: $|a*b/c'|$. If it is a non-significant mediating effect, the effect share is 0. The final mediated effects regression model is obtained to explain the complex influence mechanism.

5.4.1 Effecting paths between environmental satisfactions and residential well-being

The comprehensive evaluation model of the level of community residential well-being is designed to determine the level of residential well-being of a community or neighbourhood, but it is not sufficient to explain the mechanism of the impact of the built environment of the community on the well-being of the residents and the interactions between the environmental perception layer and the positive emotion layer, which are the evaluating factors, also need to be considered. According to the theory of emotional cognition described earlier, the emotions generated by residents towards the environment come from their perceptions of the environment.

Therefore, in the model explaining the community environment on residents' residential well-being, positive affect has a mediating role to some extent, which makes an additional mediating influence

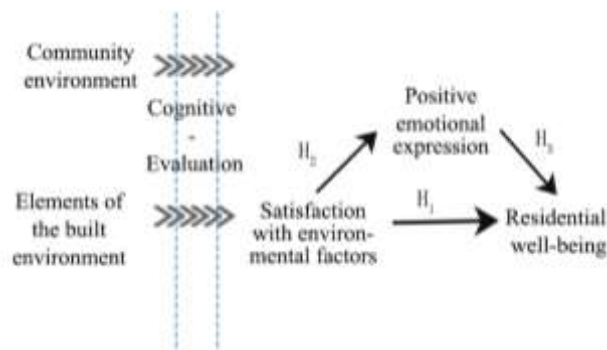


Fig.5-9 Pathways of association between environmental perception and residential well-being

path between environment perception to residential well-being, forming the model of the intrinsic environment-well-being relationship as shown in Figure 5-9. In addition, since there is an unavoidable mutual influence between positive emotions, the chain mediating role model is used to explain the intrinsic relationship between the three. Since both satisfaction with environmental elements and expression of positive emotions involve the subjective evaluation of community users, the data from 270 research questionnaires of community residents are analysed through the chain mediated effect model for explaining the specific relationships of H_1 , H_2 , H_3 and the specific analysis process is as follows:

(1) Determine the variable Y: {Residential well-being}; variable X: {Green space, Neighbourhood, Accessibility to public transportation, Design of public space and facilities,

Tab.5-18 Coefficient of mediating effect of positive affect as a mediating variable

	Residential well-being	Convenience	Comfort	Security	Belonging	Pleasure	Residential well-being
Constant	0.437	1.453	0.599	0.363	-0.299	-0.081	0.199
Green space	0.104	0.053	0.184	0.119	0.073	0.213	0.013
Neighbourhood	0.166	-0.03	-0.032	0.111	0.082	-0.038	0.16
Transport accessibility	0.161	0.54	0.151	0.069	0.008	-0.031	0.078
Public space and facilities	0.176	-0.082	0.181	0.005	0.239	0.076	0.125
Community management	0.255	0.022	0.13	0.052	-0.075	0.199	0.199
Housing Quality	0.029	0.182	0.211	0.017	0.121	0.141	-0.059
Community Culture	0.006	0.038	0.105	-0.045	0.127	0.015	-0.021
Convenience			-0.049	0.251	0.132	-0.061	0.093
Comfort				0.331	0.155	0.198	0.026
Security					0.205	0.004	0.094
Belonging						0.309	0.035
Pleasure							0.199
R ²	0.623	0.517	0.642	0.53	0.653	0.797	0.651
Adjustment R ²	0.613	0.504	0.631	0.514	0.64	0.789	0.635
F	F(7, 261)=61.663	F(7, 261)=39.895	F(8, 260)=58.317	F(9, 259)=32.489	F(10, 258)=48.655	F(11, 257)=91.925	F(12, 256)=39.85
P	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***

Note: ***, **, * represent 1%, 5% and 10% significance levels.

Community management, Quality of housing, Community culture}); and mediator variable M:{Convenience sense, Comfort sense, Security sense, Belonging sense, Pleasure sense}.

(2) Conduct mediating effect analysis, including unstandardized coefficients, standardized coefficients, t-value, significance P-value, fitted R², F-test and so on. Calculated to get Table 5-18.

(3) The resulting regression model for the three models is:

Model 1, H_1 :

Residential well-being = 0.437 + 0.104 * Green space + 0.166 * Neighbourhood relations + 0.161 * Accessibility to public transportation + 0.176 * Design of public spaces and facilities + 0.255 * Community management + 0.029 * Quality of housing + 0.006 * Community culture

Model 2, regression model H_2 was obtained based on 5 positive affective mediating variables:

Convenience = 1.453 + 0.053 * Green space - 0.03 * Neighbourhood relations + 0.54 * Accessibility to public transportation - 0.082 * Design of public spaces and facilities + 0.022 * Community management + 0.182 * Quality of housing + 0.038 * Community culture

Sense of comfort = 0.599 + 0.184 * Greenspace - 0.032 * Neighbourhoods + 0.151 * Accessibility to public transportation + 0.181 * Design of public spaces and facilities + 0.13 * Community management + 0.211 * Quality of housing + 0.105 * Community culture - 0.049 * Convenience

Security = 0.363 + 0.119 * Green space + 0.111 * Neighbourhoods + 0.069 * Accessibility to public transportation + 0.005 * Design of public spaces and facilities + 0.052 * Community management + 0.017 * Quality of housing - 0.045 * Community culture + 0.251 * Convenience + 0.331 * Sense of comfort

Sense of belonging = -0.299 + 0.073 * Green space + 0.082 * Neighbourhood relations + 0.008 * Accessibility to public transportation + 0.239 * Design of public spaces and facilities - 0.075 * Community management + 0.121 * Quality of dwellings + 0.127 * Community culture + 0.132 * Convenience + 0.155 * Comfort + 0.205 * Security

Pleasure = -0.081 + 0.213 * Green space - 0.038 * Neighbourhood relations - 0.031 * Accessibility to public transportation + 0.076 * Design of public spaces and facilities + 0.199 * Community management + 0.141 * Quality of housing + 0.015 * Community culture - 0.061 * Convenience + 0.198 * Comfort + 0.004 * Safety + 0.309 * Sense of belonging

Model 3, the independent variable X and the mediator variable M together with the dependent

variable Y are regressed to construct the model $H_2 + H_3$:

Residential well-being = 0.199 + 0.013 * Green space + 0.16 * Neighbourhood relations + 0.078 * Accessibility to public transportation + 0.125 * Design of public spaces and facilities + 0.199 * Community management - 0.059 * Quality of housing - 0.021 * Community culture + 0.093 * Sense of convenience + 0.026 * Sense of comfort + 0.094 * Security + 0.035 * Sense of belonging + 0.199 * Sense of pleasure

(4) Mediating effect test and calculate the effect percentage.

The coefficient product method is used to test whether $a*b$ presents significance and the Bootstrap sampling method is chosen to test whether the 95% confidence interval of the product term ($a*b$) of the regression coefficient a and the regression coefficient b includes the number 0; if the 95% confidence interval doesn't include the number 0, then it means that it has a mediating effect; if it is said that the 95% confidence interval includes the number 0, then it means that it doesn't have a mediating effect. However, when the total effect of environmental satisfaction and residential well-being is not significant, to explain the potential relationship between the independent variables and the dependent variable needs to consider that there may be a masking effect. The concept of masking was first introduced by Horst in 1941 for answering the question that the absence of a significant relationship between variables may be masked or influenced by a third variable, which is called the masking variable.

According to the number of influencing factors, 35 pathways can be obtained that conform to the "environmental satisfaction-positive emotions-residential well-being" and the pathways with mediating or masking effects are listed in Table 5-19 and the complete empirical results of the pathways are shown in Appendix 2.

Tab.5-19 Results of the positive affect mediation effect test

Pathways	Test Conclusion	Intermediary effects $a*b$	Efficiency ratio
Green space => security => residential well-being	Masking	0.011186	86.05%
Green space => pleasure => residential well-being	Masking	0.042387	326.05%
Public space and facilities => pleasure => residential well-being	Fully mediated	0.015124	100%
Community management => pleasure => residential well-being	Partially mediated	0.039601	15.53%
Residential quality => pleasure => residential well-being	Masking	0.028059	47.56%

(5) The mechanism of the influence of environmental satisfaction on residential well-being can be explained according to the coefficient of mediation effect calculation and test results.

First of all, in the mediation model only five paths of action have a significant mediating or masking effect, and the other paths do not have a significant mediating effect. The effect of residents' satisfaction with the design of public space and facilities on residential well-being is entirely indirect through affecting pleasure and the direct effect of satisfaction with the design of public space and facilities on residential well-being is relatively not significant. Satisfaction with community management can affect residential well-being directly or through the mediation of pleasantness and the effect of this mediation is 15.53%. In addition, the total and direct effects of residents' satisfaction with residential quality on residential well-being are not significant, but there is a significant masking effect in the path of residential quality => pleasure => residential well-being. This means that pleasure greatly masks the effect of residential quality on residential well-being to a certain extent, i.e., the effect of residential quality on residential well-being also becomes stronger after controlling for pleasure. According to the results of the analysis, the direct effect of satisfaction with residential quality on residential well-being is negative, which means that the indirect effect played by pleasure masks the direct effect, making the total effect of satisfaction with residential quality on residential well-being positive. The total and direct effects of satisfaction with green space on residential well-being are not significant, but there are two paths of action that mask the effect. Among them, the path of green space=>sense of security=>residential well-being in the security in the green space of satisfaction on residential well-being in the process of the role of 86.05% of the masking effect, that is, the security brought about by the indirect effect to a certain extent masked the green space of the satisfaction of the impact on the residential well-being, so that the total effect becomes smaller. And the proportion of the masking effect of green space => pleasure => residential well-being is 3.26, which means that the indirect effect of pleasure seriously counteracts the direct effect of satisfaction with

green space on residential well-being and there is a significant masking effect among the three, but it is not possible to accurately judge the proportion of the masking effect. Although the results show that there is no significant relationship between satisfaction with green space and residential well-being, the data results (see Appendix 2) show that the indirect effect of pleasantness is much larger than the direct effect of satisfaction with green space on residential well-being, which makes the total effect of satisfaction with green space on residential well-being pairs larger.

5.4.2 Effecting paths between positive affects and residential well-being

According to the theory of place attachment, human beings become emotionally attached to their place of residence in the process of living. Since both satisfaction with environmental elements and positive emotional expression involve the subjective evaluation of community users, the research questionnaire data of 270 community residents are analysed through the chain mediated effect model, which is used to explain the specific relationships of H_4 , H_5 and H_6 in Figure 5-10

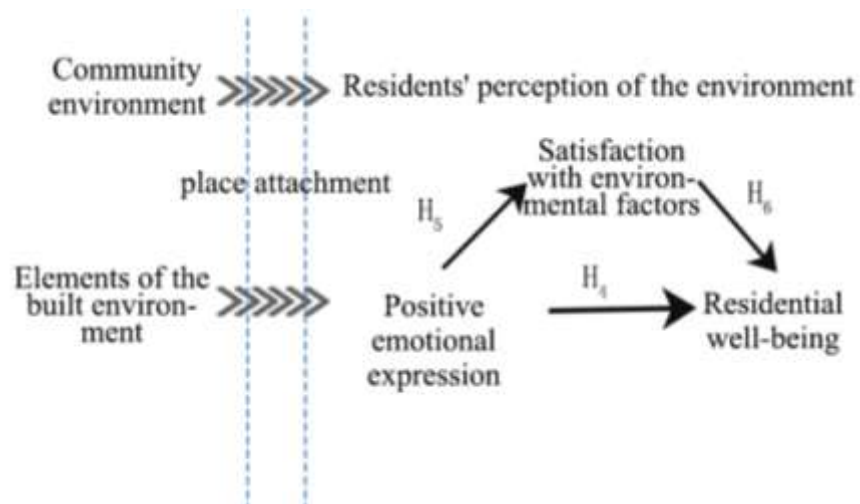


Fig.5-10 Pathways of association between positive affect and residential well-being

and the specific analysis process is as follows:

(1) Determine the variable Y: {Residential well-being}; variable X: {Convenience, comfort, security, belonging, pleasure}; and mediating variable M:{Green space, neighbourhood, accessibility to public transportation, design of public space and facilities, community management, quality of housing, community culture}.

(2) Conduct mediating effect analysis, including unstandardized coefficients, standardized coefficients, t-value, significance P-value, fitted R², F-test and so on. Calculated to get Table 5-

Tab.5-20 Coefficient of mediating effect of environmental satisfaction as a mediating variable

	Residential well-being	Greenspace	Neighbourh ood	Public transport accessibility	Public space and facilities	Community management	Housing quality	Community culture	Residential well-being
Constant	0.327	0.38	1.416	0.858	-0.62	-0.729	-0.354	-0.114	0.199
Convenience	0.172	0.064	0.05	0.565	-0.078	0.094	0.304	0.044	0.093
Comfort	0.131	0.193	0.083	0.13	0.185	0.102	0.182	0.082	0.026
Security	0.13	0.11	0.036	0.055	-0.012	0.051	-0.008	-0.056	0.094
Belonging	0.089	0.051	0.316	0.012	0.126	-0.131	0.065	0.104	0.035
Pleasure	0.371	0.493	0.021	0.005	0.282	0.289	0.238	0.017	0.199
Greenspace			0.135	0.003	0.372	0.058	0.043	-0.062	0.013
Neighbourh ood				0.04	0.032	0.018	0.172	0.896	0.16
Public transport accessibility					0.175	0.097	-0.143	-0.054	0.078
Public space and facilities						0.554	-0.008	-0.046	0.125
Community management							0.188	0.069	0.199
Housing quality								-0.061	-0.059
Community culture									-0.021
R ²	0.595	0.638	0.378	0.507	0.726	0.776	0.632	0.704	0.653
Adjustment R ²	0.587	0.631	0.364	0.494	0.717	0.768	0.618	0.692	0.637
F	F(5, 264)=77.47	F(5, 264)=92.94	F(6, 263)=26.66	F(7, 262)=38.54	F(8, 261)=86.31	F(9, 260)=99.843	F(10, 259)=44.51	F(11, 258)=55.90	F(12, 257)=40.32
P	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***

Note: ***, **, * represent 1%, 5% and 10% significance levels.

20.

(3) The resulting regression model for the three models is:

Model 1, the independent variable X and dependent variable Y for regression model:

Residential well-being = $0.327 + 0.172 * \text{Convenience} + 0.131 * \text{Comfort} + 0.13 * \text{Security} + 0.089 * \text{Belonging} + 0.371 * \text{Pleasure}$

Model 2, regression model is obtained based on 7 mediating variables of environmental satisfaction:

Green space = $0.38 + 0.064 * \text{Convenience} + 0.193 * \text{Comfort} + 0.11 * \text{Security} + 0.051 * \text{Belonging} + 0.493 * \text{Pleasure}$

Neighbourhood = $1.416 + 0.05 * \text{Convenience} + 0.083 * \text{Comfort} + 0.036 * \text{Safety} + 0.316 * \text{Belonging} + 0.021 * \text{Pleasure} + 0.135 * \text{Green space}$

Accessibility to public transportation = $0.858 + 0.565 * \text{Convenience} + 0.13 * \text{Comfort} + 0.055 * \text{Safety} + 0.012 * \text{Belonging} + 0.005 * \text{Pleasure} + 0.003 * \text{Green space} + 0.04 * \text{Neighbourhoods}$

Design of public spaces and facilities = $-0.62 - 0.078 * \text{Convenience} + 0.185 * \text{Comfort} - 0.012 * \text{Safety} + 0.126 * \text{Belonging} + 0.282 * \text{Pleasure} + 0.372 * \text{Green space} + 0.032 * \text{Neighbourhood} + 0.175 * \text{Accessibility to public transportation}$

Community management = $-0.729 + 0.094 * \text{Convenience} + 0.102 * \text{Comfort} + 0.051 * \text{Safety} - 0.131 * \text{Belonging} + 0.289 * \text{Pleasure} + 0.058 * \text{Green space} + 0.018 * \text{Neighbourhood} + 0.097 * \text{Accessibility to public transportation} + 0.554 * \text{Design of public spaces and facilities}$

Residential quality = $-0.354 + 0.304 * \text{Convenience} + 0.182 * \text{Comfort} - 0.008 * \text{Security} + 0.065 * \text{Belonging} + 0.238 * \text{Pleasure} + 0.043 * \text{Green space} + 0.172 * \text{Neighbourhood} - 0.143 * \text{Accessibility to public transportation} - 0.008 * \text{Design of public spaces and facilities} + 0.188 * \text{Community management}$

Community culture = $-0.114 + 0.044 * \text{Convenience} + 0.082 * \text{Comfort} - 0.056 * \text{Safety} + 0.104 * \text{Belonging} + 0.017 * \text{Pleasure} - 0.062 * \text{Green space} + 0.896 * \text{Neighbourhood} - 0.054 * \text{Accessibility to public transportation} - 0.046 * \text{Design of public spaces and facilities} + 0.069 * \text{Community management} - 0.061 * \text{Housing quality}$

Model 3, the independent variable X and the mediator variable M together with the dependent variable Y for regression modelling:

Residential well-being = $0.199 + 0.093 * \text{Convenience} + 0.026 * \text{Comfort} + 0.094 * \text{Safety} + 0.035 * \text{Belonging} + 0.199 * \text{Pleasure} + 0.013 * \text{Green space} + 0.16 * \text{Neighbourhood relations} + 0.078 * \text{Accessibility to public transportation} + 0.125 * \text{Design of public spaces and facilities} + 0.199 * \text{Community management} - 0.059 * \text{Housing quality} - 0.021 * \text{Community culture}$

(4) Mediation effect test and calculate the effect share, using the coefficient product method to test whether $a*b$ presents significance, the choice of Bootstrap sampling method test is whether the 95% confidence interval of the product term ($a*b$) of the regression coefficient a and the regression coefficient b includes the number 0; if the 95% confidence interval does not include the number 0, that means there is a mediation effect; if it says that the 95% confidence interval includes the number 0, it means that there is no mediating effect. According to the number of influencing factors, 35 paths can be obtained that are consistent with "positive emotion-environmental satisfaction-residential well-being" and the paths with mediating or masking

effects are listed in Table 5-21, and the complete empirical results of the paths are shown in Appendix 3.

Tab.5-21 Results of the mediation effect test for environmental satisfactions

Pathways	Test Conclusion	Intermediary effects a*b	Efficiency ratio
Convenience => community management => residential well-being	Fully Intermediated	0.03582	100%
Comfort => design of public spaces and facilities => residential well-being	Fully Intermediated	0.035625	100%
Comfort => community management => residential well-being	Fully Intermediary	0.056715	100%
Belonging => Neighbourhood => Residential well-being	Masking	0.05168	147.66%
Belonging => public space and facility design => residential well-being	Masking	0.02	57.14%
Pleasure => public space and facility design => residential well-being	Partial intermediary	0.05875	15.84%
Pleasure => community management => residential well-being	Partial intermediary	0.11542	31.11%

(5) According to the mediating effect calculation coefficient and test results can explain the influence path of positive emotion on residential well-being. In the influence path of positive emotion on residential well-being, there are three paths of complete mediating effect, two paths of partial mediating and two paths of masking effect. According to the results of the mediating effect analysis, the direct effect of the sense of convenience and the sense of comfort on residential well-being is not very significant and the effects of the two branching paths are significant, so these four paths of action are regarded as fully mediated effects. Among them, residents' sense of convenience is considered to act entirely indirectly on residential well-being through the effect of satisfaction with community management. Sense of comfort indirectly affects residential well-being through the mediating effect of influencing satisfaction with the design of public spaces and facilities and satisfaction with community management, respectively. Although the effects of convenience and comfort on residential well-being were not significant in the analysis of mediating effects, the correlation between these two positive emotions and

residential well-being was very significant in the previous correlation analysis and it is hypothesized that it is possible that the mediating benefits of satisfaction with the design of public spaces and facilities and satisfaction with community management, greatly outweigh the direct benefits of positive emotions on residential well-being. Regarding the effect of pleasantness on residential well-being is divided into two parts, one is the direct effect of pleasantness on residential well-being and the other is the indirect effect of residential well-being through the mediating effect of satisfaction with the design of public spaces and facilities and satisfaction with community management, respectively and the proportion of the indirect effect is 15.84% and 31.11%, respectively. Although the two paths of data results belongingness to residential well-being show significant indirect effects, the paths eventually show significant masking benefits due to the total effect of belongingness presenting insignificant, in which satisfaction with the neighbourhood presents a greater masking effect than satisfaction with the design of public spaces and facilities plays a role in the paths. Combined with the analysis of the strong correlation between sense of belonging and residential well-being, satisfaction with neighbourhood relationship occupies a great indirect benefit in the process of the influence of sense of belonging on residential well-being, even more than the direct benefit of sense of belonging on residential well-being and satisfaction with public space and facility design also contributes to the influence of sense of belonging on residential well-being to a certain extent.

5.4.3 Internal correlations between environmental satisfactions and positive affects

In exploring the complex relationship between the built environment and well-being, in addition to the direct effects of the within-group influences of environmental satisfaction and positive affect on residential well-being and the mediating role between the three sets of variables, it is also important to consider

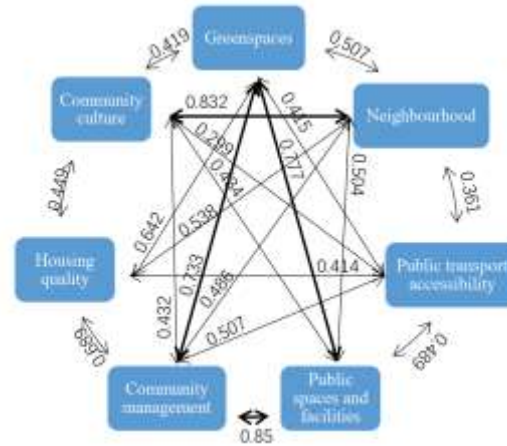


Fig.5-11 Correlations of environmental satisfactions

the internal correlations between the two sets of variables, environmental satisfaction and positive affect. The correlations of the factors within the groups (see Figure 5-11) are also potential pathways of action in the environment-well-being relationship, which can further explain the within-group interactions of environmental satisfaction and positive affect.

As can be seen in Table 5-22, there are significant correlations and positive correlations between the seven environmental satisfaction levels. Among them, residents' satisfaction with the design

Tab.5-22 Results of intra-group correlation analysis of environmental satisfactions

	Greenspace	Neighbourhood	Public transport accessibility	Public space and facilities	Community management	Housing quality	Community culture
Greenspace	1	0.507 (0.000***)	0.415 (0.000***)	0.777 (0.000***)	0.733 (0.000***)	0.642 (0.000***)	0.419 (0.000***)
Neighbourhood	0.507 (0.000***)	1	0.361 (0.000***)	0.504 (0.000***)	0.486 (0.000***)	0.538 (0.000***)	0.832 (0.000***)
Public transport accessibility	0.415 (0.000***)	0.361 (0.000***)	1	0.489 (0.000***)	0.507 (0.000***)	0.414 (0.000***)	0.299 (0.000***)
Public space and facilities	0.777 (0.000***)	0.504 (0.000***)	0.489 (0.000***)	1	0.85 (0.000***)	0.664 (0.000***)	0.434 (0.000***)
Community management	0.733 (0.000***)	0.486 (0.000***)	0.507 (0.000***)	0.85 (0.000***)	1	0.689 (0.000***)	0.432 (0.000***)
Housing quality	0.642 (0.000***)	0.538 (0.000***)	0.414 (0.000***)	0.664 (0.000***)	0.689 (0.000***)	1	0.449 (0.000***)
Community culture	0.419 (0.000***)	0.832 (0.000***)	0.299 (0.000***)	0.434 (0.000***)	0.432 (0.000***)	0.449 (0.000***)	1

Note: ***, **, * represent 1%, 5% and 10% significance levels.

of public spaces and facilities, satisfaction with community management and satisfaction with green spaces show strong correlations. In general, the content of community management involves the daily maintenance, repair and management of green space and is also closely related to the use of public space and the maintenance and arrangement of public facilities, so the strong correlation between the three will also be reflected in the intra-group relationship of environmental satisfaction, forming an impact on the results of the residents' perceptions of the built environment of the community. In addition, a strong correlation is shown between residents' satisfaction with the neighbourhood and their satisfaction with the community culture. To a certain extent, neighbourhood relationship can be regarded as a real-life expression of culture and community culture permeates residents' daily life, socialization and thus influences the mode of getting along and interaction between neighbours in their residential life. Other environmental influences also play an influential role in shaping community culture, as Daniels emphasizes that spaces that promote human conversation and activity allow people to develop a cultural atmosphere from scenes that are pleasurable and energizing.

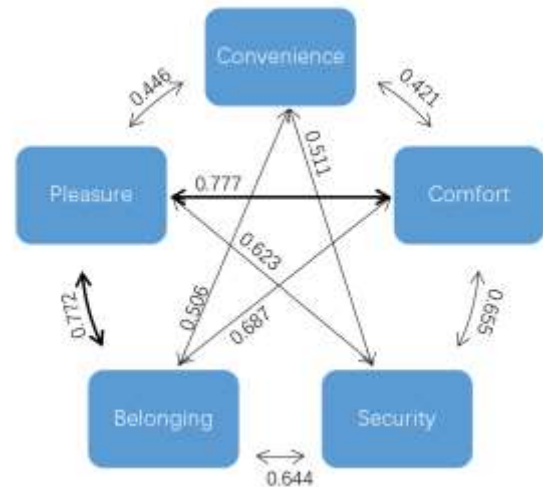


Fig.5-12 Correlations of positive affects

There are significant correlations among the five

Tab.5-23 Results of intra-group correlation analysis of positive affects

	Convenience	Comfort	Security	Belonging	Pleasure
Convenience	1(0.000***)	0.421(0.000***)	0.511(0.000***)	0.506(0.000***)	0.446(0.000***)
Comfort	0.421(0.000***)	1(0.000***)	0.655(0.000***)	0.687(0.000***)	0.777(0.000***)
Security	0.511(0.000***)	0.655(0.000***)	1(0.000***)	0.644(0.000***)	0.623(0.000***)
Belonging	0.506(0.000***)	0.687(0.000***)	0.644(0.000***)	1(0.000***)	0.772(0.000***)
Pleasure	0.446(0.000***)	0.777(0.000***)	0.623(0.000***)	0.772(0.000***)	1(0.000***)

Note: ***, **, * represent 1%, 5% and 10% significance levels.

factors within positive emotions (see Figure 5-12), indicating positive interactions among the five positive emotions, with the correlation between pleasure and comfort and belongingness being more prominent (see Table 5-23). According to the sources of the emotions, the sense of belonging mainly comes from the community group, or the group of people who live together in a specific geographical area of delineation; while the sense of pleasure and the sense of comfort mainly come from the perceived community environment or the events experienced, or the people who generate interactions or communication. Although they are both positive feedback generated by human perception, pleasure may be more inclined to the positive psychological feelings brought by environmental stimuli or events, while comfort is more inclined to the things or environmental elements that residents physically perceive and touch. For example, the geographic location and arrangement of the community's garbage sorting points make residents feel comfortable when they throw away garbage and often this sense of comfort will make the residents' psychology produce a corresponding sense of pleasure in this kind of environment and they think that throwing away garbage is a very pleasurable thing. In turn, when residents use the environment of the garbage sorting point with a very pleasant mood, this will also enhance the subjective evaluation of the residents of the garbage sorting point and when the users have a high positive evaluation of the environment, their Behaviour in the environment will also be smoother, thus affecting the sense of comfort when throwing away garbage. The bidirectional correlation between pleasure and comfort is stronger in the perception process of community environment. The strong correlation between pleasure and sense of belonging may be because some social behaviours and activities occurring in the living environment will make residents feel a sense of belonging to the community and this kind of interaction behaviour will also bring inner satisfaction and self-realization of the value of the residents, which will promote the sense of

pleasure of living in the community. At the same time, if living in the community gives residents a sense of pleasure, they will be more willing to participate in social activities developed by similar cultural interests, common goals and the same life needs, thus promoting the sense of belonging to the community.

5.4.4 Effecting mechanisms of the built environment- well-being promotion

In addition to the mediating benefits of environmental satisfaction and positive affect affecting the level of residential well-being, according to the Pearson correlation analysis in the previous section, seven levels of environmental satisfaction and five levels of positive affect were significantly related to residential well-being. Since this study explores the mechanism of environmental perception on environmental satisfaction, the within-group relationship between environmental satisfaction and positive affect is mainly focused on the internal regulation of individual subjective psychology and is not included in the model of "The built environment - Well-being promotion". Combined with the significance of the mediation effect results in the previous section, all the pathways with significant correlations were grouped together for path analysis

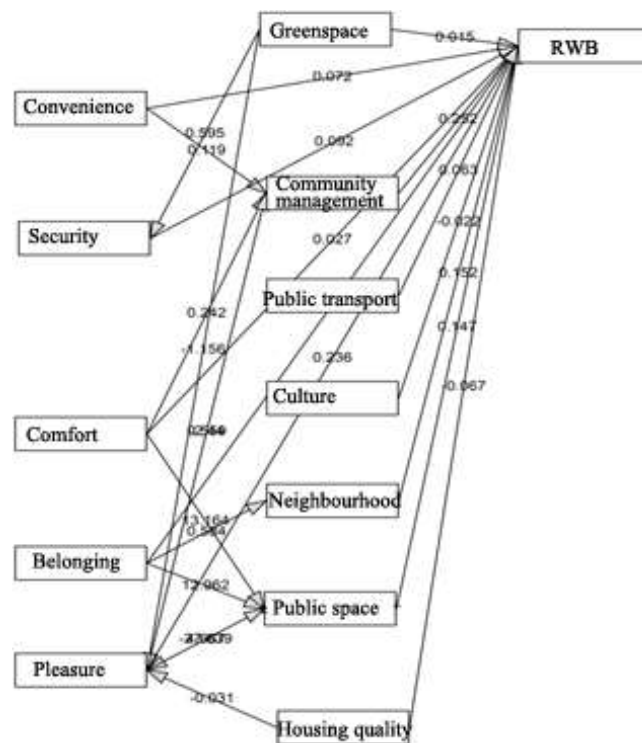


Fig.5-13 The pathway map for the built environment – well-being promotion

and the model of the relationship was obtained as shown in Figure 5-13. There are more mediating relationships in this model are mediated by environmental satisfaction indirectly affecting the role effect of positive emotion on residential well-being. And with the mediating effect of positive emotion intervening between environmental satisfaction and residential well-being more significantly only pleasure and security. To more comprehensively explain the mechanism of the role between environmental satisfaction, positive emotions and residential well-being, all the factors affecting environmental satisfaction and positive emotions are subject to factor covariance analysis, which can be used to analyse the correlation between the two molecules through the standardized coefficients calculated and the closer the closer it is to 1 in general, it means that the factors have a strong correlation with each other. If the covariance results show significance and the standardized coefficient value is larger, indicating that mathematically the correlation between the two factors is stronger, then you can consider adding the path relationship in the model to analyse and thus repeat until it no longer produces a significant and strong correlation path.

Through the two-by-two paired factor covariance analysis, the final 10 paths of action added to

Tab.5-24 Table of path node covariance relationship

X	↔	Y	Unstandardised estimated coefficients	Standardised estimated coefficients	S.E.	z	P
Housing quality	↔	Greenspace	0.722	0.649	0.081	8.943	0.000***
Housing quality	↔	Belonging	0.692	0.655	0.077	9.007	0.000***
Housing quality	↔	Comfort	0.699	0.679	0.076	9.231	0.000***
Housing quality	↔	Convenience	0.388	0.507	0.052	7.434	0.000***
Accessibility to public transport	↔	Convenience	0.366	0.675	0.040	9.188	0.000***
Community culture	↔	Belonging	0.528	0.537	0.068	7.779	0.000***
Greenspace	↔	Belonging	0.683	0.659	0.076	9.044	0.000***
Greenspace	↔	Comfort	0.705	0.699	0.075	9.410	0.000***
Belonging	↔	Comfort	0.662	0.691	0.071	9.345	0.000***
Belonging	↔	Convenience	0.357	0.500	0.048	7.352	0.000***

Note: ***, **, * represent 1%, 5% and 10% significance levels.

the relationship model as shown in the table below were obtained and according to the analysis of significance $p < 0.05$ then there is a direct linear effect between the variables. Finally, after adding the paths in Table 5-24, the path analysis was conducted again to obtain the final relationship model of "The built environment - Well-being promotion" with a better fit (Figure 5-14). Due to the limitations of the sample size, this model cannot determine the specific quantitative impact on the relationship between "the built environment - well-being promotion" and mainly uses the qualitative trend to explain the mechanism of different environmental perception variables on residential well-being.

In the final relationship model of "the built environment - well-being promotion", green space and community management have a negative effect on well-being, which is contradictory to the existing research that green space has a positive effect on human psychology. The possible reason for this negative effect is the covariance between the variables and that pleasantness can

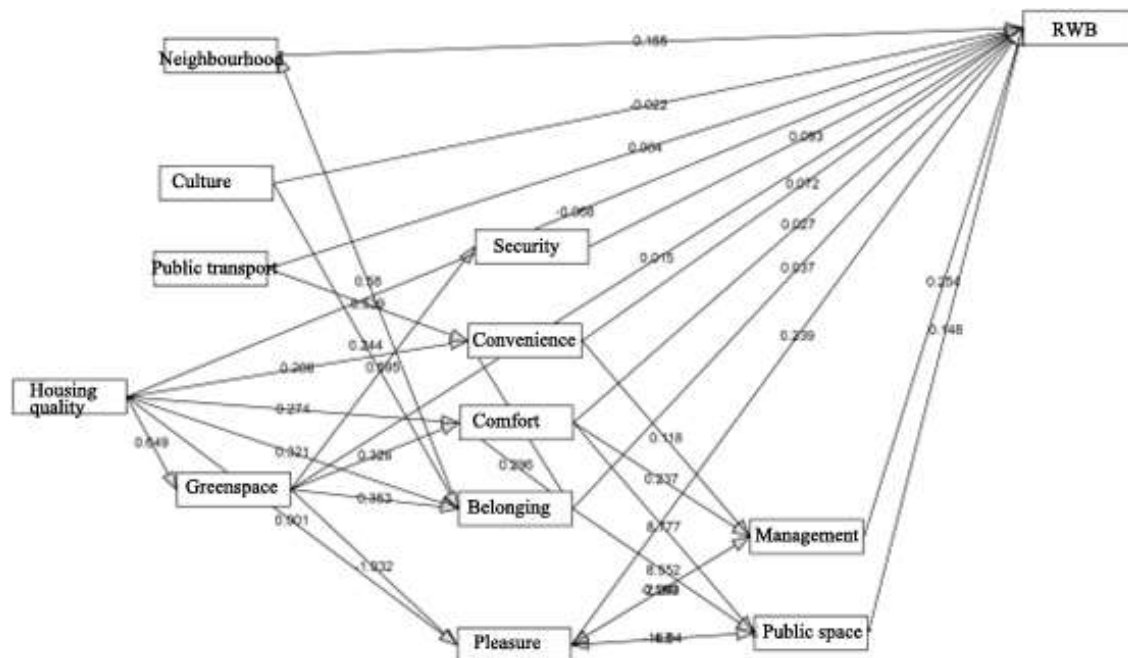


Fig.5-14 The ultimate relationship model of the built environment – well-being promotion

be explained by a linear combination of four variables: satisfaction with green space, community management, design of public space and facilities and quality of housing. The positive impact of community residents' satisfaction with the design of public spaces and facilities far outweighs the impact of the other three environmental satisfaction variables and despite the negative effect of satisfaction with green space and community management, the overall impact of environmental satisfaction on positive affect still shows a positive trend. Overall, the mediating role of positive affect is more pronounced in the influence mechanism of the built environment-well-being promotion compared to environmental satisfaction. In addition to the direct effects of all influences on residential well-being, it is worth noting that residents' satisfaction with green space and residential quality affects residential well-being through the mediating role of comfort, which also acts on residential well-being by influencing residents' satisfaction with community management and the design of public spaces and facilities. Pleasure as a mediator unidirectionally influences residents' satisfaction with green space and residential quality to act on residential well-being, but pleasure and residents' satisfaction with community management and public space and facility design show bidirectional mediating effects in influencing residential well-being. In addition, the mediating effect of sense of belonging intervenes in the indirect effect of residents' satisfaction with the quality of housing, community culture and green space on residential well-being, while sense of belonging indirectly affects residential well-being through residents' satisfaction with neighbourhood relations and the design of public space and facilities. The mediating effect of convenience is more significant in the influence of residents' satisfaction with the quality of housing and accessibility to public transportation on residential well-being, while satisfaction with community management also indirectly affects the effect of convenience on residential well-being.

5.5 Summary

This chapter proposes the concept of residential well-being based on the theory of design for well-being, analyses the meaning and characteristics of residential well-being and constructs a conceptual model. The study analyses the needs and problems of residential design for well-being in urban communities around the sense of residential well-being and discusses the complex relationship between environment and well-being in depth. The study conducts an empirical investigation, based on which a fuzzy comprehensive evaluation model of residential well-being is constructed using hierarchical analysis and fuzzy comprehensive evaluation method, which helps to judge the comprehensive level of residential well-being of different communities or neighbourhoods.

First, based on the design theory of community residential design for well-being, the study proposes the concept of "residential well-being" to explain the complex relationship between environment and well-being, discusses its characteristics and influencing elements and constructs a conceptual model of residential well-being. On this basis, to explain the relationship between the community environment and residents' happiness, it is necessary to evaluate the community's residential well-being and to analyse the value orientation, internal mechanism, connotation and characteristics of residential well-being evaluation. Then, based on these theoretical analyses, field research is carried out to establish the set of influencing factors, design the research questionnaire, screen the research subjects and organize the research data. Due to the subjectivity and fuzzy characteristics of the evaluation factors, the fuzzy comprehensive evaluation method was chosen to establish a comprehensive evaluation process of residential well-being and the weights of the factors were obtained through the hierarchical analysis method by the scores of 12 multi-stakeholder stakeholders and 270 direct users of the community environment on the

influencing factors and finally obtained the fuzzy comprehensive evaluation model of the community's residential well-being. Through the fuzzy comprehensive evaluation model, the residential well-being of different neighbourhoods is comprehensively evaluated, and the evaluation score levels are set by combining the principle of maximum affiliation and the principle of weighted average, which helps to clearly reflect the comprehensive level of residential well-being of each neighbourhood. Finally, to explain the complex inner relationship of environment-well-being more clearly, the interactions of positive emotion and environmental satisfaction may play a mediating role in the process of environmental influence on happiness are analysed and the internal relationships of the two groups of influencing factors, environmental satisfaction and positive emotion, are correlated and all the significant paths of action are fused to form a relational model, which ultimately explains the built environment-well-being promoting influence mechanism.

CHAPTER 6 BASIC THEORY OF DESIGN FOR WELL-BEING IN COMMUNITIES

6.1 The influencing mechanism of residential well-being and the built environment

It is complicated to explore the relationship between environment and residential well-being, many studies chose a mediator as a bridge to connect two items and to analyse the deeper association between them. Questionnaire and interview were the main data source of the studies, which may be because the assessments and perceptions on environmental characteristics can only be obtained through the self-report of interviewees, which is also the most direct way to understand the subjective feelings of residents. The positive association between life satisfaction and well-being is widely acknowledged. Some studies considered the overall satisfaction with environment characteristics as the result of well-being, which supported satisfaction results can fully express their well-being within the environment (Azimi & Esmaeilazadeh, 2017; Etminani-Ghasrodashti et al., 2017; Wu, 2014). In addition to the direct influence of the built environment on mental health, there are also many complicated indirect influence paths. This study has considered three categories of mediators in terms of the associations between the built environment and well-being.

6.1.1 Satisfaction as the mediator of linking residential environment and well-being

Satisfaction has been studied the most as a mediator between environment and well-being. Seven studies shown in Table 6-1 have explored how people's satisfaction with environmental characteristics as a mediator influences well-being at different points or focuses. Van Herzele (2012) proposed that neighbourhood satisfaction indicates complete mediation on well-being in

Table 6-1 Satisfaction as the mediator of environment and well-being

Author	Mediator	Data source	Related factors
Etminani-Ghasrodashti, R. et al.	Satisfaction	Mail questionnaire	Buildings, surrounding facilities, proximity to public transportation, neighbourhood
Hadavi, S.	Neighbourhood satisfaction	Mail and on-site questionnaire	Proximity to green/social spaces, quality of green space
Gur, M. et al.	Housing estate satisfaction	Questionnaire and interview	Qualities of housing, facilities, neighbourhood, public spaces, accessibility to workplace
Dong, H. W. & Qin, B.	Satisfaction with each element	Questionnaire	Urban parks, ease of driving, neighbourhood
Van Herzele, A. & de Vries, S.	Neighbourhood satisfaction	Fieldwork & questionnaire	Neighbourhood greenness
Lee, K. Y.	Neighbourhood satisfaction	Face-to-face interviews	Facilities in communities, neighbourhood relations, commuting
Wei, X. T. et al.	Satisfaction with each factor	Questionnaire	Public transportation, community management

regression analysis and the satisfaction with neighbourhood greenness is more closely related to general well-being than it is with health in the strict sense. Hadavi's mediation analysis study (2017) suggested that the impact of green space quality on mental health is mediated by both neighbourhood satisfaction and use patterns, while the proximity of open lawn with trees is significantly mediated by satisfaction. A study in Turkey (2020) adopted CHAID analysis to propose the positive impact of a number of environment-related factors on well-being, among

which residential community satisfaction as the variable with the greatest impact on residential well-being, was selected as the first-level intermediary connecting environment and well-being. But the study was limited to areas where people of high economic status live, with no strong evidence to apply the research results to most people. Lee (2021) took neighbourhood satisfaction as an emotional response of residents to neighbourhood environment and explored its mediating role in the process of physical environment satisfaction affecting quality of life. Although scholars have different definitions of neighbourhood satisfaction, they all support taking people's satisfaction with environmental factors as the mediating mechanism of the built environmental impact on well-being. However, Dong and Qin (2017) found that although neighbourhood satisfaction played a mediating role in the relationship between environment and

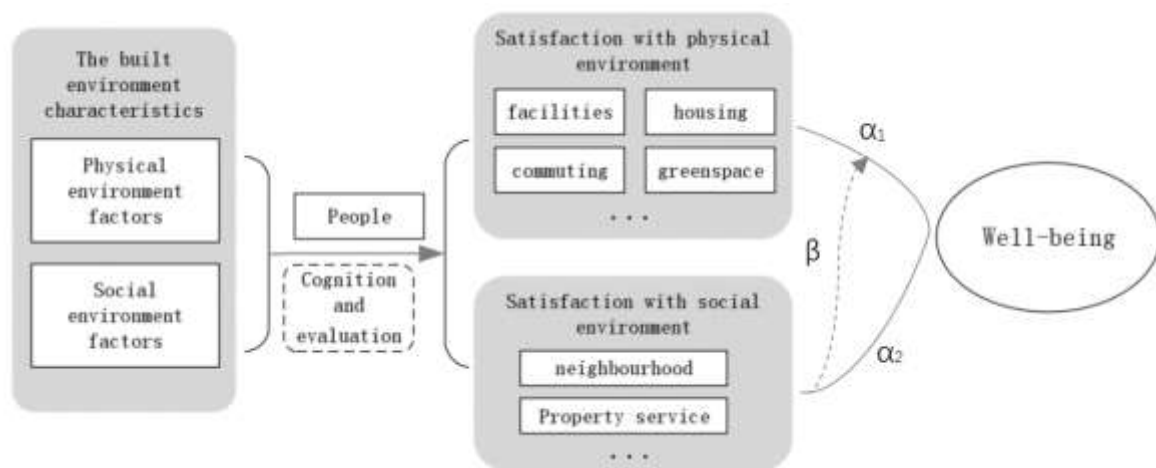


Fig.6-1 The influencing mechanism of satisfaction as mediator

well-being, it contributed little to the explanatory power of the whole model. It means the physical environment plays only a minor role in determining mental well-being, which is inconsistent with other screened studies, but the author did not discuss the potential reason for this result.

Based on these studies, the influencing mechanism of satisfaction as a mediator is shown in Figure 6-1. The environment characteristics act on people and people evaluate the corresponding factors through cognition and form their satisfaction with each factor. Satisfaction with various aspects has different degrees of positive impact on well-being, so the influence of the built environment on well-being was expressed through the results of people's satisfaction with different factors. Through the research on the mechanism of indirect correlation between physical attributes of environment and mental health feelings, it can provide some insights for the planning and design practice of solving mental health problems. However, the characteristics of the physical environment targeted by these studies are not very comprehensive and it is a single and one-sided model to establish the relationship between environment and mental health only with satisfaction as the mediator.

6.1.2 Behaviour or activity as the mediator of linking residential environment and well-being

Table 6-2 shows the three studies that explored the relationship between the built environment and well-being using Behaviours or activities as the mediator. In Nordbo and colleagues (2020) opinion, certain the built environment characteristics can not only exert a direct influence on

Table 6-2 Behaviours/activities as the mediator of environment and well-being

Author	Mediator	Data source	Related factors
Nordbo, E. C. A. et al.	Participation in leisure activities	Questionnaire & GIS	Green space; surrounding facilities
Zhang, D. L. & Tu, Y.	Pro-environmental behaviour	household survey	Greenery; quality of housing; waste facilities
Liu, Y. F. et al.	Health-related behaviours	Population Census survey	Housing quality; cultural facilities

children's moods and feelings but also mediate the outcome result through participation in activities. In terms of the impact factors, they found a positive correlation between access to green space and children's well-being, although having a park within the neighbourhood was negative for the moods and feelings of the Norwegian 8-year-olds when analysing direct associations. The conclusion indicates participation in activities can counteract the negative psychological effects of some the built environment factors on children through indirect influence pathways, which confirms the mediating role of participation in activities. Zhang and Tu (2021) added the mediating role of pro-environmental Behaviour based on the impact model of residential satisfaction. It also provides preliminary evidence that building quality, greenery, indoor environment and waste facilities contribute to the pro-environmental Behaviours of residents. Although the research results may be sensitive to individual characteristics and market dynamics since the measurement of environmental features is based on the subjective evaluation of residents, it still supports the mediating role of pro-environment Behaviour in the influence of environmental features on well-being. Previous studies have shown that the immediate living environment of the elderly will have a substantial impact on their subjective well-being due to the narrowing of activity space and relationship network (Costa-Font, 2013; Rojo-Pérez et al., 2007). Although a study in Shanghai (Liu et al., 2017) was conducted to explore the relationship between residential environment and health, the model confirmed an indirect impact pathway of the residential environment on subjective well-being, with Behavioural impact on health as the intermediary pathway.

Figure 6-2 summarized the influencing mechanism of behaviours or activities as mediators in the studies. The built environment features act as a stimulus factor to affect individuals' perception of the surrounding environment. People are stimulated by the features of the built environment to

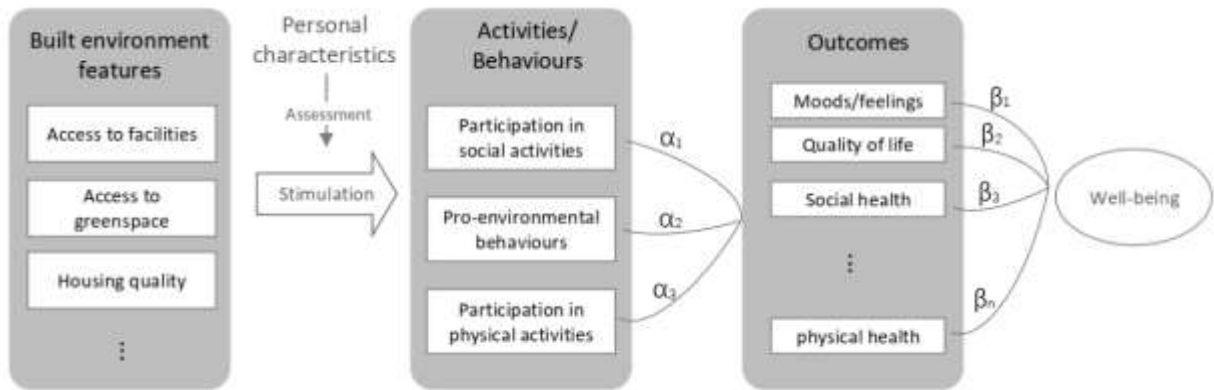


Fig.6-2 The influencing mechanism of behaviour/activity as mediator

generate corresponding assessments, which can promote or inhibit some specific Behaviours or participation in some activities. The interventions of Behaviours or activities have a direct impact on specific outcomes, such as moods, quality of life, social health and physical health. There is a positive correlation between various outcomes and well-being, thus forming an influencing mechanism of Behaviour or activity as a mediator.

6.1.3 Affect as the mediator of linking residential environment and well-being

The third mediator was the affects and emotional perceptions of people (Table 6-3). Different from the data collection of the first two mediating factors, the data on emotional experience can be obtained from social platforms and face-to-face interviews, rather than being limited to the self-report of respondents in the questionnaire. Through emotional analysis of texts obtained from social platforms, Cheng and colleagues (2021) confirm that green quality has a positive impact on expressed well-being through sentiment analysis. The study also finds that people's green sensitivity increased significantly after the pandemic and that people show much more emotional sensitivity to subdistrict-scale urban parks than to city-scale urban parks. Since the mood data was collected from social platforms, which means that the study mainly focused on the younger generation, the conclusions might not necessarily apply to the elderly and children.

Table 6-3 Affects as the mediator of environment and well-being

Author	Mediator	Data source	Related factors
Cheng, Y. Y. et al.	Positive sentiment value	ArcGIS & Weibo	Green quality of urban parks
Kwon, M. et al.	Recreational well-being	Online survey	Access to amenities; surrounding facilities
Guo, Y. Q. et al.	Sense of community	Face-to-face interviews	Park-based green space; access to various facilities; street connectivity; social interactions
Zhang, Z. & Zhang, J. X.	Sense of community	Questionnaire and interview	Greenspace, transportation, surrounding services and facilities, public space
Chang, P. J. et al.	Place attachment	Questionnaire & stakeholder on-site evaluation	Greenway quality; green space
Nurhakim, I. et al.	Place attachment	Field observations & questionnaires	Parks

Moreover, the data in the study can only represent people's emotions posted online, not necessarily their actual feelings, which may affect the results, but does not affect the mediating mechanism of sentiment value. When studying the influence of green space on mental health or moods, scholars mostly use place attachment as a medium to explore the correlation between perceived green quality and well-being (Chang et al., 2020; Lau et al., 2021). Among them, the study in Taiwan (2020) believes that the quality of green space could not directly affect the well-being of the elderly but takes the environmental stressors' influence on place attachment as a positive path to study the impact of perceived environment on well-being, which was also proposed in the study of Zhang et al. (2015). Lau et al. (2021) propose that place attachment and environment preference play multiple mediating roles between perceived environment and positive emotions. Place attachment needs to influence positive emotions through environment preference as a mediator, which may provide a deeper understanding of the relationship between

environment and well-being. The sense of community has also been proposed as an intermediary mechanism to explain the interaction between environment and well-being, forming an indirect influence path through the psychological process (Zhang& Zhang, 2017; Guo et al., 2021). Zhang et al. (2017) confirm that the built conditions and service functions positively affect well-being as environmental factors and proposed the activation pathway of the sense of community as the mediator. Guo et al. (2021) propose three paths of the objective environment on well-being, among which the sense of community participates in two indirect pathways as a mediator. Kwon et al. (2019) suggest that perceived walking ability and community attractiveness have positive impacts on recreational well-being, proposing a mediating pathway that environmental factors influenced well-being and life satisfaction through recreational well-being.

Based on the conceptual framework of these studies, the influencing mechanism between environment and mental health with affect as the mediator is shown in Figure 6-3. In addition to

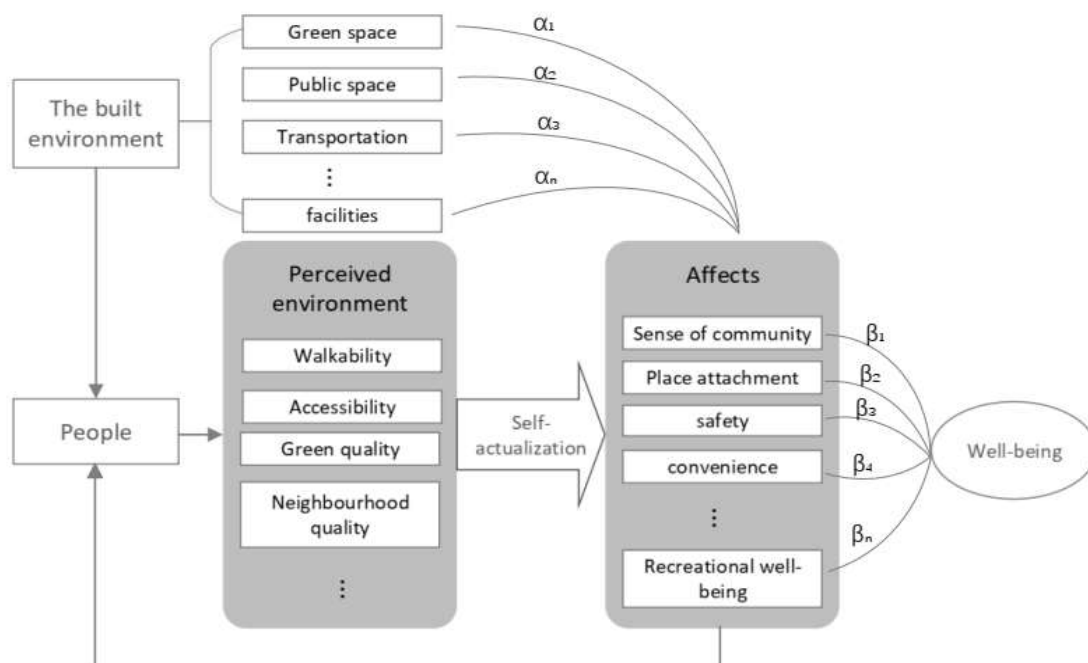


Fig.6-3 The influencing mechanism of affect as mediator

the direct influence of the built environment on well-being, there are two indirect ways that environmental factors affect well-being. The first is mediated by both emotional response and perceived environment. The elements of the built environment are transformed into the perceived environmental quality through people's cognitive evaluation and people in the environment form emotional responses to the perceived environment through self-realization and accumulation of time. The second is that consider affective outcomes as the only mediating effect on the built environment and well-being. Regardless of the pathway, the resulting affective responses will continue to affect people's cognition and the quality of their perceived environment, forming a closed loop of response.

In addition to a single mediator, some studies combine multiple mediators to explore more comprehensive and complex mechanisms. Although Mouratidis (2020) focuses on the negative effects of neighbourhood deprivation on well-being, the analytical process of the study confirmed that amenities, perceived safety and environmental quality can positively affect well-being through neighbourhood satisfaction and emotional response to the neighbourhood. Wang (2016) revealed that residential environment usage and affective experiences are important mediating factors affecting well-being. The impact of usage and affective experiences on residential satisfaction includes an indirect influence pathway from activities to affective experiences. This indicates that there are certain interactions among the three mediators, which is particularly important for a more comprehensive explanation of the influencing mechanism of the built environment on well-being.

6.1.4 A theoretical framework of the influencing mechanism of residential well-being

In addition to the screening conditions of this study, the similarities in the research perspectives of the selected studies in this paper are mainly reflected in the bottom-up theory. The bottom-up theory supports that the experiences in the objective environment are the determinants of well-being level and affect well-being in a unidirectional way, which means the level of well-being does not affect the individual's perceptions of the built environment. Supported by this theory, most studies believe that the built environment can change the level of well-being by affecting the objective experience of individuals, but well-being does not react to individuals' feelings and perceptions of life experiences. In addition, in terms of research content, most studies emphasize the complexity of the relationship between the built environment and well-being and the diversity of influencing factors. In addition to some studies focusing solely on the impact of greening or transportation on well-being, more studies are trying to prove that two or more environment-related factors have a significant impact on well-being.

Although it is agreed that the relationship between the built environment and well-being is complex, the mechanisms proposed by different studies are obviously different. There are three categories of theoretical points emphasized by relevant studies. One is supported by the Campbell model (1976), which indicates that the impact of the living environment on life satisfaction is mainly reflected in the stimulation of individual cognition by the objective environment, thus forming an individual's evaluation of multiple environmental fields. The second category focuses on the mediating effect of Behaviours and activities. The positive influence of the living environment on well-being comes from the supporting effect of the environment on positive Behaviours and promoting their participation in activities. Specifically,

the theoretical basis of this kind of research is derived from social cognitive theory and activity theory, which believed that the living environment significantly affects the cognitive process of shaping individual self-efficacy (Bandura, 1986). Effective intervention in individuals' physical Behaviours leads to the improvement of their physical well-being, while promotion of activity participation helps maintain good social interaction and improve social well-being. Both paths have an important impact on improving well-being. The third is mediated by affective responses based on the cognitive theory of emotion. Lazarus (1991) believes that emotion is the product of interaction between people and the environment, which can be regarded as an evaluation of perception. The affective result is formed after the accumulation of many emotions, which is a long-term emotional state. The change in the built environment can affect people's affective results in the environment and then affect the level of subjective well-being. Therefore, there are obvious differences in the mechanisms proposed by studies based on a different theoretical basis.

In the past ten years, with the deepening of the theme of well-being, related studies have revealed that the influencing factors and results of well-being have been continuously expanded, providing a certain research basis for explaining the internal relationship between the built environment of the community and well-being. At the same time, this has also triggered some scholars to discuss the comprehensiveness and rationality of the existing theoretical framework and successively put forward new perspectives and insights (Lennon et al., 2017; Mouratidis, 2018). Firstly, the existing research findings lack consideration of the top-down effects of well-being on mediating factors and objective environments. As mentioned above, most of the conceptual frameworks proposed by existing studies believe that the mechanism between the built environment and well-being presents a bottom-up unidirectional impact, ignoring the reverse effect of well-being on the built environment. The AIM model proposed by Diener (2008)

believes that individuals with high subjective well-being tend to focus on positive stimuli in life, face life experiences more optimistically and adopt a positivity bias to look back on the past. Applying this theory to the interaction mechanism of the built environment and well-being, individuals with high well-being may evaluate all aspects of life more positively and have more positive affective responses and Behavioural changes. Therefore, the relationship between well-being and the built environment may be a two-way effect including top-down and bottom-up, rather than the one-way effect that has been followed by existing studies.

In addition, although the effects of various mediating factors have begun to be gradually recognized, the comprehensiveness of the action mechanism still needs to be supplemented. As for the research framework based on the Campbell model, the incompleteness was reflected in taking residential satisfaction as a single mediator. In theory, complex factors of the living environment may affect many aspects of individual life, but the individual is not rational, in real life the emotional side may result in determining the individual to recognize or constraint effect on the improvement of the living environment, which leads to its subjective evaluation cannot fully show the effects of the environment on residential well-being. Therefore, it is necessary to further explore other potential mechanisms based on the analysis of residential satisfaction. In addition, most studies using activities or Behaviours as the mediator ignore the mediating effect of the perceived environment and existing studies have confirmed that the objective environment can affect individual Behaviour through the perceived environment (Jun & Hur, 2015). Ignoring the mediating role of the subjectively perceived environment may lead to erroneous research conclusions between the built environment and well-being. Those studies that use affective responses as the mediating factor focus on people's perceptions and affective results to the environment, while affects and emotions are easily affected by personal cognition and social

factors, so it is difficult to scientifically explain the impact of the built environment on well-being with affective result as the single mediator. It is worth noting that some studies have proposed that the action mechanism between the built environment and subjective well-being involves two residential satisfaction, perceived environment, affective responses and Behavioural activities (Pfeiffer & Cloutier, 2016; Wang & Wang, 2016; Mouratidis, 2018; 2020). This provides a useful reference for coordinating multiple theoretical viewpoints to construct a more comprehensive conceptual framework at one time.

To supplement the deficiencies of the existing theoretical framework, this study proposes a new theoretical framework as shown in Figure 6-4. The solid arrows represent the bottom-up relationship between the residential environment and well-being, while the dotted arrow reflects the top-down system in the influencing mechanism. As emphasized by the Campbell model (1974), the impact of the built environment on well-being stems from people's perceptions of the

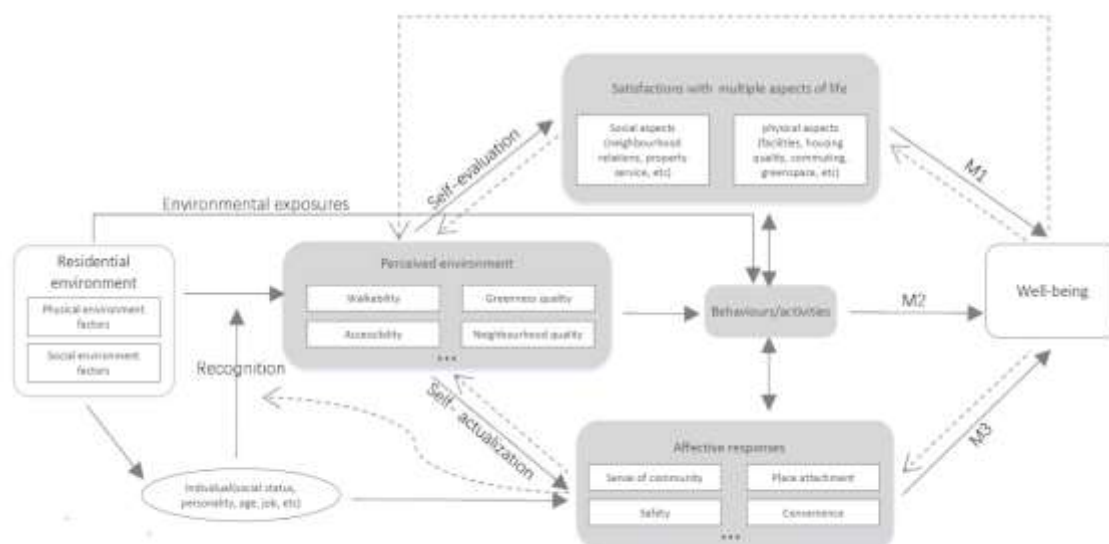


Fig.6-4 A theoretical framework of the influencing mechanism between residential environment and well-being

environment. After being stimulated by physical and social environmental elements, individuals will perceive stimuli through personal cognition, such as walkability, accessibility and neighbourhood quality, which have been concerned about existing research. At the same time, the stimulation of the objective environment to the individual will produce corresponding emotional experiences through physiological and psychological stress responses. As mentioned above, both theoretical analysis (Mouratidis, 2018) and empirical research (Wang & Wang, 2016; Mouratidis, 2020) reflect that the perceived environment and the determinants of well-being are not simply direct links but have complex indirect effects. Therefore, based on social cognition theory and emotional cognition theory, this study believes that perceived environment may further affect people's satisfaction with different aspects of life, emotional responses and environment-related Behaviours through three mediating pathways (M1, M2, M3). It cannot be ignored that some studies have confirmed that residents' travel Behaviour and travel characteristics have a significant impact on people's emotional acquisition, cognitive evaluation and self-goal realization (Morris, 2015; Sugiyama & Thompson, 2007; Waterman, 2005), while some evidence in psychology that supports positive affect can facilitate approach Behaviour (Cacioppo, Gardner, & Berntson, 1999). This means that the interplay between Behaviours, life satisfaction and affective responses should be considered in the bottom-up relationship. Based on the previous discussion of existing research, this study suggests that there is likely to be a top-down relationship between well-being and the built environment. According to the top-down theory, individuals with higher well-being are more likely to give positive evaluations and be positively influenced by the things they focus on (Diener & Ryan, 2009). Therefore, in addition to being more satisfied with all areas of life (Ettema & Schekkerman, 2016), individuals with higher well-being levels may also have a better-perceived environment (Eibich et al., 2016),

which means well-being can directly affect the perceived environment in some ways. Although there is not enough empirical evidence to support the influence of well-being on affective responses, the subjective well-being model proposed by psychology (Diener, 2000) can indicate a positive relationship between positive emotion and well-being, which may reflect the interaction of affective outcomes and well-being. Moreover, affective responses intervene in the cognitive process of the individual's perception of the residential environment through psychological processes, thus continuously forming a mechanical model of the residential environment and well-being composed of three mediating effect pathways (M1, m^2 , M3). Different from previous research models, this model contains three mediating pathways of environmental impact on well-being and proposes the reverse effect of well-being on the environment to form a circular system. It helps further realize that the relationship between the built environment and well-being is not only a one-way influence and there are complex interactions among the three mediating factors.

6.2 The concept of design for well-being in urban community

Well-being, is the eternal pursuit of human theme, has always been a common concern of society. But well-being cannot be viewed as a separate and isolated issue and should be linked to other social, economic, cultural and environmental issues. Based on Maslow's demand pyramid and Chen Conglan's research on Chinese residential ethics, this study combines the evolution of Chinese people's pursuit of the living environment with human needs and summarizes it as "living in home – living in peace – living well – living in well-being" and finally achieving a state of "well-being" (as shown in Figure 6-5). In conjunction with the above, well-being as a state of continuous self-satisfaction, above all needs, is also the goal of well-being. Combining

the previous studies on the living environment and well-being of urban communities, this study proposes the concept of urban community residential design for well-being: the design process of a series of decisions for residents to maintain sustainable well-being of the living environment of urban communities,



Fig.6-5 Pyramid of human needs for living environment

namely, the design of urban community residential well-being.

From the essence of urban community residential design for well-being, community the living environment design must be its core content. The basic characteristic of community the living environment design is to meet the use needs, safety needs and natural and human needs of residents. Design for well-being, based on meeting the basic needs of residents, conducts community the living environment design with the core goal of improving well-being, that is, focuses on community the living environment factors that can effectively improve well-being.

From the essence of well-being, personal inner satisfaction is the real well-being, so well-being has a strong subjectivity, and well-being is a long-term continuous expression of positive emotions, well-being is relatively stable. Just as many quantitative well-being studies use well-being index to measure people's satisfaction with their overall life, well-being is an individual's overall perception and comprehensive evaluation of the surrounding things and environment, with holistic characteristics. The starting point of design for well-being is the living well-being

of residents in urban communities. Designers cannot grasp the subjective differences of each resident, but people in the same environment should have strong commonality in their perception and evaluation of the surrounding environment and things, so design for well-being has certain stability and operability.

6.2.1 The philosophical discussion of design for well-being

From the perspective of philosophy, there is a close relationship among the subject, object, carrier and acceptor in urban community environmental design for well-being (see Figure 6-6). Among them, the subject is the existence corresponding to the object, the subject is the person who can know and practice the object and determines the meaning of the object's existence. The main body of urban community environmental design for well-being is the people who participate in decision-making and practice design for well-being, including designers, residents and other stakeholders. Relatively speaking, the object of design for well-being is the community the living environment transformed by the subject based on well-being, including material

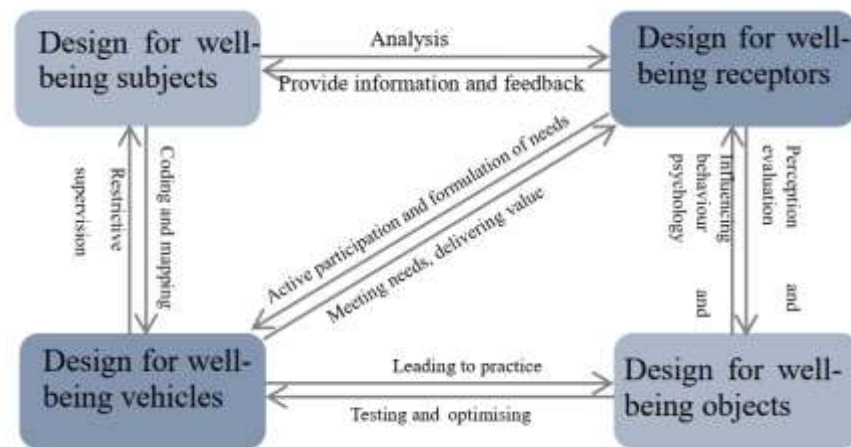


Fig.6-6 A relational model of design for well-being in urban community environments

environment and non-material environment. The receptors of urban community environmental design for well-being are the residents living in the urban community, including children, adults, the elderly, the disabled and other diverse groups of different ages and with different mobility. In terms of science and technology, the carrier refers to the material that can transfer energy or carry other substances. In this study, the carrier of design for well-being represents the design expression that can deliver well-being and carry the well-being of residents. Such expression can be the design scheme of community environment, or the design standard or norm of community environment based on the well-being of residents.

Dialectical materialism holds that the object exists independently of the subject. The subject does not passively adapt to the objective world, but actively reflects and transforms the world in practice. Through in-depth analysis and research on the well-being of the recipient, the subjects of design for well-being jointly make decisions and draw community environment design schemes or norms that can make residents feel happy and use this as a carrier to guide the subjects of design for well-being to design or transform the real community environment and make it become the object of design for well-being. At the same time, the carrier of design for well-being plays a role of restraint and supervision on the subject according to the presented standards or norms and the ultimate practical object of design for well-being is also the inspection and evaluation of the carrier and the design scheme or norms are constantly optimized in the practice process. As a part of the receptor and subject of design for well-being, residents are responsible for providing information for the subject and actively participating in expressing the carrier of design for well-being in the process of design for well-being. In the process of practice, the receptor perceives and evaluates the object and feeds it back to the designers. Meanwhile, its Behaviour and psychology are always affected by the community environment,

forming an interactive relationship. In addition, community environmental design schemes or norms as carriers of design for well-being should meet the comprehensive needs of design for well-being recipients and provide them with residential and emotional value. Therefore, design for well-being is a well-being-oriented sustainable design activity.

6.2.2 The role of multiple stakeholders in design for well-being

As explained by Freeman, an American economist, stakeholders are groups that can affect the realization of goals. The design of urban community the living environment involves many stakeholders, who have different purposes due to their different locations. Although the ideal original intention of design for well-being is to design a community the living environment that makes residents feel happy for a long time, to balance social and economic issues in the practice process, it is also necessary to pay attention to the opinions and ideas of other stakeholders. There are five main stakeholders in the whole community residential design for well-being process, which are residents (including residents of all ages and different Behavioural abilities), sub-district offices and community workers, community construction investors and real estate developers, property management personnel and government decision-making departments.

(1) Occupants

The goal of urban community the living environment design for well-being is to make the residents in the community environment can continue to be happy, therefore, the most direct and important stakeholder is the community residents. This includes people of different ages, as well as people of different mobility who live in the community. What design for well-being should do is to create the living environment that promotes most residents to feel happy and the environmental factors that promote the well-being of different types of residents have different

influences. Therefore, design for well-being should balance the interests of different groups in the community and form a community of interests in the living environment.

(2) Sub-district offices and community workers

Due to the administrative planning of residential quarters and communities in China, the community the living environment needs to be supervised and maintained by sub-district offices and community workers after it is put into use and has a certain supervisory and management role for property management companies. Therefore, sub-district offices and community workers have a close relationship with the community the living environment and are also one of the stakeholders in the design for well-being of the community the living environment.

(3) Community construction investors and real estate developers

The construction of community the living environment is inseparable from investors and real estate developers, who play a decisive role in the planning and functional distribution of the community. At the same time, the quality of the living environment may have multiple impacts on the community real estate, such as the occupancy rate of residents, housing prices, community awareness, etc. These impacts may be closely related to the economic interests of community construction investors and real estate developers.

(4) Property management personnel

The property company collects a certain amount of property fee to manage the residential community through public bidding of the sub-district office or signing a contract with the community owners committee and is mainly responsible for the cleaning, security, facility operation and maintenance of the community. The quality of the work of the property

management personnel may directly affect the living feelings of the residents in the community and even affect the payment rate of the property fee. Therefore, the property management personnel also assume the role of stakeholders in the design for well-being of the community the living environment.

(5) Government decision-making departments

All community the living environment design projects need a series of decision approval by relevant functional departments of the government before they can be implemented, so the government decision-making department is also one of the relevant stakeholders of design for well-being. From the perspective of policy services, government policy subsidies are conducive to the implementation of community residential design for well-being and design for well-being is also conducive to further implementing the fundamental purpose of improving well-being in the basic strategy of developing socialism with Chinese characteristics.

Sanoff (2000) proposed that if people can actively participate in the creation of the environment, rather than passively feel the impact of the environment, the environment will work

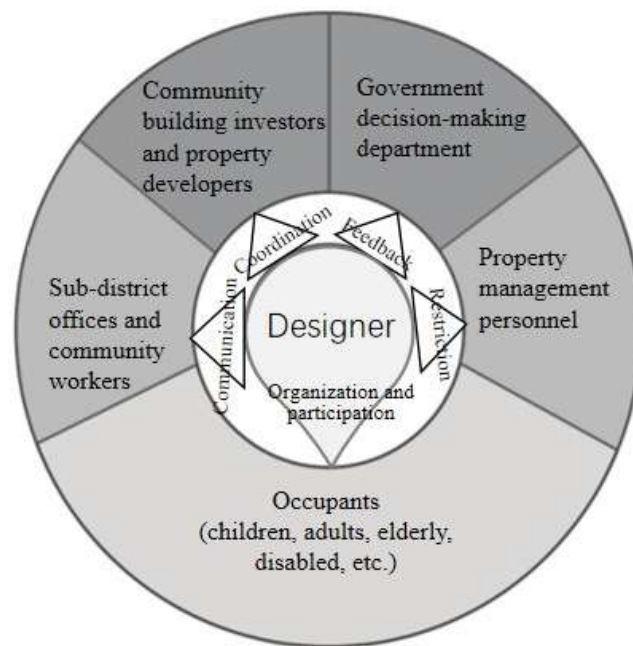


Fig.6-7 The role of designers in the process of design for well-being

better. For all stakeholders with different ages, physical conditions and design aspirations, active participation in the whole process of community residential design for well-being will help build a happy community environment more smoothly. Therefore, designers, as one of the subjects of design for well-being, need to assume the responsibility of a central organizer to involve other stakeholders in the process of design for well-being. The designer's job is to coordinate community construction investors and real estate developers, grasp the overall budget of the community environment that can be put into use, organize other stakeholders to participate in the design for well-being of the community environment, integrate the suggestions and needs of multiple stakeholders, express the design scheme or standard guidelines of design for well-being with architectural language and finally put forward practical design strategies. The relationship between the designer and other subjects of design for well-being is shown in Figure 6-7. Among them, residents, property management personnel, sub-district offices and community workers mainly affect the design of community residential well-being from the level of community environment and architecture, while government decision-making departments, community construction investors and real estate developers affect the construction of community environment from the macro level of city, social development and economy.

6.2.3 The ethical value of design for well-being

The research object of urban community environmental design for well-being is urban community environment, whose essence is a place for human body and spirit to rest and rest and a carrier of ethical living activities involving material environment and non-material environment. As a man-made non-natural the living environment, community environment carries a material-based spiritual relationship between people and the established environment.

From the attribute of environment, community environment is a complex social environment without nature, its essence is a comprehensive system with human needs as the core, to serve life and improve human spirit as the goal. Since ancient times, human beings have created and enjoyed life in the environment and formed their own ethical values to highlight the exploration of the essence and meaning of life (Chen, 2016), among which there are many ethical value relationships worth studying between people, people and the environment. The essence of the ethical value of urban community environmental design for well-being is to analyse the value of the creation of community environment for the meaning of individual life and the ultimate pursuit. The values reflected in the design of community environment shape the ethical relationship and values among residents to a large extent.

To make the design result perfectly realize the design purpose, people usually abide by certain ethical values when carrying out design activities. Practicality, economy and aesthetics are considered as the three basic values of design. From the perspective of value composition, there are certain value defects in practicality, economy and aesthetics, which only consider the realization of functional, economic and aesthetic value, while ignoring the high-level needs of users. When human society develops to a higher stage, people begin to have needs for self-esteem and self-realization and begin to pursue well-being, which makes the design activities to meet people's needs have obvious value pursuit. With the development strategy of "beautiful China" and "Happy Chinese dream" put forward, the design attitude and value judgment of socialist values with Chinese characteristics need to be reflected in the design activities. From the perspective of axiology, self-realization and well-being are the ultimate pursuit of life value, located at the highest end of the value system and are also the inevitable result of the development of human society. From the perspective of design ethics, design for self-realization

and well-being, as an ideology and cultural form, has the function of guiding and judging the design field it applies to and permeates into the whole process of design. By combining the design of human-centred the living environment and the essential needs of Chinese people for living, this section will discuss the ethical value of urban community environmental design for well-being from the four aspects, including living in home(有居), living in peace(安居), living well(善居) and living in well-being(乐居).

Living in home(有居): the ontological value of the living environment

Human beings, as the real beings in the real world, must absorb information energy from the outside world for production to meet their basic survival needs, which requires a relatively stable space to accommodate their bodies and protect their lives and then ensure the continuous progress of survival activities. On the other hand, the essential meaning of human is its unique sociality, and human beings need to make themselves a member of a living community and be recognized and accepted by it. Generally, the living space is the premise for human beings to obtain social attributes and the premise for human beings to become a living community is the space they live in, and the living space gives people the social ethical value of life. In the Qing Dynasty, Li Yu (2014) accurately summarized the value and significance of housing for human beings by saying, "One cannot live without a home, and one cannot live without clothes". In ancient times, the demolition of a home was seen as both physical and social exile, that is, the removal of its owner as a member of the living community and has historically been regarded as the most severe punishment possible (Hanna,2009). In modern society, in addition to relatively private houses, the living environment has also established many public spaces that constitute a living community for social communication and exchange of ideas. They are the "arrival points"

of existence. The living environment formed on the material basis of these "arrival points" accommodates various life Behaviours of human beings and enables the community to form a unique way of life and be passed on. Therefore, the reason why the living environment and residential buildings have such great significance for the Chinese people is not only because of the functional attributes they provide to shelter the wind and rain and facilitate people to carry out life, but more importantly, the spiritual and social attributes generated by the changes of time and space. For China, housing is the fundamental interest of the people, and it is also the ethical value basis of the CPC's governance. Only by addressing the basic needs of the people for food, clothing, housing and transportation can get closer to the fundamental goal of development and strengthen the fleshly ties between the Party and the people.

From the perspective of the ontological nature of human existence, to shelter and protect, human beings have learned architecture, planning and design. From the initial construction of nests and simple civil buildings to today's high-rises of reinforced concrete, the existence of these material spaces shows that living needs are the most primitive and fundamental manifestation of human body's well-being (Chen, 2018). The living space is built by human beings and the meaning of its existence depends on the use of human beings and human beings rely on the living space to gather to live and present the state of being in the world. Living space is ontological only in the meaning system of human beings. In Heidegger's view (Gao, 2017), the primitive instinct of all living people is to find a place to live, and residence is regarded as the fundamental feature of human existence and residence, as the essential expression of human spatial characteristics, correspondingly has ontological value. In the book of Huangdizhaijing, it is stated that "wherever people live, they all live in the residence"(Feng, 2004), which shows that the residence is regarded as the essential meaning of human existence and the basis of life. From the perspective

of the nature of human living space, people determine their own existence and position in the space, carry out daily activities and constantly transform the man-made natural space into social space, forming residential space forms at different levels such as housing, community and city. To survive, human beings constantly overcome the contradiction with the real world and transform the process of living space also reflects the ontological value of living.

Living in peace(安居): home sense of living in peace and work

Living and working in peace and contentment is the most popular life ideal of Chinese people and living and working in order has a superior ethical significance. The prerequisite for living in peace is to have a physical existence basis - home, home is not a simple residential building, as Heidegger said, the real stability is not a temporary residence and not all buildings are residences. Good birds will choose trees to live and human beings' choice of the geographical location of their homes is also a "good place to camp"(Liu,1985). From an ethical point of view, the meaning of "good" includes the harmonious unity of their homes and surrounding environment and is conducive to the smooth development of human activities. As the Yellow Emperor's House Sutra says: "So the house is the foundation of man." If people take the house as their home, if they live in peace, that is, the family generation Changji, if they are restless, that is, the family is declining ", the Chinese people have since ancient times set the house as the basic judgment of a good life. From the perspective of the social attributes of residence, living in peace is the unity of human living Behaviour and social atmosphere, which means that people enjoy the stability and safety brought by residence after owning a residence and make their lives obtain a stability in society through living Behaviour. At the same time, as an important connotation of the Chinese dream, people are committed to building the achievements of reform and opening, so

that the people have more sense of gain and belonging and contribute to the practice and realization of national rejuvenation.

"If people want to settle down, the house must have the feeling of home"(Kaston, 2001), indicating that the residential building, as a material existence, is the basis of home construction and the result of the geographical location selection of the living community. At the same time, the "feeling of home" can be regarded as the prototype of home consciousness, which indicates that the house has the spiritual and emotional sustenance value beyond the single physical shelter, which is not only the physical basis of survival, but also contains the metaphysical residential ethics. The generation of home consciousness is not instantaneous, but the result of the spiritual level generated along with the construction of home and home consciousness in turn also acts on the process of home construction, helping human beings to build a home that makes them feel safe. As Minkowski said, the essence of life is a perception, and everyone's life experience and feeling are stored in the space-time mixture called home and the care and dependence on home is essentially a memory of our own life perception and this memory condenses into everyone's home consciousness.

Home is the base of existence for people to settle down in the vast world. For people's experience, it is the known space relative to the unknown space around them. It is the place where people try to adapt to the environment and provide psychological security. The focus of the home is "An", the ancient Chinese sages of "An" cognition beyond the basic material level, directly rose to the spiritual level of pursuit, such as Zhuangzi said, "the posture is united, sorrow and well-being is not easy to give before, know its helpless and if the life of Ann(Guo, 1961).Peace should be the result of the adaptation of the individual's body and soul to the world

of existence and the pursuit of the spiritual nouveau. To return to reality, the essence of living in peace is that both the house as the material basis of living shelter the human body and the home consciousness building the basis of spiritual home provide nourishment and shelter for the human spirit.

Living well(善居): the recognition of benevolence, justice and harmony

From the perspective of human's pursuit of housing needs, "good residence" can be said to be another stage based on "settling down". If "settling down" means that human beings join a living community and are accepted and recognized and then have a security and belonging to their home, "good residence" highlights the process that human beings beautify their home kindly and have psychological identity after becoming a member of the living community and is the positive influence of home on human's view of living. The "good" here means that the home itself is a good living environment, which can meet the basic survival needs of people. At the same time, people should be full of goodwill towards the existing home and try their best to transform it in a direction conducive to the establishment of the main value of the residents and the development of residential identity. Good and evil are relative and determined by people's subjective spirit, value orientation and judgment of objective Behaviour consequences. As human society has a certain consensus on basic moral standards and value orientation, some good, emotionally positive and positive feelings are often associated with good, on the contrary, negative, negative and disharmonious feelings become a symbol of evil. The "good" of the living environment lies in the perfection of the environmental space and whether it gives full play to its function and meets the needs of users. The "good" of living lies in the pursuit of a higher level based on human beings' pursuit of social interaction and being respected and other spiritual needs based

on living in peace. It explores the harmonious relationship between individuals and society and the harmonious symbiosis between human beings and nature from the perspective of the unity of heaven and man. Just as Rolston argues that man himself, with all his senses and emotions, is a product of nature, human culture has evolved from environmental perception and that "the individual self must be adapted to the demands of culture on him and ethically to his neighbour"(Yang, 2000). From the perspective of human existence value, the essence of "good residence" is to construct the ethical identity of the living community to the home. The root of the identity is human's memory of some familiar buildings or Spaces in the living environment and it is the feeling that people establish the existence value.

Home identity, derived from human's identity to the living environment, is attached to the emotional value satisfied by the living environment. It is related to the quality of the living environment itself, but also to the way of life and values of human beings and it is the meaningful connection between human beings and the environment in which they live. Manuel Custer (2006) believes that a sense of identity is a source of meaning and experience that can be expressed and presented in the form of space. For example, the Parthenon, built in BC, represents the Athenian citizens' identification with the city of Athens and its emphasis on the common good. In the cognitive world of Athenian citizens, the city state represented the place where all Athenians could live together, was their home and the Parthenon as the spiritual centre of their home increased the survival value of all Athenians. As Professor Chen (2019) argues, the sense of identity is constructed, which means that human beings understand and own the living world and are owned by them. Home identity contains too many contents, not only the design and transformation of buildings and Spaces for human beings to realize individual and social living, but also the memory and concern of human beings living in homes. From the perspective

of social stability, "good residence" can reflect whether the ruler's grasp of the system and policy can be widely recognized by residents. Only universal recognition can form the essential harmony of life and fundamentally meet people's emotions, identifications and other spiritual needs. From this point of view, "good housing" not only requires the inhabitant to choose a suitable environment and make every effort to design and transform the environment in the direction of "good", but also requires human beings to display cultural and social attributes as the inhabitant to find the meaning of their existence and shoulder the ethical values of realizing the unity of heaven and man and harmonious coexistence between man and the environment.

Living in well-being(乐居): the happy value of poetic dwelling

"Well-being (乐) " usually has the meaning of pleasure and joy in Chinese. Compared with the needs of "good residence" for Behaviour and material environment, "Le residence" means to live happily and more importantly, it highlights the spiritual feelings and spiritual pursuit of people living in the living environment. Its essence is that human beings' ultimate pursuit of well-being and its positive influence make people's survival meaning realize in the direction of well-being and well-being. The reason why living can produce well-being is, on the one hand, because the elements of the living environment have reached the ideal conditions for human life and residence; on the other hand, it is the spiritual core of the occupants themselves, that is, whether the inner well-being and wealth are enough to achieve self-realization. From the perspective of philosophical value, "happy residence" can be seen as the integration of hedonistic philosophy and ethical hedonism philosophy, which not only pursues the well-being of oral desire in secular life and feels the positive experience brought by materials, but also satisfies the social attributes of residence, acts for the well-being of most people, pursues spiritual peace and realizes self-

value, both of which are indispensable. Chinese scholar Professor Chen (2019) believes that permanent well-being is related to living and the reason why there are the concepts of heaven and elysium in Chinese and foreign myths and legends, which symbolize permanent well-being, is also because human beings have been avoiding pain from beginning to end and longing for long-term well-being.

"Poetic dwelling" is one of the main propositions of Heidegger's philosophy of personal existentialism and it is also regarded by many people as the ideal state of dwelling - to live poetically. The general meaning of habitation is residence and accommodation, which has the meaning of life and existence in poetry and is regarded as the basic feature of human existence in Heidegger's philosophical theory (Sun, 2005). He believes that how to obtain the essence of life from dwelling is the goal pursued by "poetic dwelling", which requires people to maintain spiritual goodness and spiritual well-being in the world they live in. If this state can continue to allow people to measure themselves with divinity, then poetic dwelling can occur. In other words, people exist in the world and constantly have positive interaction with the environment, so that they continue to perceive well-being and examine the degree of self-realization and finally achieve a state of life is "poetic dwelling", which symbolizes human's desire for a better life. Most of a person's life is spent in living and how to live happily is a lifelong pursuit of everyone. It is not only the physical basis such as architecture, public space, traffic space, but also the metaphysical spiritual pursuit of longing for permanent well-being and longing for self-realization.

As the value orientation of urban community residential design for well-being in this study, "living in well-being" emphasizes that people's well-being is placed in a reasonable relationship

between people and the environment, so that its value can be fully respected and realized and pays attention to the role positioning of people's pursuit of well-being in today's social context. Building a community with a shared future for mankind has always been Chinese strategic conception for the development of human society, which also demonstrates the value return of Marx's ontology (2009) that "the essence of man is the true community of man". From the perspective of subject value theory, the essential goal of "happy residence" is to build a "happy community" in the living environment, connect the good pursuit of multi-stakeholders together and turn the yearning for a happy life into a holistic realization goal. Therefore, the design for well-being ethics formed by introducing the value of pursuing well-being into the design process means that the reasonable relationship between design and human well-being must be considered in the entire design activity and the construction of "community within well-being" should be the goal of design action and the value criterion of human living environment.

6.3 The procedure of design for well-being

6.3.1 Value-oriented well-being promotion

(1) Well-being promotion

Since ancient times, Chinese philosophy has advocated the philosophy of the unity of heaven and man. For Chinese people, heaven, earth, man and God are an organic unity. Human beings live between heaven and earth and survive by the gifts of heaven and earth, so the essence of design is the conscious Behaviour of human beings living between heaven and earth. Zhouyi regards the harmony among heavenly way, tunnel and humanity as the principle and fundamental law followed by all things in the world. Therefore, people's design activities should conform to nature and the design of living environment should also choose the most beneficial way for

people and the environment to adapt to the symbiosis. Based on the holistic view of the unity of heaven and man, the program system should reflect the unity of theory and practice, the unity of the built environment and social ethics and the unity of people's pursuit of well-being and living environment in the implementation of urban community residential design for well-being. The



Fig.6-8 A holistic view of design for well-being

program of design for well-being is to build a system that integrates human perception, social ethics and environmental factors into an organic whole and interacts with each other (as shown in Figure 6-8) and guide different implementers to design community environment under specific circumstances. As a harmonious organic system, the design program of urban community environment well-being mainly focuses on the value co-creation relationship between users and living environment. The value co-creation theory is a sentiment put forward by Prahalad and

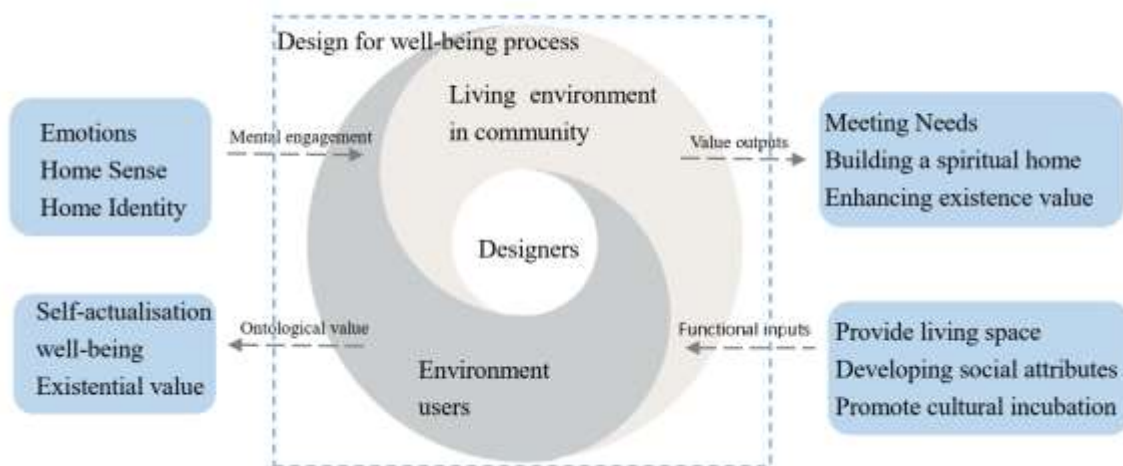


Fig.6-9 Co-creation of the value of users and environments in the design process

Ramaswamy (2004) based on the perspective of marketing strategy management, emphasizing that product value is co-created by enterprises and customers. As shown in Figure 6-9, the designer, as a resource integrator who controls the whole design process, takes the environment user and the community living environment as equal subjects to participate in the design, so that the two can jointly determine the problems to be solved in the design process and jointly create value in the interaction. The value of a design is continuously and dynamically formed as users interact with the target environment.

In the years of research on healthy cities, the concept of health promotion originated from the field of public health and gradually developed into a comprehensive theory integrating Behavioural science, public health, medicine and other disciplines. The health promotion theory established in the 1986 Ottawa Charter is considered as a practical approach to explain the impact of space environments on health. The study of healthy city believes that space environment can affect people's health and environmental optimization is an important way to realize people's health promotion. In this study, well-being promotion can be considered as a sub-branch of health promotion theory, whose ethical value is to promote harmony between people and their environment and to help people find the meaning of self-realization and existence in their residential environment. The essence of well-being promotion is the process of promoting people to improve and maintain their own well-being, recognizing that there is an interaction between the community living environment and people and the optimization of the environment can realize the well-being promotion of community residents. Well-being promotion is proposed to promote the process of people achieving and improving well-being and is a sustainable development strategy to coordinate the ultimate pursuit of human beings and the environment. Based on the health promotion strategies proposed by the World Health

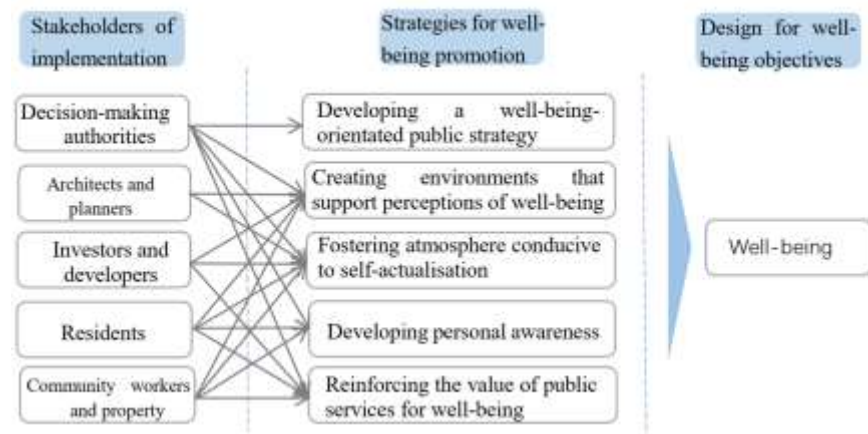


Fig.6-10 The relationship between well-being promotion strategies and the subject of implementation

Organization according to different implementation subjects, this study proposes five directions for well-being promotion from the level of community environment, which are: formulating well-being-oriented public policies, creating an environment supporting the perception of well-being, creating a community atmosphere conducive to self-realization, developing individual awareness and strengthening the well-being value of public services. As mentioned above, stakeholders, as different implementation subjects, adopt different well-being promotion strategies in the process of participating in design for well-being to achieve the final goal of design for well-being (see Figure 6-10).

(2) The guiding role of values in the community environment design process

When discussing the relationship between design and values, Simon Swaffield emphasized that design thinking is to output value and the design process and result show the designer's values. For scientific research, putting forward a good scientific problem is the key to the success of the research. Design is an activity to make decisions to meet people's needs and the problem focused by design is a decision expression to screen people's needs based on value and finally solve realistic problems. Therefore, the designer's values determine what scientific questions are

initially raised in design research and what design needs are met by the design results. The design process itself is an organic cycle system (as shown in Figure 6-11). Starting from raising questions and discovering design requirements, planning implementation to meet the requirements and then evaluating the degree and results of the requirements being met and feeding them back to real life, a permanent cycle is formed. From the quality of design results, each cycle is the expression of a design activity. Through the dynamic expression of the cycle, the degree to which the design needs are met is constantly improving, which makes the quality of design results rise to a new height. In this

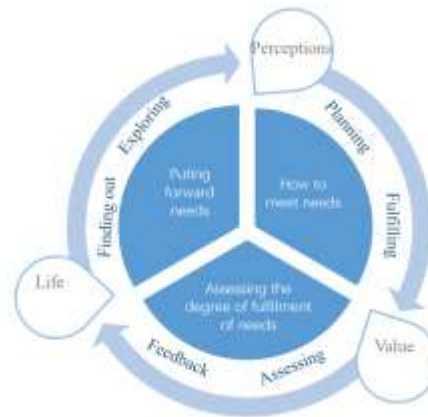


Fig.6-11 Basic relationships in the design process

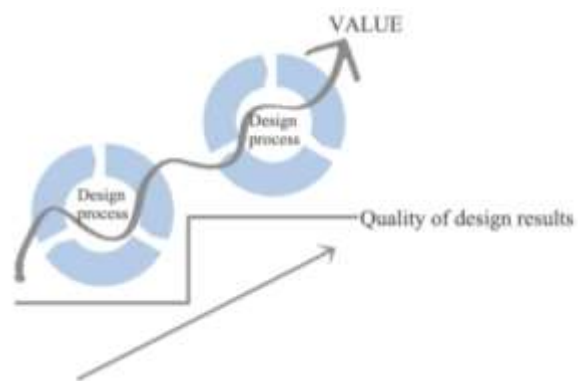


Fig.6-12 The impact of value on the quality of design outcomes

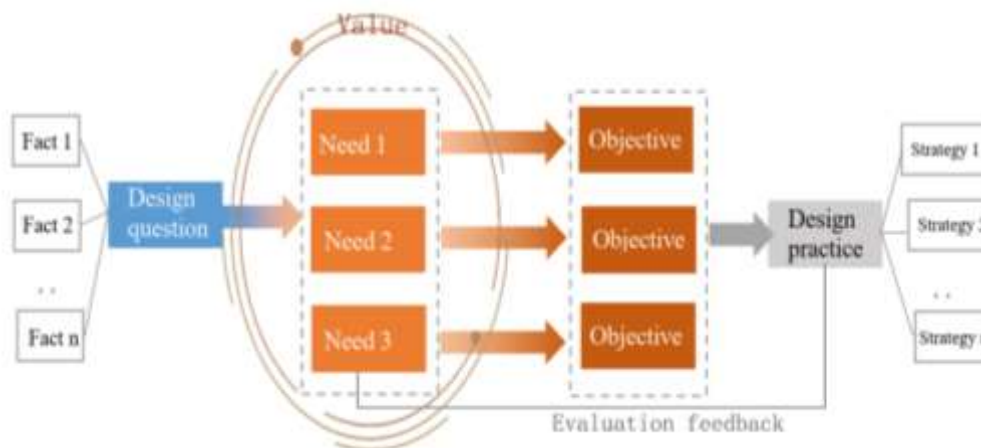


Fig.6-13 Intervention of values within the design process

system, design values are constantly rising through the core of the design process (see Figure 6-12). For the internal process of the design program, the design value is involved in two stages (as shown in Figure 6-13), the first is from the reality of the discovery of the problem to the value based on the need to separate the design receptors from the problem. The second value intervention is the process from the analysis of design requirements to the realization of design objectives and the design subject formulates corresponding design tasks according to the design value orientation to meet the design needs. As can be seen from the figure, value forms a ring without clear boundary surrounding the design needs separated from the problems, affecting the design tasks planned based on the design value. Meanwhile, as the theoretical basis of the entire design process, value shoulders the important responsibility of grasping the design core and value orientation. In addition, the evaluation generated by the strategies implemented through the design practice after being put into use also needs to be fed back to the next round of design activities with the design value, thus forming a sustainable design.

From the perspective of subjective axiology, the reason why things have value is because they are pursued or satisfied by people,

so value can be regarded as the object satisfying the needs of the subject. According to the above, the needs of urban community environmental design receptors can be divided into material needs, spiritual needs and social needs.

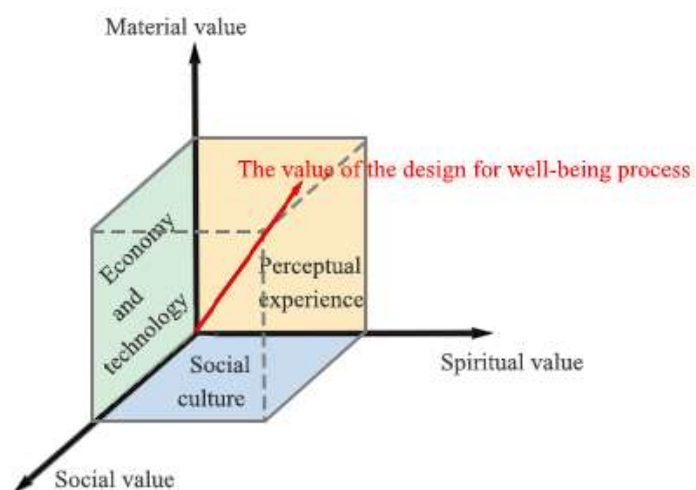


Fig.6-14 A three-dimensional value model of the process of design for well-being

As a subject living in the world, people also have material attributes, spiritual attributes and social attributes. If value is defined in terms of effects, value is the influence of the interaction of subject and object. Therefore, value has three attributes in the community residential design for well-being program, namely material value, spiritual value and social value. Figure 6-14 shows the three-dimensional value model of the design for well-being program, which forms a design for well-being program with three-dimensional value through the value creation of economy and technology, perception and experience and social culture.

6.3.2 Design for well-being in urban community environment

Community environment design is the design of community level between urban design and architectural design. Urban design is a design activity aimed at urban construction and space development based on the three-dimensional space environment of human, natural and social factors. Community environment design and architectural design are designed for the space environment of community level and for the internal and external space of a single building respectively. Although the three design activities are at different levels, they present the same theoretical identification in terms of spatial form, design procedure and human-environment interaction. The elements

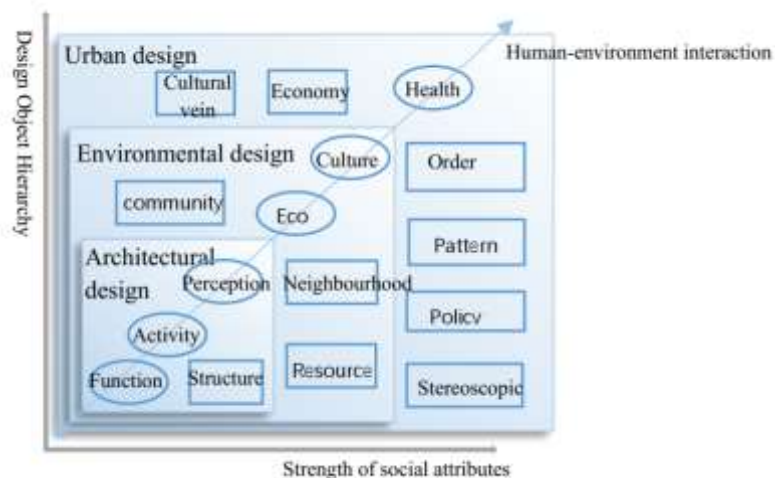


Fig.6-15 Design elements at different levels

on the human-environment interaction axis in Figure 6-15 are the design elements of all levels and there are some unique design elements of different levels. No matter what level of design research, the essence is to solve problems creatively and its design patterns or procedures should be consistent in research logic. John Christopher Jones, and stakeholder in design methodology, divides the design process into three stages of "analysis, synthesis and evaluation", which he believes will continue to cycle until the final design is finalized. This study believes that the essence of the design

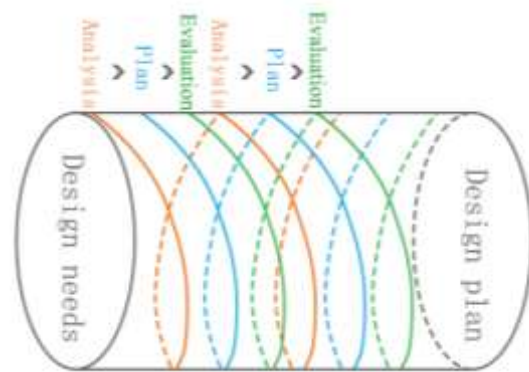


Fig.6-16 The nature of the design process

process is the co-evolution of design needs and design plans (as shown in Figure 6-16) : Designers start with the exploration of design needs, determine the problems to be solved from the preliminary research on practical problems and users, then determine the design needs to be met and conduct research about the needs to form a design plan composed of a series of design

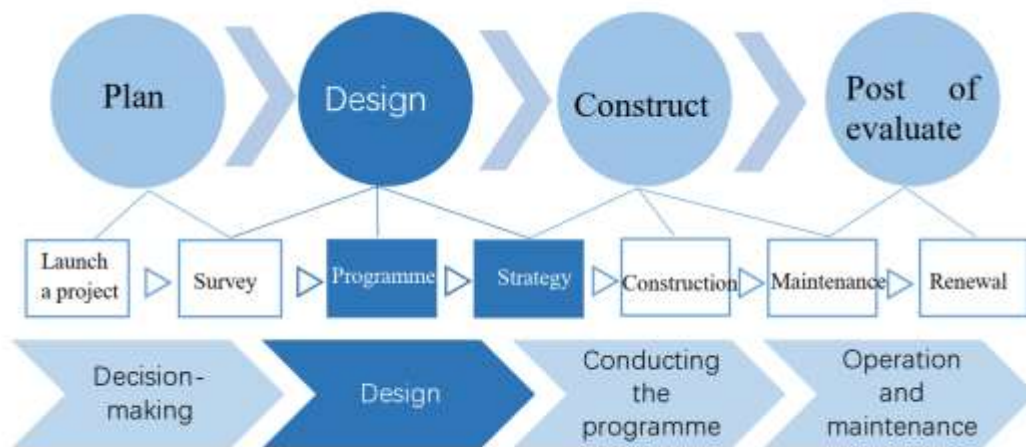


Fig.6-17 The role of design in the full cycle of building generation

strategies and then map the current plan to the design needs in turn and use the evaluation of the plan to improve the accuracy of the design needs. Then develop the design plan further. Architectural design and architectural planning cannot be completely separated in many cases and the two are closely linked to form a whole design system for the design of architectural space conception. From the perspective of the whole life cycle of a building (see Figure 6-17), the complete generation of a building starts from the initiation of a project, which is generally divided into four stages: decision stage, design stage, implementation stage and operation and maintenance stage. To be more detailed, the practice of a project should go through seven steps: project establishment, research, design, strategy determination, field construction, maintenance

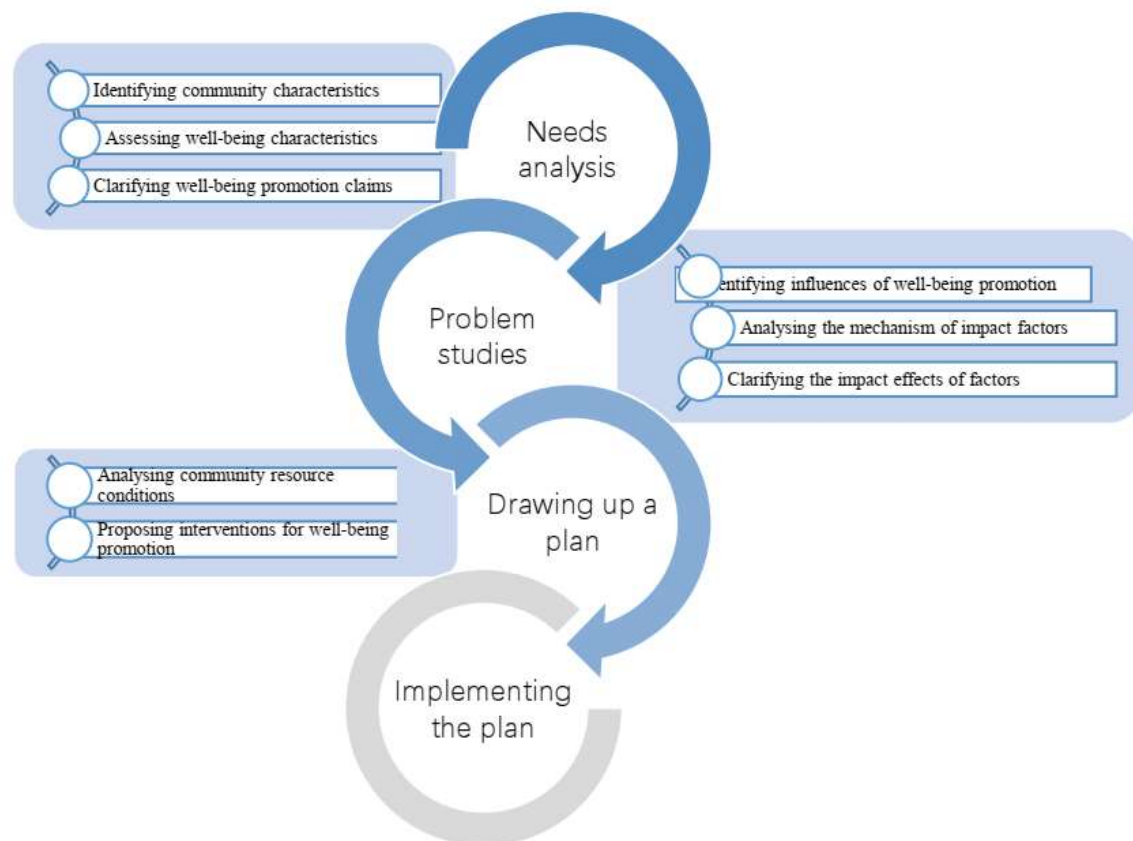


Fig.6-18 Key elements of the design process for urban community environments

and operation and renovation. Many scholars have divided the whole process of construction

production into four separate research fields, namely, architectural planning, architectural design, architectural construction and post-use evaluation. As shown in Figure 6-17, these four processes cannot be completely separated from each other and there are certain overlapping contents. Similarly, the design studies of community level and city level also have similar characteristics. This study needs to clarify the scope of research involved in urban community environmental design for well-being and indicates the specific steps involved in the whole cycle process of design, including investigation and analysis, research design scheme and proposed design strategy, that is, the theoretical research before the actual construction.

PRECEDE-PROCEED model, MATCH model and intervention graph model are commonly used in the health promotion theory mentioned above. They all start from the analysis of health demands and take the research situation of health impact factors as the basis for health promotion programs. This is also the characteristic of the design procedure of this study. By integrating the action mode of health promotion with the general process of scientific research of "question raising, problem analysing and problem solving", this study divides the urban community environment design process based on well-being promotion into three stages before the implementation of the plan, as shown in the Figure 6-18, which are demand analysis, problem research and plan making in turn. First, the research of well-being promotion should clarify the target community and population, and the starting point of the research is to analyse the well-being characteristics of the target population and the needs of well-being promotion. Secondly, it is necessary to identify the influencing factors or environmental factors that promote well-being and clarify the influencing mechanism and effect of influencing factors on well-being. According to the analysis of the impact factors and the resource conditions of the real community, the well-being promotion intervention plan of the target community is formulated and finally the

intervention strategy is implemented to meet the design needs. In the study of urban community environmental design for well-being, this study uses the research logic of "clarifying community well-being needs, determining environmental factors affecting well-being, analysing the influence mechanism of factors related to well-being and proposing community environmental design for well-being strategies", whose essence also comes from the health promotion theory. Applying it to the relationship between urban community environment and well-being forms the main content of urban community environment design program based on well-being promotion.

6.3.3 Process construction of design for well-being in urban community

(1) A model of the process of design for well-being

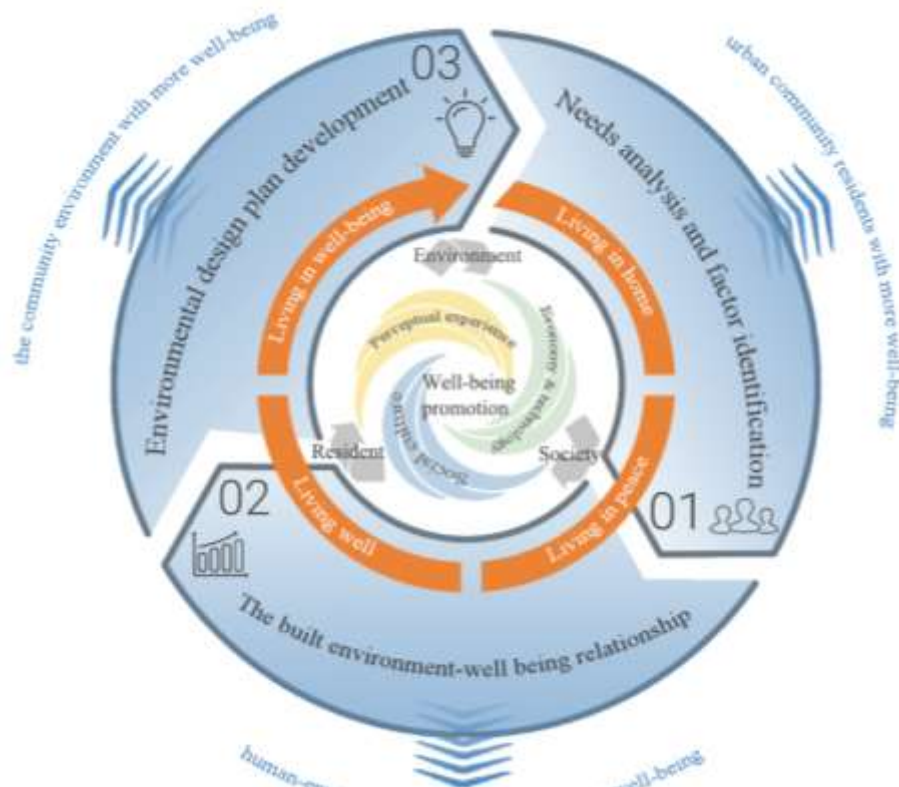


Fig.6-19 A model of the design process for residential well-being in urban communities

Based on the concept and ethical value of design for well-being, combined with the holistic view of the unity of nature and man and the three-dimensional value model of design for well-being, this study proposes a procedural model of urban community environmental design for well-being (Figure 6-19). This model emphasizes the content of urban community environmental design for well-being program and defines the research scope. Through the design process of needs analysis and factor determination, environment-well-being relationship research and environmental design plan formulation, the goal of the design program is to achieve urban community residents with more well-being, human-environment interaction with more well-being and the community environment with more well-being.

The core of the model is the design value of well-being promotion. The design value of well-being promotion is the value basis for the environmental design for well-being of urban communities and it is also the internal driving force for the analysis of design needs and the determination of factors and the ethical basis for the study of the relationship between environment and well-being and the formulation of environmental design plans. Around the core design value is the value creation composed of three attributes of design for well-being, namely material attribute, social and spiritual attributes. The design plan proposed by the urban community environmental design for well-being should create realistic value in economic technology, social culture, perception and experience after the actual construction and it is also the design element that the design needs and design problems need to consider well-being. Surrounded by the design value and the orientation of design elements, the sustainable symbol represents the harmonious symbiosis between residents, environment and society, highlighting the holistic philosophy of the unity of heaven and man.

Demand analysis and factor determination, environment-well-being relationship research and environmental design planning are the three core steps of urban community environmental design for well-being. Among them, the analysis of the specific needs of users to promote well-being in the community environment is the basis of the research question. On this basis, the exploration of human-environment interaction is carried out in detail and the influencing factors of well-being promotion are identified and the mechanism and effect of influencing factors on residential well-being promotion are studied. Finally, according to the resource situation and characteristics of the specific community environment, the corresponding design strategy is proposed to promote the promotion of well-being and constitute a design plan.

Finally, the design process of urban community residential well-being follows the ethical value of "living in home – living in peace - living well – living in well-being" from the beginning to the end. The final design plan should aim to achieve the happy living of poetic dwelling as the final design goal, and it is expected to achieve a happier urban community residents and community environment after implementation. And scientific knowledge of how to promote happier human-environment interactions. The procedural model of urban community environmental design for well-being reflects the concept of value through design. It takes the design value of well-being promotion as the theoretical basis, how to make residents happier in their place as the leading issue and the well-being influence mechanism between people and environment as the core content, which is the overall unity of theoretical basis and practical path.

(2) Participations of stakeholders in design for well-being

Needs analysis Problem research Work out a plan	Investors and property developers	Residents	Designers	Decision making authorities	Community workers	Property managers
Community locations ↓ Assessing well-being characteristics ↓ ● Clarifying well-being needs ↓ ● Identifying influences on well-being promotion	√ Expected cost √ Investing fund √ Value propositions	√ Providing information √ Fitting analysis √ Proposing needs √ Seeking value √ Screening √ Filling out questionnaire	Screening impact factors Identifying the specific needs Clarifying design issues	√ Community positioning √ Value orientation √ Policy target √ Policy guidance	√ Determination of staff √ Advising √ Supplementary information √ Advising	√ Management responsibilities √ Advising √ Supplementary information √ Advising
Analysing the mechanisms of influence on well-being ↓ Clarifying the impact effects ↓ ● Modelling impact factors		√ Advising √ Participating weighting √ Assessing	Modelling the relationship between environment and well-being Explaining the mechanisms Calculating the weights of the impact factors	√ Participating weighting √ Assessing	√ Advising	√ Advising
Analysing community resource conditions ↓ Proposing environmental practice pathways ↓ ● Proposing design strategies for well-being promotion	√ Capital values √ Advising √ Providing support	√ Lifestyle √ Feedback	Summarizing design strategies Realizing environmental practice pathways Integrating community resources	√ Providing support √ Analysing feasibility √ Providing support	√ Work content √ Providing support	√ Service condition √ Providing support

Fig.6-20 Stakeholder tasks in the design process

A complete urban community environmental design for well-being program should be a sustainable behaviour of creating perceptual value under rational rules and follow a systematic process of "probation-sequence-trial-sequence-sequence-explicit". Each program node has the property of passing decision to the next node and presents the decision value of step rise in the unit of "problem-analysis-decision". The process nodes involved by different stakeholders are also different. To organize stakeholders and each node in the design process reasonably and optimally is the most important responsibility of designers in the process of urban community

environment design for well-being. Figure 6-20 shows the steps and tasks that various stakeholders participate in the complete process of urban community environmental design for well-being.

Demand analysis and factor determination

This process is the implementation feedback of the problems raised in the research logic. It is to preliminarily determine the construction objectives, value propositions of the community environment and the living needs of the community residents for the environment according to the project proposal and interviews with residents and other stakeholders. Clarifying the well-being needs is an important node in the process, which responds to the design pursuit of urban community environmental design for well-being for the well-being needs of residents and the original intention of "people-oriented" design. From the perspective of design research, this node is the part where designers absorb and reprocess information from various sources, determine the collection of influencing factors according to demand analysis and finally put forward explicit design questions around the design value.

Study on the relationship between the physical environment and well-being

This process is the focus of the research logic and corresponds to the part of the analysis problem. The design problem is decomposed and transformed into an analysis of the impact of people's feelings and environmental factors and the residents are involved in the analysis and research process through questionnaires and interviews. The designer summarizes the opinions of other stakeholders to identify the environment-well-being impact factors and calculate the weight of the factors. The environment - well-being factor is identified as an important node to carry out in-depth exploration of the interaction mechanism between people and environment and finally

get the environmental factor model that affects the well-being of community environment. As an important program node, the construction of environment-well-being impact factor model shoulders the link from design problem to design strategy practice and is also the result of the research on human-environment interaction.

Environment design planning

This process is a part of transforming the impact model of well-being and environmental factors into a community environmental design strategy and it is also a path realization process of projecting design concepts and values into the real environment. In this process, based on the value orientation of well-being promotion, it is necessary to transform the language of the impact factor model into the path of environmental practice and then propose the design strategy of urban community residential well-being according to this path. Design for well-being strategy is the last node in the design for well-being program and it is also the result expression of feedback design problems to residents' needs.

From the perspective of the tasks of relevant stakeholders in the urban community environmental design for well-being process, residents, as users, participate in a number of core tasks in the community environment design for well-being process, especially in the first and second parts, which enrich the research process of urban community environment construction from the perspective of user needs, which is also a response to the value-oriented design concept of promoting well-being.

6.4 Methods of design for well-being

The implementation of urban community residential design for well-being needs specific design methods as support. In the field of architecture and planning, the presupposition design method is used by most designers, that is, the direct transformation of design concepts into concrete material forms. Compared with the bottom-up design method, this presupposition method has higher flexibility and freedom and is easier to master in the development of traditional design. In contrast, the bottom-up generative design method starts from collecting the basic data of the elements themselves and processes the data according to certain rules or design logic to promote the occurrence of the design method. As shown in Figure 6-21, the design method of urban community residential well-being in this study is to explore the complex relationship between happiness and the environment according to users' perception and experience and quantify various perception degrees and environmental factors by using statistical methods, to feedback the information received by users in the environment to designers. Therefore, the design method proposed in this study is a bottom-up design method that combines subjective perception needs with objective material environment under the guidance of well-being needs of preset design and completes the design of promoting environmental perception attributes under the condition of controlling the generation rules of material and social environment of urban communities. The generated results are fed back into the design in real time. Due to different perspectives and backgrounds, community environment design methods supported by different theories have different applications and expressions. According to



Fig.6-21 Characteristics of the main approaches to design for well-being

the concept and ethical value of urban community residential design for well-being discussed above, the method of urban community residential design for well-being is more inclined to a method of collecting environmental elements based on user perception and experience, which can be specifically understood as follows: Based on the research on the impact of the built environment on well-being, taking well-being promotion as the design value and relying on the value concept of harmonious coexistence between well-being and community living environment, this paper puts forward the problem of urban community residential design for well-being, analyses the impact mechanism of urban community environment on residents' happiness and deduces the urban community residential design for well-being method of urban community environmental design strategy. According to the process sequence of design for well-being, combined with the program model and tasks of urban community residential design for well-being, this study puts forward the main methods of urban community residential design for well-being (Figure 6-22). According to the time axis of the design node, these methods include: the acquisition method of well-being needs, the determination method of environmental factors, the measurement method of users' environmental perception, the establishment method of

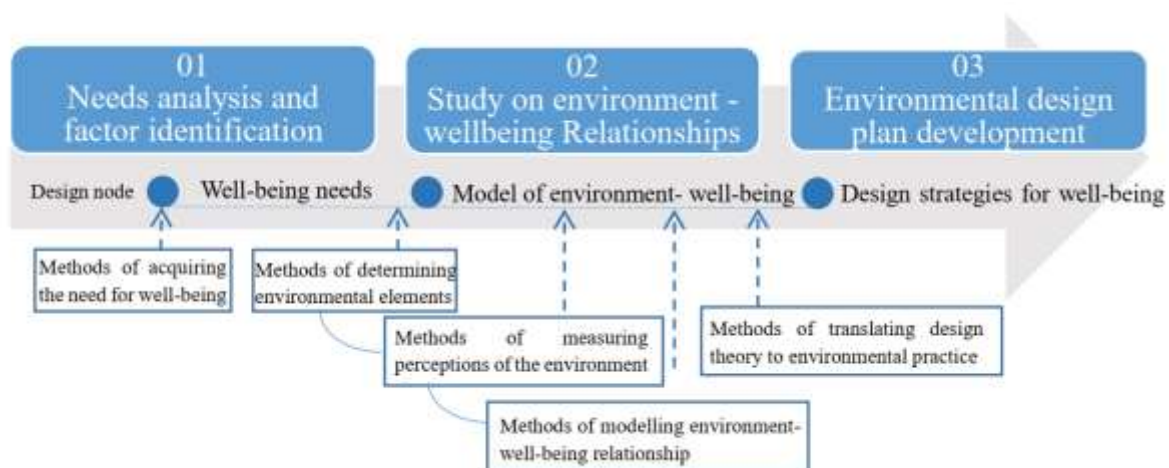


Fig.6-22 Key approaches to design for well-being in community environments

environment-well-being impact factor model and the conversion method of design theory to environmental practice. The following will explain and explain each method in detail.

In addition to the core methods of urban community residential design for well-being, qualitative analysis methods such as semantic analysis, inductive analysis and fuzzy comprehensive evaluation analysis should also be adopted in the urban community environmental design for well-being program to obtain information from phenomena and quantitative analysis methods such as correlation analysis, multi-factor variable analysis and mathematical model method should be adopted to master scientific laws in the data. These approaches can be considered as part of the main approach to residential design for well-being in urban communities. These methods have different characteristics depending on the process and context in which they are used. As shown in the figure, in the process of design for well-being from the question of design for well-being to the expression of design for well-being strategies, both the main methods of design for well-being and the qualitative and quantitative research methods show inductive, statistical and deductive characteristics. It is embodied in the inductive analysis of the need for happiness, the statistical analysis of the relationship between the factors affecting the environment and well-being and the deductive analysis of the transformation from theory to practice.

6.4.1 Methods of obtaining the well-being needs of residents

As for residential needs, scholars and scientists from various countries have reflected scientific research conclusions and experience summary in each national design guideline after years of theoretical and empirical research. Therefore, from the design guideline and previous research, the universal needs applicable to most residential communities can be summarised. Compared

Tab.6-4 Framework for intentional collection of specific needs

Types of information collection	Contents
Basic	Personal information of residents such as district of residence, age, sex, occupation, length of residence, etc.
Key needs	<ul style="list-style-type: none"> • What spaces do you think the community you live in has that could influence your residential well-being? • What kinds of activities or spaces do you think could be added to your community that would enhance your residential well-being? • What kinds of cultural or social interactions in the community where you live do you think would enhance your sense of well-being? • What positive feelings have you experienced while living in your neighbourhood?
Methods	Telephone; questionnaires (paper/electronic); interviews

with the community living needs summarized from the design guidelines, the well-being needs are strongly subjective. Therefore, when exploring the well-being needs of community residents, in addition to the needs obtained from existing materials and information, it is also necessary to obtain the needs of residents in a specific community through field research. Interviews, survey questionnaires, Behaviour observation and other methods are used to conduct qualitative analysis of the data, and the well-being needs of residents in the community are formed according to the needs summarized by existing materials (see Figure 6-23). The content of self-report of community residents mainly focuses on the intention of well-being needs and the framework of information collection practice adopted based on

**Fig.6-23** Methods of acquiring residential well-being needs

the existing needs orientation is summarized in Table 6-4.

There are three main methods to collect information, and the investigators choose the appropriate collection method according to different situations. The characteristics of telephone collection are easy to operate but easy to produce communication information errors, it is difficult to grasp the time of the interviewees, and it is easy to have a negative impact on community residents. The reason and content of the survey should be clearly written in the questionnaire, which can be conducted in two ways, paper version and electronic version. The paper version of the questionnaire needs to be distributed and collected at home, which costs a lot of manpower and time, and the subsequent data entry and analysis is troublesome. The electronic questionnaire is not limited by the region and the filling time is relatively flexible, but it is difficult to control the quality of the data, and the data loss may be relatively large. The data collected by the interview method can capture some details in the interviewees' answers and even judge the authenticity and reliability of the interviewees' answers by their expressions and tone. However, since the interview content is recorded manually, personal understanding and recording will lead to data deviation.

From the perspective of three-dimensional value of design for well-being, the needs of community residents in this study can be divided into material needs, social needs and spiritual needs. The acquisition of well-being needs comes from the

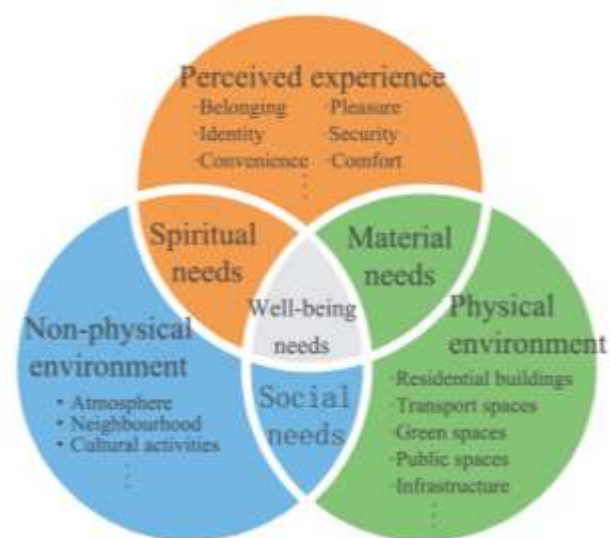


Fig.6-24 Components of residential well-being needs

interaction between residents' perception and experience, community material environment and community non-material environment. From Maslow's level of needs, urban residents' needs for residential well-being are gradually satisfied from low level to high level in the order of "material needs, social needs and spiritual needs" (see Figure 6-24).

(1) Material needs

Material needs are the basic living function needs of people living in the community, mainly based on the material environment to meet the daily life of residents and it is a study of the relationship between people and material environment. In the community living environment, material needs mainly include living needs, entertainment needs, transportation needs, natural needs and other needs that can be met through tangible material space and are also the basic needs of people's lives.

(2) Social needs

Social needs are derived from the communication among community users, which is the only way for multiple individuals to form a society and plays an important social function in People's Daily life. In the study of the interaction between environment and people, the demand for neighbourhood relations, culture, community activities, property management and other aspects has always been the focus of attention, and these social needs formed for the non-material environment also originate from the material environment within a certain range.

(3) Spiritual needs

Spiritual needs are affected by the values of community users, reflecting the spiritual pursuit of people in the current stage of urban development in China and also the exploration of self-

realization of residents outside the perception of community environment. Spiritual needs mainly rely on people's personal feelings about the material environment and non-material environment, such as belonging, identity, convenience, pleasure, comfort, to provide residents with emotional experience.

6.4.2 Methods of determining elements of the built environment in urban community

The impact of the built environment on people's perception is more direct and significant at the micro level. In Europe and the United States, such studies mostly focus on the micro-community level. In previous studies, many scholars tried to summarize different methods of obtaining environmental data. The sources of urban community the built environment elements in this study are mainly from the previous literature and design guidelines. The design guidelines are derived from the experience summarized by many scholars and teams based on many empirical studies and need the joint support of the government and relevant departments. Therefore, the

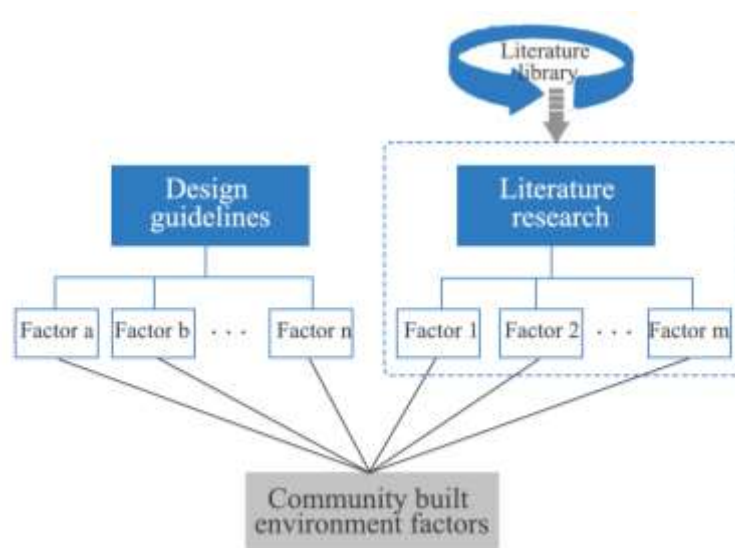


Fig.6-25 Methods for collecting elements of the built environment in urban communities

through the environment. Among them, the content division of some guidelines is more specific and there are special guidelines for different spatial environments such as public space, school, and community, which helps this paper more carefully screen the built environment elements of urban communities. The pursuit of well-being in real life can be reflected in living in the world with a positive spirit. Community environment design guidelines related to promoting positive living are collected. As shown in Figure 6-26, the national design guidelines mentioned above are combined with the local design guidelines mainly focusing on environmental planning and design and screened out the design guidelines related to the community the built environment, a total of 21 design guidelines. In the process of determining the built environment elements of urban communities, the data collected mainly focus on the environmental elements that can be moulded artificially, while the natural elements such as water, air and light are not included in the scope of this study. Based on the perspective of community environmental design, seven elements related to the built environment of urban communities are obtained in the figure,

Tab.6-5 Overview of the elements of the built environment of a community

Community built environment elements	Contents
Transport spaces	Public transport accessibility, promoting walking and cycling paths, time to reach each functional space.
Public spaces	Organising activities to promote the use of space, awakening the need for community interaction, and rationalising the allocation of space for sports and recreation.
Green spaces	Number and quality of community parks, placement and maintenance of green landscaping, connectivity to green spaces.
Buildings	Residential buildings have an aesthetically pleasing façade, building quality and distribution density.
Service facilities	Functional community service facilities (car parks, hospitals, commercial, education, etc.) and infrastructure (street lighting, seating, litter bins, surveillance, etc.).
Cultural atmosphere	Community activities encourage resident participation, regional vibrancy and attractiveness, and a community culture that permeates life.
Community management	Management of property companies, waste transport and disposal, service operation management, safety supervision.

namely, traffic space, public space, green space, community architecture, service facilities, community atmosphere and community management (see Table 6-5). In addition to the environmental factors summarized in the design guidelines, the determination of the built environment factors also depends on the actual situation of the selected community and the results of existing literature research and the final the built environment factors affecting residential well-being are summarized from the three.

6.4.3 Methods of measuring the user's perception of the environment

Perception refers to the psychological process of perceiving, processing and recognizing the physical environment in the face of the stimuli of the real environment. In this study, users' perception of community environment can be regarded as the result of community the built environment elements satisfying their needs for residential well-being (as shown in Figure 6-27). From the perspective of residential needs, users' satisfaction of material and social needs constitutes their perception of community the built environment, while satisfaction of spiritual

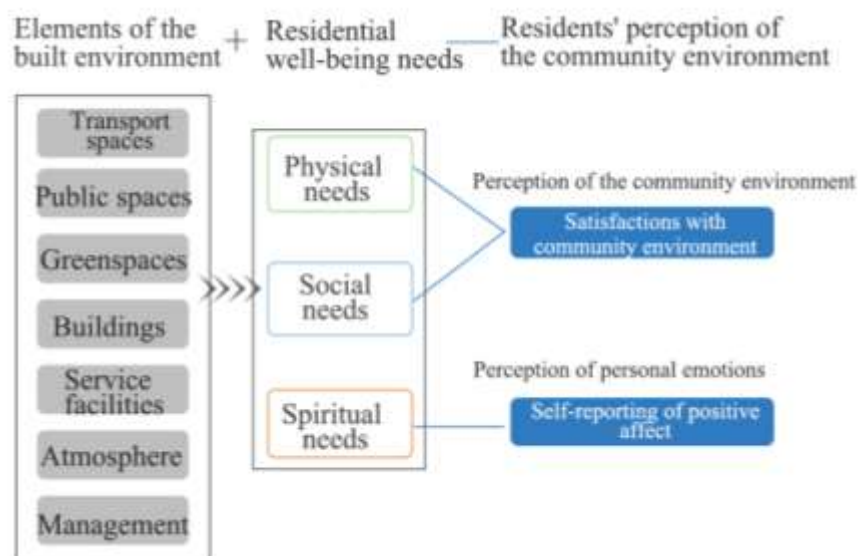


Fig.6-27 Perceptions of community environments

needs is also an individual's perception of self-positive emotions. These two perception paths together constitute the result of residents' perception of community environment. When exploring the relationship between people and the environment, environmental perception also includes individuals' cognition and emotional experience of non-material environment such as group culture, aesthetic judgment and value orientation in the environment. The user's perception of the environment is strongly subjective, and its measurement method is mainly based on the user's subjective evaluation, that is, through the form of user's self-report. The subjective evaluation of users mainly includes three methods: questionnaire survey, sample interview and cognitive map. Direct evaluation of users' perception of community environment is the most direct way to obtain the data of community residents' perception of community environment. Questionnaire survey is a relatively common and easy to implement method. It is conducted by paper questionnaire and online questionnaire. The sample size depends on the survey time and the number of residents in the community. The sampling interview method is generally conducted in the form of semi-structured interview through face-to-face, email reply and

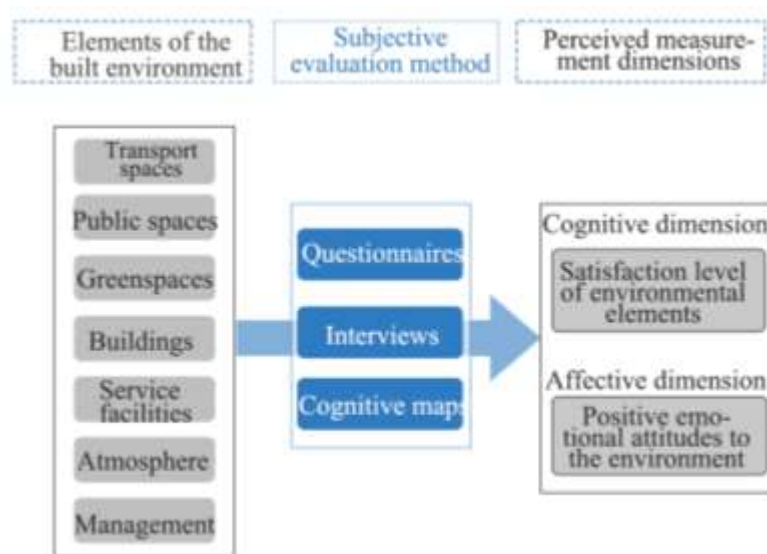


Fig.6-28 Measures of perceptions of the community environment

telephone interview, which is selected according to the actual situation and research emphasis. According to the obtained data, quantitative methods such as regression analysis, neural network algorithm, intermediary model, or qualitative methods such as semantic analysis, word frequency statistics and grounded theory was used to further analyse the interview content.

In the process of exploring the relationship between community environment and well-being, residents' perception of community environment elements as users is the most important data in the research. Based on the definition and understanding of well-being by many scholars, the measurement of residents' environmental perception in this study is divided into cognitive dimension and emotional dimension. In addition to users' satisfaction with the elements of community the built environment, residents' subjective evaluation of positive emotions generated in community environment is also collected. As shown in Figure 6-28, this study uses the user subjective evaluation method to collect residents' perception data on the community the built environment. Questionnaire survey, sample interview and cognitive map are the main data collection methods to measure users' two perception dimensions.

6.4.4 Methods of establishing a model of the built environment-well-being

Community the built environment-well-being model is the explanation of the relationship between environmental factors and well-being perception data and is also the basic analysis before empirical research. Because of the complexity of well-being perception data, it is necessary to deal with the data flexibly in the study of environment and well-being. In scientific research, to clearly explain the interaction between cross-level variables, it is necessary to choose a suitable mathematical model. Well-being is difficult to capture through directly observed variables and a large number of questions and data are solved through subjective judgment and

evaluation. Due to the user's different age, occupation, social status and so on, the subjective evaluation results have great uncertainty and fuzziness. And these subjective data are difficult to use the traditional accurate domain method to establish a mathematical model. Due to the structural characteristics of fuzzy logic itself, it has great advantages in describing subjective events and well-being itself is a dynamically changing concept, so it is more appropriate to use fuzzy comprehensive evaluation method to establish a relationship model between environment and well-being when studying well-being related problems full of uncertainty and subjective judgment. Fuzzy comprehensive evaluation refers to using the principle of fuzzy system to make fuzzy comprehensive judgment on problems containing subjective factors and reasoning to solve information problems that are difficult to deal with conventional methods. Fuzzy comprehensive evaluation method is good at expressing the qualitative knowledge and experience with unclear boundaries. With the help of membership function, it comprehensively evaluates the membership level of the things to be evaluated from multiple factors and quantifies the fuzzy relationship. The mathematical models of fuzzy comprehensive evaluation are generally divided into single-level fuzzy comprehensive evaluation model and multi-level fuzzy comprehensive evaluation model. When studying the relationship between environment and well-being, a single level cannot clearly explain the complex relationship between residential well-being and community environment. Therefore, this study adopts the multi-level fuzzy comprehensive evaluation model and the specific implementation steps are as follows:

(1) The evaluation factor set U was established

Level factor set is a set of level factors that affect the evaluation object, usually represented by U ,

$U = \{u_1, u_2, u_3, \dots, u_m\}$, u_m represents a total of m layers of factors that may affect the well-being

of residence. The evaluation factor set at each level is the set of evaluation factors that affect the

evaluation object at a certain level. $U_i = \{u_{i1}, u_{i2}, u_{i3}, \dots, u_{in}\}$, in represents a total of n factors affecting the well-being of residence at the i level.

(2) Set the evaluation level V

Evaluation level set is the set of various evaluation results that interviewees may make on

evaluation objects, which is usually expressed by V, $V = \{v_1, v_2, v_3, \dots, v_j, v_j\}$, represents a total of j kinds of evaluation results. Different evaluation levels and comments can be selected according to the actual situation. For example, when collecting residents' satisfaction with their living environment, the evaluation can be divided into five levels: very dissatisfied, not very satisfied, average, satisfied and very satisfied. When respondents evaluate the intensity of their own emotions, they can also use a 7-point or 5-point scale to report their emotions.

(3) Fuzzy relation matrix R is determined

R represents the membership degree of the single factor of the evaluation factor concentration to the elements of the evaluation grade concentration, which refers to the possible degree that the respondents' evaluation result is the i-evaluation factor belonging to the j evaluation grade. Then

the fuzzy relation matrix for U_i is shown in formula (6-1):

$$R = \begin{pmatrix} r_{11} & r_{12} & r_{13} & \dots & r_{1j} \\ r_{21} & r_{22} & r_{23} & \dots & r_{2j} \\ \dots & \dots & \dots & \dots & \dots \\ r_{n1} & r_{n2} & r_{n3} & \dots & r_{nj} \end{pmatrix} \quad (6-1)$$

Each row from left to right represents the membership degree of U_i for different evaluation levels v_j and each row adds up to 1. Since the factors in this study are mainly qualitative factors, the percentage statistical method can be used to determine r_{ij} . Percentage statistics method is to directly make percentage statistics of the evaluation results of the evaluated factors and take the results as the membership degree of the factors.

(4) Create a weight set W

When establishing the built environment-well-being relationship model, it is necessary to determine the importance of each factor in the comprehensive evaluation, that is, to assign a

weight value W to each evaluation factor. $W = (W_1, W_2, W_3, \dots, W_m)$ refers to the weight of each

evaluation index, $W_m \geq 0, \sum W_m = 1$, representing the weight set of the influence of m layer

factors on residential well-being. Hierarchy weighting $W_i = (w_{i1}, w_{i2}, w_{i3}, \dots, w_{in})$, on behalf of the i-layer n a set of weights of evaluation factors. The weights are generally determined using analytic hierarchy process, Delphi method, weighted average method, stakeholder estimation

method and other methods, according to the collected data and the actual situation to choose and different levels can use multiple methods to assign values.

(5) Fuzzy comprehensive evaluation set B

The fuzzy comprehensive evaluation set $B_i = W \times R$ is established through R and B_i is the fuzzy evaluation score obtained from the defuzzied score of the elements of the i layer. Finally, the fuzzy comprehensive evaluation set is obtained, as shown in formula (6-2):

$$B = (W_1, W_2, W_3, \dots, W_m) \times \begin{vmatrix} r_{11} & r_{12} & r_{13} & \dots & r_{1j} \\ r_{21} & r_{22} & r_{23} & \dots & r_{2j} \\ \dots & & & & \\ r_{n1} & r_{n2} & r_{n3} & \dots & r_{nj} \end{vmatrix} \quad (6-2)$$

$$= (b_1, b_2, b_3, \dots, b_m)$$

Among them, $b_i = (w_{i1}, w_{i2}, w_{i3}, \dots, w_{in}) \times \begin{vmatrix} r_{11} & r_{12} & r_{13} & \dots & r_{1j} \\ r_{21} & r_{22} & r_{23} & \dots & r_{2j} \\ \dots & & & & \\ r_{n1} & r_{n2} & r_{n3} & \dots & r_{nj} \end{vmatrix}$

$$= (b_{i1}, b_{i2}, b_{i3}, \dots, b_{in})$$

(6) Establish a model of the built the built environment-well-being

After the previous five steps, a multi-level fuzzy comprehensive evaluation model can be obtained. As shown in Figure m, representing the number of levels, n in each level is independent, representing the number of evaluation factors in each level. It can be seen that the fuzzy comprehensive evaluation method is actually a single factor evaluation matrix and the corresponding weight vector at each level to obtain the final evaluation result step by step. B is the comprehensive membership degree spatial matrix of all evaluation factors on residence well-being and the influence degree of each factor is judged according to the maximum membership principle. Finally, by combing the relationship between environment and well-being, the relationship model shown in Figure 6-29 is drawn to explain the complex relationship between community environment and residential well-being.

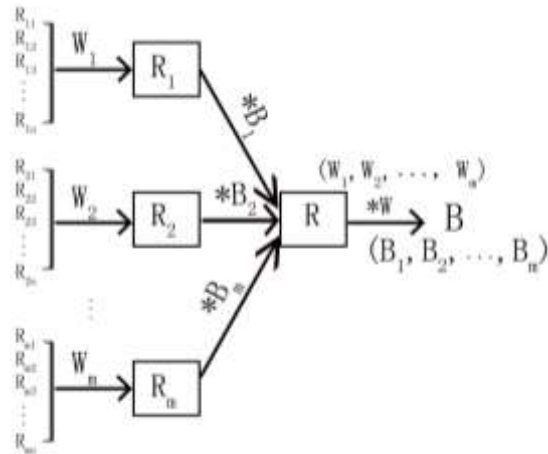


Fig.6-29 A fuzzy comprehensive evaluation model of residential

6.4.5 Methods of translating theory into environmental practice

The concept of design for well-being is an idea generated by researchers after thinking about the problem between the environment and human well-being. An idea can only be developed into the theory of design for well-being through logical deduction. After that, how to apply the theory of design for well-being to the practice of community environment needs to be considered. The

value of design for well-being theory lies in the discovery of a kind of logic and necessity, but from the perspective of creativity, only theory is not enough, and practical methods under the guidance of theory must be mastered to achieve the consistency of design theory and practice. In the process of community environment practice, the solution to improve well-being should, on the one hand, connect the influencing factors of well-being in the design for well-being theory with the community environmental factors related to architecture and on the other hand, take the intervention of community the built environment design as the core. Multidisciplinary technology and multiple considerations are integrated to ensure that community environmental design strategies are feasible and have the possibility to improve the well-being of residents. In the process of research on design for well-being, the analysis and analysis of the relationship between environment and well-being may extend many paths or attributes to solve problems outside the field of architecture. Some of these pathways or attributes may be slightly translated to form strategies that guide the design of a community's the built environment, while others may not be solved by the creation of a simple architectural scene. Therefore, to explain the relationship between environment and well-being from the perspective of architecture and to influence residential well-being through the intervention of the built environment design, it is necessary to put forward some translation methods for the practice of design for well-being theory in community environment.

In the process of exploring the built environment-well-being model, the degree of influence of satisfaction of different environmental factors on well-being has been quantified in the mathematical model. The design for well-being of community environment with these environmental factors as the core can be understood as transforming the abstract influencing factors in the mathematical model into the community environment and physical space related to

people's environmental perception. As shown in Figure 6-30, environmental factors that affect well-being in the built environment-well-being model can be directly generated into design strategies for factors that interfere with community environment and positively affect residents' perception and experience by improving the quality of community environment. However, the emotional factors in the model cannot directly correspond to the factors in the community environment, so the environmental factors in the model should be used as a medium to indirectly intervene in the design of the community environment and affect the emotional intensity of residents in the environment through the shaping of the immaterial environment and the transformation of the material environment, to improve the well-being of residents.

Fig.6-30 The process of theory to practice in design for well-being

Since the fuzzy evaluation model above explains the relationship between residential well-being and residents' perception factors, in which environmental factors and emotional factors are in parallel, it cannot explain the mutual influence between emotional factors and environmental factors in residents' perception. Therefore, in the process of applying design theory to environmental practice, it is necessary to clarify the relationship between environmental factors

as intermediaries and emotional factors to better apply design for well-being theory to the design strategy of community environment. In this study, the data of emotional factors and environmental factors are collected in the form of subjective self-report. The linear model is used to describe the influence of environmental factors variables on positive emotions in a specific community and the fuzzy evaluation model of well-being is combined to explain or explain how the effect of positive emotions on well-being is affected by environmental factors. The variables in the linear model are community environmental factors, which reflect the effect of residents' environmental perception on positive emotion. The hierarchy equation obtained can be seen in formula (6-3):

$$\begin{aligned}
 A_1 &= \beta_{01} + \beta_{11} \times E_1 + \beta_{12} \times E_2 + \dots + \beta_{1n} \times E_n + R_1 \\
 A_2 &= \beta_{02} + \beta_{21} \times E_1 + \beta_{22} \times E_2 + \dots + \beta_{2n} \times E_n + R_2 \\
 &\dots \\
 A_m &= \beta_{0m} + \beta_{m1} \times E_1 + \beta_{m2} \times E_2 + \dots + \beta_{mn} \times E_n + R_m \quad (6-3)
 \end{aligned}$$

Among, A - each positive emotion.

E - various environmental factors.

R - random error of each regression coefficient equation.

B - the estimated coefficient of each environmental factor, representing the strength of the environmental perception.

In this way, the promoting effect of each environmental factor on different positive emotions and put forward the design strategy of community environment based on the influence of positive

emotion factors on well-being in the fuzzy evaluation model. For example, to promote the sense of belonging in the community, it can intervene in the shaping of community environment from several environmental factors that have a greater impact on the sense of belonging.

6.5 Summary

This chapter discusses the meaning of design for well-being and the role of designers in the process of design for well-being. In accordance with the principles of design for well-being and the practical problems to be solved, the ethical value of community environmental design for well-being is put forward and the procedures and main methods of design for well-being are discussed around the design value. From the perspective of design ethics, design for self-realization and well-being, as an ideology and cultural form, has the function of guiding and judging the whole process of design for well-being in this study and this value also permeates into every step of the design for well-being procedure. The design value of pursuing well-being plays an important role in the construction of urban community design for well-being program, making the exploration process of community environment design based on well-being needs become the basis of the construction of urban community design for well-being program. Urban community design for well-being program is based on the community the built environment design to meet the needs of well-being and its essence is the community environment space design from the perspective of architecture and planning. The core of the design for well-being program revolves around the three attributes of design for well-being: material attributes, social attributes and spiritual attributes to create value and form a harmonious coexistence between residents, the environment and society. In the implementation of design for well-being, three core steps are carried out in turn: demand analysis, problem research and plan making and the participation tasks of various stakeholders in the design process are discussed in detail. The goal

is to achieve happier residents in urban communities, happier human-environment interaction and happier living environment in urban communities. Finally, under the guidance of well-being needs in presupposed design, according to the process sequence of design for well-being, this paper discussed the acquisition method of well-being needs, the determination method of environmental elements, the measurement method of users' environmental perception, the establishment method of the built environment-well-being impact factor model and the transformation method of design theory to environmental practice.

CHAPTER 7 RWB-BASED DESIGN STRATEGIES IN COMMUNITIY

7.1 Delineation of environmental problems in urban communities

Communities of densely populated cities are essentially a product of Chinese urban development as a populous country that adheres to compact construction. Since the reform and opening, sustained rapid economic growth and rapid urbanization have led to a dramatic increase in urban population and after exploring the spatial spread and expansion of cities, the urban development model of intensive and compact, spatially high-density has become the development consensus of Chinese major cities. However, along with the gradual high population density, building density, open intensity and other characteristics of urban built environments, urban community environments have typical characteristics in terms of land use patterns, building forms and traffic organization methods. Based on the three dimensions of community well-being needs, this study summarizes the environmental problems of communities oriented to different needs based on the residents' suggestions for improvement of the community and the characteristics of urban communities in response to the questionnaires, which will help to propose environmental design strategies in the next step.

7.1.1 Community environmental issues oriented to physical needs

High-density urban neighbourhoods have similar environmental characteristics to high-density cities. The most typical characteristics of high-density urban communities are high residential population density and high plot ratios, which in this study refers to urban communities with plot ratios exceeding 2.0 within the geographic boundaries of the community. This study summarizes the problems that exist in the living environment of high-density urban communities oriented

toward material needs, which mainly include the basic needs of people's lives such as housing needs, entertainment needs, transportation needs and nature needs. Because the spatial form of high-density cities is very compact, the increase in population density has increased the demand for land use and building space in large numbers, which makes some of the original natural spaces in the city (e.g., mountains, water, green space, etc.) have been gradually encroached upon. As the main space for the urban population to live in, the land use pattern of high-density urban communities also gradually tends to be compact, and the area of communities and residential districts is relatively small. In addition, due to the limited spatial resources and the need to meet the housing problems of many people, residential buildings are basically dominated by high-rise buildings in terms of architectural form and the variability of their architectural appearance is relatively small. The dense residential layout makes some residences very close to the street or street-front commercial premises and residents are subject to noise nuisance. And after experiencing the outbreak of the New Crown epidemic in early 2020, the small per capita living area has brought some negative psychological impacts to people who live and work at home. In meeting the daily recreational needs of the residents, the public space in high-density urban communities is built on a tight land and compact scale, which creates an ambiguous structural plan and a loss of memory and culture in the current state of the public space in high-density urban communities. And high-density urban communities are driven by socio-economic



Fig.7-1 Cramped public interaction spaces and damaged public facilities

development tend to set up some charges or service facilities that favour economic taxation, losing the original role of public space to promote the social interaction of residents, which is also the problem of spatial equity or rights that exist in high-density cities that many researchers are exploring. Due to the large population of users, the frequency of damage to public service facilities increases in daily use (see Figure 7-1) and according to interviews with some residents, it is easy for untimely maintenance to affect the use of the facilities.

In addition, the number of travellers in high-density urban communities is higher than that in non-high-density urban communities in daily life, so vehicle congestion often occurs in the streets where high-density urban communities are located and there is a serious shortage of available parking spaces in the community and the parking of non-motorized vehicles, such as bicycles and electric vehicles, can only be arranged in a small open space next to the residential building or public space (see Figure 7-2 a) and 7-2 b)), occupying the space for residents' daily activities and also affecting the environmental cleanliness of the community. Residents' daily activity space also affects the cleanliness of the community environment, so the lack of parking space is also an environmental space problem that needs to be emphasized in the context of high-density urban communities. Green space has long been recognized in academic research as an environmental element that can positively promote people's mental health, especially in the context of the New Crown Epidemic, the healing effect of green space in high-density urban



Fig.7-2 Compact non-motorized parking and out-of-service elevator

communities has become more and more significant. To improve the practicality of space, high-density urban communities will tend to encroach on green space to increase residential or commercial space to achieve the benefits of economic development, so the green space in high-density urban communities is prone to the problems of insufficient green area, single greening mode, poor plant levels and ecological effects. Some residential communities even set up escalators at the entrances and exits for the sake of so-called grandeur and aesthetics (Figure 7-2 c)), but they are out of use due to a lack of maintenance, resulting in the elevator occupying a large public space and failing to provide convenience for the residents.

7.1.2 Community environmental issues oriented to social needs

The fulfilment of the social needs of residents in the community living environment mainly comes from the non-physical part of the community environment. As mentioned earlier, human beings themselves have social attributes and high-density urban community environments have many problems in facing social needs due to spatial constraints. The social attributes in this study are the various relationships that occur between people and people and between people and the environment, based on the occurrence of residential Behaviour. In high-density urban communities that focus on economic development and the number of people to be accommodated, high-rise residential settlements are often designed on a larger scale, with more



Fig.7-3 Underutilized public spaces and facilities in sample communities

entrances and exits to meet the convenience and accessibility of transportation, to further increase the land utilization rate and obtain more economic benefits. From a psychological point of view, neighbourhood interaction is in most cases a kind of unplanned and unarranged chance encounter Behaviour, the chance and number of chance encounters directly affects the depth of interaction and frequent interaction between neighbours helps to deepen each other's progress in neighbourhood relations. However, in high-rise residential buildings, the place where people may have chance encounters is usually the public space and facilities, such as lobby entrances, elevator halls, corridors and other spaces, such spaces are often designed to meet the needs of the travel, the space is relatively narrow, which leads to the living area is too densely populated and in the narrow space to meet each other to produce a sense of oppression rather than conducive to the occurrence of social Behaviours. This makes the chances of interactions between neighbours greatly reduced, little understanding of each other, to a certain extent, increasing the psychological distance between residents, not conducive to meeting the needs of residents' interactions. During the questionnaire collection in the sample community, many residents reflected that the activity space and public facilities in their neighbourhoods were insufficient, and the utilization rate of sky gardens was very low (see Figure 7-3 a)), which are physical environmental problems that affect the interaction needs of residents in their daily lives. In addition, the negligent management of throwing objects from height, smoking in elevators, walking dogs without leashes and children damaging public property has led to tense neighbour relations in the district and these Behaviours are to a certain extent rooted in the lack of maintenance and management of public facilities by the community and the property owners.

As the basic platform for mass cultural activities, high-density urban communities gather many people and rich composition of the population, which naturally forms a unique community

culture. Community residents have begun to put forward new requirements for cultural needs based on material needs being satisfied. However, the limited activity space and huge population density make most of the community comprehensive activity spaces small (as Figure 7-3 b)), with outdated and single internal facilities and some of them are even only set up in the shaded area next to the residential buildings with a few tables and chairs as the activity space for the residents in the neighbourhood (as Figure 7-3 c)). In addition, due to many administrative tasks sinking into urban communities, communities do not have enough time and energy to organize community residents to carry out a variety of cultural activities, while some folk cultural organizations are difficult to popularize among community residents because of the lack of community support, guidance and publicity. The compact spatial layout of high-density urban communities also results in extremely limited space for cultural activities and there is no place to put cultural utilities such as books, paintings, calligraphy, musical instruments and so on; these existing material and non-material environmental problems in high-density urban communities impose great limitations on the satisfaction of residents' cultural needs.

7.1.3 Community environmental issues oriented to spiritual needs

Spiritual needs, as mentioned earlier, are influenced by the values of community users and are residents' exploration of self-actualization outside of the perceived community environment, relying primarily on the emotional experiences people have about the physical and nonphysical environments. In the context of high-density urban communities, based on the collation of literature research and resident interview results, it is summarized that spiritual needs in this study mainly refer to the positive emotions that community residents perceive in their living environments, such as a sense of belonging, a sense of pleasure, a sense of security, a sense of

comfort and a sense of convenience. According to the questionnaire collection and interviews with the sample community residents can be obtained the ranking of the correlation strength between different emotions and built environment elements, as shown in the figure summarizes the correlation between different positive emotional needs and built environment elements and summarizes the corresponding existing problems of high-density urban community environment. It can be said that each environmental element is closely related to the five major positive emotions and influences whether the spiritual needs of community residents are satisfied. As mentioned in the previous section, as the public's education level increases, Chinese residents begin to pay attention to a higher quality of living environment and the spiritual comfort and self-realization it brings to them when their material needs are satisfied. A single traditional living space can only meet the basic needs of life, but a large number of templated space construction does not necessarily meet the real needs of residents, so the root of the problem of living environment in high-density urban communities is the lack of spiritual needs of the residents to meet the needs of the research, so that the space is independent of the existence of the real human activities around the service of people's lives.

In the field research, some residents said that some similar spaces in the neighbourhood often confuse them and many of the spaces in the neighbourhood lacked identification (see Figure 7-4 b) and 7-4 c)) and the public areas were dark and lacked a security when walking at night. At the same time, some residents also pointed out that the neighbourhood almost do not know each other very well, usually not many activities in the community people communicate less, do not feel the unique cultural atmosphere. In addition, during the research process, some public spaces have lost their original functions, and the facilities are dilapidated and lack of timely maintenance due to the long period of non-use and there are warning signs hanging in many

places in the community to keep away from the danger (see Figure 7-5 a)). Therefore, some of the residents in the community feel unhappy and lack of a sense of belonging to the property management's failure to maintain the facilities in a timely manner, poor garbage sorting (Figure 7-5-b) and the failure to organize cultural activities. To facilitate the management of the community, only one or two entrances are open, although this strengthens the security of the community, but the lack of entrances and the damage of the internal transportation facilities make the residents feel inconvenient and uneasy in their daily trips. In general, the facilities and



a)

b)

c)

Fig.7-4 Monofunctional and unmarked public activity areas



a



b

Fig.7-5 Dilapidated services and poorly managed waste segregation

space of the new neighbourhoods can basically meet the daily material needs of the residents, but the improper maintenance and lack of cultural activities are not conducive to meeting the social and spiritual needs of the residents.

7.1.4 Principles for optimizing the design of community environments for well-being promotion

Well-being promotion is not only the value goal of design for well-being in theory, but also the general orientation that guides the principles of community environment optimization in practice.

(1) Well-being-oriented principle

In 2011, the United Nations General Assembly included the concept of well-being in the assessment of national "human development indices", which means that well-being is no longer just a simple psychological state but has become an effective complementary tool for measuring the economic growth and social development of a particular country, city, or even region. Since socialism with Chinese characteristics entered the new era, Xi Jinping has repeatedly emphasized in public that he seeks "the well-being of Chinese people and the rejuvenation of Chinese nation", which shows that whether the people are happy or not also occupies a prominent position on the road of national rejuvenation and plays an important role in the process of realizing the Chinese dream. The Chinese people's pursuit of well-being can be traced back to traditional Chinese culture and the process of realizing the Chinese dream also means the pursuit of realizing the common well-being of the Chinese people. Taking well-being as the value guide for urban community environment optimization design can promote urban residents' perception of a better life and the common realization of the Chinese dream on the macro level and help to improve the quality of life of urban residents on the micro level and strengthen the well-being of residents in

the living environment. In the process of community environment optimization, it should always keep in mind that the overall enhancement of the residential well-being of the community environment as the primary goal, to create a better quality of life for community residents, improve the quality of life of residents and promote the sense of accessibility and well-being of residents.

(2) Principle of Public Participation

In the world, public participation has been emphasized and encouraged to develop since the 1940's. With the deepening of research theories and the promotion of practical projects, public participation has gradually been regarded as a basic right of national citizens. Public participation can be regarded as a limited scope of public participation, in the designated scope of the citizens can participate in the public affairs of decision-making, Zhi Xing, supervision and other processes and has the right to express their own wishes and opinions, the purpose is to safeguard their own legitimate rights and interests or the public interest. Compliance with the principle of public participation in the process of urban community environment optimization can protect all stakeholders to participate in public decision-making and promote the fair and reasonable allocation of social resources. To a certain extent, the principle of public participation ensures that community residents have the right to speak in the design of the living environment, effectively realizing the original purpose of the living environment for people and guaranteeing public decision-making aimed at enhancing the well-being of environmental users. In the process of community environment optimization, the main body of public participation includes community workers, government decision-making departments, residents, investors and property managers of the five stakeholders, the whole process of community environment optimization in

the preliminary research, program determination, implementation of the construction, evaluation and maintenance of the later stages, which will help to reflect public opinion, comprehensive consideration of the public's wishes and also play a role in the coordination of the interests of all parties and integration of the role of mutual supervision. It also plays a role in coordinating and integrating the interests of all parties and supervising each other.

(3) Principle of Sustainable Development

The Chinese government has always taken the path of sustainable development as one of its basic national policies. Sustainable development means being able to meet current human needs without jeopardizing the ability of future generations to have their needs met, which at the same time embodies the ecological value of harmony between human beings and nature. For the promotion of well-being of community environment optimization is also to fully consider the concept of sustainable development, to meet the spiritual needs of the residents at the same time to take effective measures to rationally use the natural and social resources, to reduce the adverse impact on the environment. For example, in the process of optimizing the urban community environment, the layout of the transportation network and the configuration of public facilities should not only meet the residents' daily use more convenient and comfortable, but also ensure that the comprehensive benefit of the community has been improved. In the optimization of green space should not only consider the aesthetic needs of residents to enhance, at the same time to ensure that the introduction of locally adapted vegetation can improve the community's landscape ecological benefits. In short, all environmental optimization activities are placed within the natural environment, so that the natural environment, man-made living environment

and the residents' sense of well-being together into a virtuous circle, becoming a "community of well-being".

(4) Principle of Geographical Difference

Well-being is the ultimate pursuit of human beings throughout their lives. Although well-being is a positive subjective experience overall, different regions may have unique needs for well-being in terms of material and cultural aspects. Since the 18th National Congress, Comrade Xi Jinping has repeatedly emphasized that "we should be firm in cultural confidence and promote the creative transformation and innovative development of the excellent traditional Chinese culture", which points out the direction of Chinese modern urban community environment construction work. In the process of moving towards modernization, it is more important for us to return to regional cultural self-confidence and deepen the adaptability of regional differences in community environment optimization. For example, different geographic locations and climates have led to differences in residents' material needs for the living environment. To withstand the cold winter climate, the walls of residential buildings in northeastern China are mainly thick and warm; while in the middle and lower reaches of the Yangtze River in China, where there are many rainy seasons, the residents' concern for the residence often lies in the moisture-proof and mildew-proof walls. In addition, ethnic and cultural differences in different regions also affect residents' perception and experience of well-being in living and focusing on improving cultural spaces with regional differences and public spaces to promote traditional cultural inheritance when optimizing community environments will greatly enhance local residents' sense of belonging and well-being.

7.2 Overall strategies for constructing communities with residential well-being

The design strategy proposed in this chapter is a response to and a practice of the theory of design for well-being and the model of environment-well-being intrinsic relationship in the previous section. The practice of designing residential well-being in high-density urban communities should be based on the principles of pluralistic governance, trust and negotiation, the value orientation of promoting well-being, the concept of establishing a community with shared well-being and the goal of integrating resources as the overall strategic direction, which guides the proposal of optimising the physical environment and shaping the non-physical environment to promote the residents' sense of well-being. The overall strategy is to promote the optimisation of the physical environment and the shaping of the non-physical environment.

7.2.1 A community organisation model based on pluralistic shared governance

In recent years, sociologists have been working on the development of self-governing communities, in which the government hands over part of its management authority to society, providing space for individual residents and members of the public to participate in the process of community management and self-governance of the living environment. The community organisation model is also a way for various stakeholders to interact and relate to each other in the community management process. Community organisation is a working process that organises all parties related to the design of the community environment to work together, allowing for the full utilisation of resources within the community and the existence of a harmonious and symbiotic relationship between the environment and people. As our scholars Jing Zhaoliang and others have said, the ideal community is as an independent social community that plays a role in public affairs, especially when it becomes a common space for private life

under marketisation, the community has more social attributes, between citizens and government. The context of high-density urban communities can magnify the possible contradictions in public affairs decision-making, highlighting the social and spiritual needs of the people in their living environments and how to reconcile the different needs of many people with the huge contradiction of lack of space has also become a major difficulty in the design of residential well-being in high-density urban communities. Neither complete autonomy nor complete administrative action is conducive to high-density urban communities meeting the diverse needs of well-being, which means that the community organisation model has to be built based on collaboration between the government, service organisations and residents, with each of them playing to their strengths and building high-density urban community environments with the well-being of the residents as the core, to maximise the integration of resources and services for the people.

The idea of building a multi-stakeholder community environment emphasises the building of a platform for collaboration among different stakeholders at the community level, which leads to joint and collaborative decision-making among the government, business organisations and the public (see Figure 7-6). The advantage of this is that it helps the government to understand the real needs and living experiences of the people, while also bringing



Fig.7-6 A community organization model of pluralism and co-governance

the strengths of enterprises and other organisations into full play to jointly build a community environment that enhances the well-being of residents and helps the community to move towards self-governance. As shown in the figure, the centre of the community organisation model based on pluralistic governance is the well-being of the residents and the three community organisations work together around the well-being of the residents. For example, relevant government departments and community workers should be the coordinators between owners' associations and property companies, including the government's leadership and advice to owners' associations and its supervision and assistance to property companies and other organisations; owners' associations should play an important role in guiding residents' feelings about the community environment and communicating their needs for residential well-being, so that the government and property organisations can be more targeted to serve the community and build the environment. Property companies and other service organisations should take up the responsibility of serving the community residents and maintaining the community environment and regularly feedback the results of implementation to the owners' committee and relevant government departments. Therefore, to better implement the idea of community governance of pluralism and promote the environmental atmosphere of the trinity of community co-operation, designers can refer to the following strategies in the process of high-density urban community environmental design:

(1) Discover new community subjects and set up an environmental design volunteer team. The establishment of community volunteer teams is an effective means to cultivate and attract community residents to participate in community environmental design. In view of the form of composition of different high-density urban communities, pay attention to children, the elderly, women and other vulnerable groups in the living environment and encourage them to join the

design volunteer team, boldly participate in the design and transformation of the community environment and put forward their own needs and ideas.

(2) Build a public communication platform for community environment design. The designer is responsible for building a platform to organise communication among multiple subjects, including online software-based message platforms and offline face-to-face communication platforms, to enhance the participation ability and sharing spirit of community residents. Ensure that the multiple subjects involved in community environmental design regularly exchange design ideas and environmental improvement plans and form benign cooperation under orderly control. Use some community activities to organise the participation of multiple subjects, such as the promotion of rubbish classification activities, coordinating and organising the participation of community workers and the government, owners' committees and residents, property companies and rubbish disposal agencies, etc. On the one hand, it can deepen the residents' knowledge of their own behaviour and improve their self-efficacy and on the other hand, it allows the government to understand the residents' suggestions and needs for rubbish classification and at the same time, helps property companies and garbage disposal agencies to carry out their work more smoothly. It also helps property companies and rubbish disposal organisations to carry out their work more smoothly, so that the three parties can work together to create a clean and tidy community environment.

(3) Regulate the coordinating mechanism of multiple actors. To ensure the long-term and stable operation of each subject's participation in community environmental design and to avoid the occurrence of the phenomenon of "derailment" of a certain subject, it is particularly important to formulate a collaborative mechanism and rules and regulations. Designers can invite

representatives of each subject to participate in the development of synergy mechanisms in the form of symposiums and clarify the responsibilities of each subject and constrain the behaviours of each subject member through relevant rules and regulations, to better promote the process of designing high-density urban community environments for residential well-being. At the same time, the establishment of an information resource sharing platform, the release of information and the solicitation of opinions on social platforms such as WeChat public numbers and official microblog accounts will help to publicise the information on the design of community residential well-being, present a good image of the community to the public, enhance the pride and sense of belonging of the community's residents and form a community of well-being.

7.2.2 A survey of needs for a well-being environment based on the principle of trust and consultation

The environmental characteristics of high-density urban communities present unique challenges and opportunities for promoting resident well-being and it is essential to understand the needs of the design subject before environmental design strategies are proposed. Conducting a well-being environment needs survey is a critical first step in promoting resident well-being in high-density urban neighbourhoods and a well-being environment needs survey is an effective tool for understanding the specific needs of these neighbourhoods and developing targeted strategies. Well-being needs are highly subjective, a comprehensive need that cannot be easily quantified and their primary focus is also on the residents of high-density urban communities. However, design solutions that only consider the needs of users are flawed and not always feasible. The construction of community environments should consider the needs of multiple stakeholders for community environments and co-ordinate the diversified needs for well-being environments, such as economic, social development and livelihood needs. Trust is the most crucial core

element for coordinating all parties and achieving good mutual trust between multiple stakeholders is the prerequisite for investigating the needs for a happy environment in the design of high-density urban community environments. Trust and consultation are the cornerstones of a healthy living environment. Trust fosters a security and belonging, while consultation ensures that residents have a voice in decisions that affect their living conditions. Surveys show that residents value these principles and associate them with increased satisfaction, better relationships and a stronger sense of community. At the same time, the survey revealed that there is often a lack of trust and consultation in the living environments of high-density urban neighbourhoods. Many residents report feeling disconnected from management and perceive a lack of transparency and open communication in the design and transformation of community environments. Consultation processes are often perceived as superficial, with governments making decisions without listening to the genuine views of residents. This lack of trust and consultation can lead to dissatisfaction, conflict and a weakened sense of community.

Through interviews with community staff, residents and relevant government departments, several areas for improvement in conducting the Well-being Environment Needs Survey are identified, including the need for more open and honest communication from management, regular opportunities for residents to provide feedback and participate in decision-making and initiatives to build trust among residents and between residents and management. Based on the results of the face-to-face interviews with residents and quantitative analyses, several recommendations are made. First, management should prioritise building a culture of trust by promoting transparency and honesty in all interactions. Second, regular consultation processes should be implemented to ensure that all residents have a voice in decisions that affect their living conditions. Third, initiatives such as community building activities and conflict resolution

training can help build trust and improve communication among residents. The Well-being Environment Needs Survey still leaves a large gap between the understanding of its importance and its actual implementation in residential settings. Therefore, proactive measures are needed to foster a culture of trust, promote open consultation and create a supportive and positive living environment.

Prior to conducting a survey of well-being environment needs in high-density urban communities, it is critical to understand the unique context of high-density urban communities. A well-being environment needs survey should be designed to capture both quantitative and qualitative data. Quantitative data can provide measurable insights about the needs of the community, while qualitative data can provide a deeper understanding of residents' experiences and perceptions. Surveys should include questions about residents' satisfaction with living conditions, relationships with neighbours, experience of positive emotions and access to basic services and amenities. Involving the community in the survey process is essential to ensure a high response rate and accurate results. This can be achieved by clearly communicating the purpose of the survey, making it accessible to all residents and providing incentives for participation. In addition, working with local community organisations can help build trust between residents and the community and encourage participation. Once survey data has been collected, it should be analysed to identify patterns, trends and areas of concern. The results of the analysis can then be used to develop targeted strategies to promote resident well-being. For example, if the survey reveals that residents feel unsafe in their neighbourhoods, then aspects including improved lighting in public areas, increased police presence or the organisation of community watch groups could be focused on in the environmental design strategy. By understanding the unique context of these neighbourhoods, developing comprehensive surveys, engaging the community

in the survey process and using the data to develop targeted strategies, healthier, happier and more supportive neighbourhoods that trust each other can be created.

7.2.3 Environmental policymaking with well-being promotion as a value proposition

In general, environmental policy refers to a series of measures to regulate and control the construction of the environment within a certain period, under the guidance of the national macro-development strategy, to coordinate the relationship between environmental protection and economic development, which contains the idea of environmental construction, policy objectives, management methods and laws and regulations related to the environment (Du, 2003). The nature of environmental policy is also an expression of how people live in harmony with the environment and Gibson and his followers argue that the attributes of the environment are generally appropriately characterised through the relationship with people (Weinberg et al., 2018), as time and space will constitute the human experience of the built environment. In this study, the subjects of environmental policy are the various stakeholders involved in the environmental policy proposal, which include the environmental policy makers, the grassroots organisations that implement the policy, the relevant government regulators and the people who are directly affected by the environment. Value orientation determines the overall direction of environmental policy making, which is influenced by the specific time background and specific environment to show the value tendency consistent with the values and residential values pursued and aspired by the main body of the policy. The value orientation of China's environmental policy should be supported by a certain democratic system and relevant laws and regulations to cope with the challenges of diversified interests and severe environmental protection trends during the period of China's social transformation and at the same time, to

implement the central idea of people-centredness and to enhance the sense of well-being of the residents of China's communities in their living environments by focusing on the harmonious relationship between human beings and their environments. In the process of formulating environmental policy, China has always insisted on people-oriented and has always started from the fundamental interests of the greatest number of people in terms of values, i.e., to pay attention to the interests of human beings as well as to the protection of the environment. The community living environment policy is on this basis to focus on the living environment where people live and to maximise the promotion of the environment for human well-being from the perspective of people's most immediate interests. High-density urban communities face unique environmental challenges. These challenges include air and noise pollution, limited green space and the urban heat island effect. These challenges can have a significant impact on the physical health, mental health and overall quality of life of residents. Therefore, it is important to have a clear understanding of these challenges and their impact on well-being when developing environmental policies for high-density urban communities.

Values-oriented environmental policymaking prioritises community values such as health, well-being and quality of life. This policymaking orientation creates awareness that the environment is not only a physical space, but also a social and psychological space that has a significant impact on the well-being of its inhabitants. Environmental policies should therefore aim to create environments that not only fulfil physical needs but also promote social interaction, psychological well-being and a sense of belonging. Wellbeing promotion is increasingly recognised as an important goal of environmental policymaking in modern societies. In the context of high-density urban community environments, the promotion of maximum residential well-being felt by the people directly affected by the environment, that is, the community

residents, should be a valued principle and criterion of community environmental policy. This study argues that a value orientation that prioritises the health and well-being of residents is what leads to more effective and sustainable policies. The construction policy of high-density urban community environment should be based on the basic goal of balancing the contradictory relationship between the demand for high-density population living and the limited community built environment resources, integrating the multi-stakeholders of the community built environment policy on the multiple needs of the environmental construction and coordinating the interests of various subjects in the process of the formulation and implementation of the environmental policy by taking the value orientation of promoting the community residents' sense of well-being in their living environment as the value orientation and thus satisfy the environmental needs of community residents for well-being. Promoting well-being through environmental policy requires a value-oriented approach to well-being promotion that prioritises residents' health and well-being. By engaging the community, creating green spaces, promoting sustainable transport, encouraging sustainable building design and raising awareness among residents, high-density urban communities can develop effective and sustainable environmental policies that enhance well-being. This will not only address the unique environmental challenges faced by high-density urban communities, but also create healthier, happier and more supportive environments for residents to live, work and play. Therefore, the following aspects should be taken into consideration when formulating an environmental policy oriented towards the value of well-being promotion:

(1) Community participation policy. Involving the community in the decision-making process ensures that policies reflect the values and needs of residents. This can be achieved through public consultations, surveys and participatory decision-making processes.

(2) Green space policies. Creating and maintaining green spaces can improve air quality, reduce noise pollution and provide space for social and sporting activities. Relevant policies may include requirements for green spaces in new developments, initiatives to protect existing green spaces and programmes to encourage the use of these green spaces.

(3) Sustainable transport policies. Promoting sustainable transport can reduce air and noise pollution, improve physical health and enhance social interaction. Relevant policies may include improving public transport, creating safe and convenient footpaths and cycle tracks and implementing car-free zones.

(4) Building design policies. Encourage sustainable building design, which includes the use of environmentally friendly materials and practices such as rainwater harvesting, solar-powered lighting and native landscape design. Sustainable design not only reduces the impact of buildings on the environment, but also helps improve their long-term viability and resilience and enhance the comfort and well-being of residents. Relevant policies may include building codes requiring energy-efficient designs, incentives for green building practices and provisions to ensure adequate natural light and ventilation in residential buildings.

(5) Education and awareness policies. Raising awareness of the link between the environment and well-being can encourage residents to support and comply with environmental policies. This may involve educational activities, community workshops and collaboration with local schools and community organisations.

7.2.4 Implementation of a culture based on the concept of community with shared well-being

The emergence of the term "community" has always evoked positive and warm associations, such as solidarity, harmony, a sense of belonging, tolerance and so on. According to the scale of differentiation, from national community, community of human destiny, down to village community, clan community and neighbourhood community. According to the attributes, there are also economic community, cultural community", emotional community and spiritual community. The idea of community has been explored and gradually developed into a summary of organic groups with intrinsic significance of co-operation, synergy and complementarity as early as in the idea of the Cosmopolitan Social Community described in the Book of Rites. The research on community with shared well-being has been particularly enthusiastic in recent years, as Liu Yuzhao concluded that there are five elements that make up a community after summarising Japanese and American scholars' research on the village community hypothesis and market community, namely groups, boundaries, external interactions, cohesion and a sense of collective identity and internal inter-membership relationships. The characteristics of community with well-being in this study have similar attributes, including a certain geographical scope, shared life experiences, shared social relationships, specific culture and values and a sense of belonging to the community. Xiang Jiquan's research focuses on the reconstruction of community with shared well-being and sense of belonging and is committed to improving the integration of traditional neighbourhood community. Some scholars even found in their research that the influence of community with shared well-being is gradually weakening under the influence of contemporary economic and market development, but there is an important value of community with shared well-being when it is needed to perform functions such as emotion and

social cognition. Gui Yong and other scholars believe that the community with commercial housing as the main component of the community from the two aspects of the sense of belonging and social interaction, urban residents of the perception of the neighbourhood community is increasingly fading, how to promote the sense of community of urban community residents is the key to the construction of the community with shared well-being. As President Xi Jinping pointed out, "The centre of gravity is at the grassroots in building a harmonious society. The grassroots are the cells of society and the foundation for building harmony. If the foundation is not solid, the ground will shake", the community as a grassroots cell, the concept of community with shared well-being helps to make urban residents feel the warmth of the community and a sense of belonging, but also helps to make the community residents consciously and actively to create and maintain their own homes. In other words, the process of building a community with shared well-being is also the process of community residents' pursuit of a better life and its realisation.

Since the 18th CPC National Congress, community governance has been orientated towards enhancing the people's sense of access, well-being and security and Xi Jinping's "letting the people live a happy life is the most important thing for the country" has been the goal of community building. The Chinese have always adhered to the cultural concept of social well-being, from the utopia of the Taiping Heavenly Kingdom to Kang Youwei's idea of a commonwealth society. Happiness as a culture can be understood as the non-material space formed by people in the pursuit of happiness based on the expansion of their material, social and spiritual needs. Due to the large differences in occupation, age and education of the main body of community residents, the residents' interests in the community environment are becoming more and more diversified, but the ultimate direction of everyone's pursuit is the same, all of them

want to live a happier life and it can also be said that well-being is a common culture among Chinese people. As socialism with Chinese characteristics enters a new era, the main contradiction in our society has been transformed into the contradiction between the people's growing needs for a better life and the unbalanced and insufficient development, vigorously implement the concept of community with shared well-being can promote the community to enhance the consensus of the residents, enhance the cohesion of the community and a sense of belonging to the community, so that every resident of the community with shared well-being feel warmth and harmony of the atmosphere of the home. By enabling community residents to understand the concept of neighbourhood community and reach a consensus that community environment construction should be based on the common goal of realising living well-being, every resident in the community will consciously maintain the community environment in their daily lives and make efforts for the community with shared well-being. The community with shared well-being can be regarded as a small unit of "Happy China" and China is composed of countless community with shared well-being. When efforts are made to improve the living well-being of each community with shared well-being during the process of community living environment construction, then the overall living well-being of Chinese residents will be improved, and the culture of well-being value can be continued and promoted. The culture of happiness value can also be continued and promoted. Therefore, the following strategies can be considered to promote the culture of well-being when designing for well-being in high-density urban community environments:

- (1) Vigorously promote the concept of community with shared well-being, produce relevant slogans and posters and set up special publicity spaces in public places and facilities to post posters and slogans to enhance residents' daily awareness of community with shared well-being.

(2) Divide special cultural activity spaces in public spaces and organise community cultural activities on a regular basis, such as games for welfare on holidays, community concerts and voluntary activities to help each other, to form a social network in the community and enhance the cohesion and sense of belonging of community residents.

(3) Conducting regular residents' forums to collect residents' opinions and suggestions on community management, promoting community residents' sense of participation in community building as users and helping to enhance residents' sense of responsibility for the community with shared well-being.

7.2.5 Community space configuration targeting resource integration

High-density urban neighbourhoods face a unique set of challenges in terms of space allocation and resource integration. These challenges are often exacerbated by the large number of people living in the neighbourhood, the limited amount of space available and the diverse needs of residents. One of the main challenges is the efficient use of limited space. In high-density urban neighbourhoods, every square foot counts. Balancing the needs of residential, commercial and public space is a complex task. There is a constant need for more housing, more offices, more shops and more amenities, all competing for the same limited space. This often leads to overcrowding and a lack of open space, which negatively affects the quality of life of residents. Another challenge is the integration of basic resources. High-density urban communities require a wide range of resources, from water and electricity to health care and education. It can be logistically challenging to ensure that these resources are evenly distributed and easily accessible to all residents. For example, in urban community environments with high population densities, it can be difficult to ensure that all residents have access to green spaces that are critical to their

mental health. In addition, transport is a major challenge in high-density urban community environments. High-density urban neighbourhoods often face traffic congestion, inadequate parking and poor pedestrian and bicycle infrastructure. These traffic problems can lead to increased pollution, decreased safety and lower quality of life for residents. Finally, high-density urban communities often face challenges related to social inequality. The high cost of living in these areas can lead to economic segregation, with wealthier residents having access to better resources and amenities. This can create divisions within communities and make it more difficult to integrate resources effectively.

To address these challenges in designing for well-being in high-density urban community environments, effective resource integration is essential for the environmental sustainability of



Fig.7-7 Sustainable Transportation and Waste Separation and Recycling System for the Hammarby Community in Stockholm, Sweden (Image source

https://www.thepaper.cn/newsDetail_forward_1268311; https://www.sohu.com/a/162110202_657545)

the community and for improving the well-being and quality of life of its residents. The Hammarby community in Stockholm, Sweden, is a classic example of environmental resource integration in an urban community (shown in Figure 7-7). The community successfully recycles resources by using an innovative waste management system that segregates and recycles waste and converts organic waste into biogas for energy production. The spatial layout includes underground waste collection points, reducing the need for waste collection vehicles and minimising pollution, while co-locating the landfill to produce heat and electricity. In addition, the Hammarby community prioritises sustainable transport, with an extensive network of footpaths and cycle paths, efficient public transport and electric vehicle charging infrastructure, with energy produced from waste also being made available for use by public transport and new energy vehicles. If the Hammarby community makes better use of energy resource recycling to reduce depletion of the natural environment, the Vauban community in Freiburg, Germany, demonstrates a more successful integration of spatial resources in a high-density urban community, as shown in Figure 7-8. The spatial layout of the Vauban community prioritises sustainable transport, with an extensive network of walking and cycling paths, efficient public transport and car sharing services. Despite the high density of buildings in the community, the community places great importance on planning a large amount of green space for residents' recreation and has designed personalised green belts with the participation of residents and planted greenery on rooftops to create a pleasant living environment. The community's emphasis on sustainable transport and green space creates a vibrant and environmentally friendly community. From this, in the process of designing for well-being in the environment of high-density urban communities, the following points can be referred to for spatial configuration aimed at resource integration:

(1) Develop composite functional spaces. For example, the development of composite functional space combining residential, commercial and public space to promote social interaction and economic activities. Integrate the functions of traffic roads, greening and infiltration drains, etc. and plan them as multi-functional traffic spaces, increasing the greening area while ensuring easy accessibility.

(2) Lay out a pedestrian-friendly transport network. Implement the concept of private car reduction, use public transport to connect the community with the city's main traffic, reasonably plan environmentally friendly parking spaces, build community bike paths and encourage residents to use bicycles or new energy vehicles for travelling. Separate

pedestrian and vehicle flow and control vehicle speeds to improve safety and encourage residents to engage in physical activities.

(3) Reduce the scope of public services. Short-distance communities adopting sustainable transport policies, connecting footpaths and cycle paths into an efficient and green transport network. Ensure that basic services such as commercial, medical and educational services are



Fig.7-8 Public transportation space and green space in the community of Vauban, Germany (Image source https://www.sohu.com/a/514732849_120845342)

easily accessible around the community and that daily shopping and service needs can be met within walking distance.

(4) Rational use of community resources. Build solar energy facilities on rooftops and use photovoltaic technology to produce energy not only for self-consumption, but also to sell excess energy to businesses outside the community. Use local building materials and new environmentally friendly building materials to save costs and adapt to local conditions. Community waste is separated and recycled to reduce overall community energy consumption and power is generated to produce fertiliser, promoting the development of a circular economy in the community.

7.3 Strategies for designing community environments with well-being orientated promoting positive emotions

Based on the previous theoretical research on the relationship between environment with well-being, standing in the field of architecture and urban planning, this study wishes to introduce the mediating role of subjective positive emotions of urban dwellers, and this section proposes

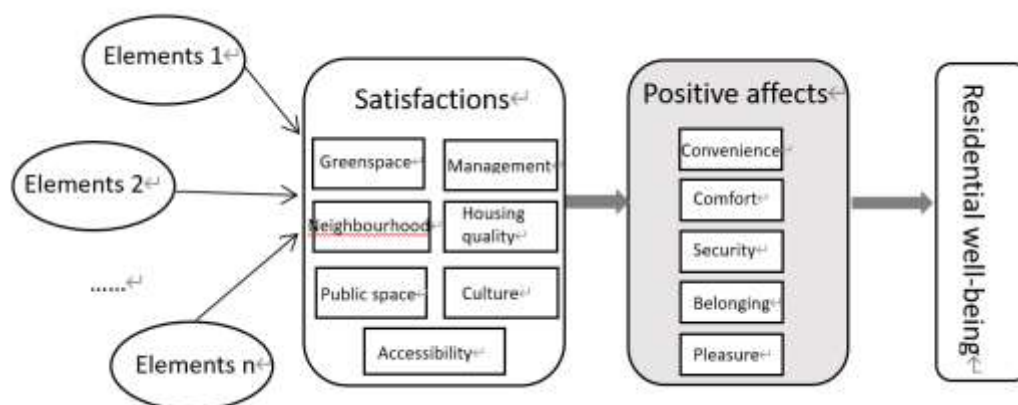


Fig.7-9 Proposed logic for design strategies based on positive affect enhancement

design strategies for environment with well-being that promote residential well-being as Fiture 7-9 from the perspective of enhancing the expression of five positive emotions, namely, comfort, belongingness, security, convenience, and pleasure.

7.3.1 Strategies for designing well-being environments that enhance convenience

Based on the role of positive affect in the environment-well-being relationship, which includes both mediating and mediated benefits, this study proposes strategies for building a well-being environment in urban communities from the perspective of promoting positive affect. From the mechanism of ‘the built environment - well-being promotion’, the perception of convenience is most closely correlated with the three environmental satisfaction factors of public transport accessibility, housing quality and community management (Table 7-1), forming a path of

Tab.7-1 Analysis of the relationship between convenience and environmental elements

		Green space	Transport accessibility	Public spaces and facilities	Housing quality	Community management	Neighbourhoods	Culture
convenience	Relevance	0.317	0.609	0.247	0.465	0.261	0.295	0.295
	Intermediated benefits	0.064	0.565	-0.078	0.304	0.094	0.05	0.044
	Mediated benefits	0.053	0.54	-0.082	0.182	0.022	-0.03	0.038

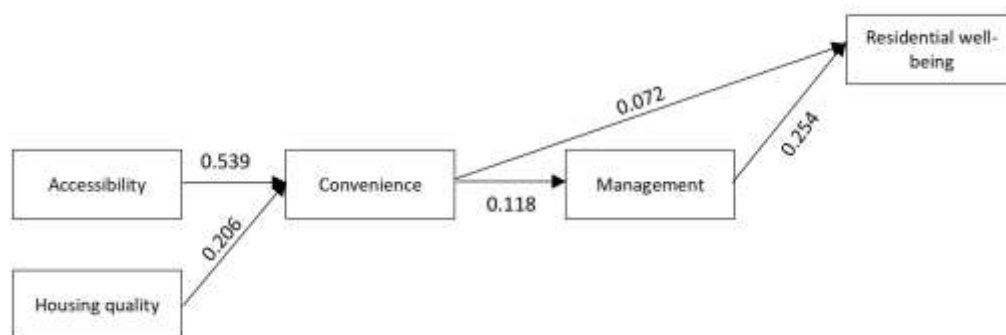


Fig.7-10 Pathways to residential well-being that promote convenience

residential well-being enhancement that promotes the sense of convenience, as shown in Figure 7-10. And from the analysis of residents' social media data, the experience of the sense of convenience can be decomposed into the convenience of the walking path network, the convenience of the use of activity and leisure facilities, the convenience of parking, and the convenience of public services. As shown in Figure 7-11, this study synthesises the results of the environmental impact elements of the sense of convenience and the results of the social media data analysis and proposes the following strategies for designing a well-being environment in urban communities that promotes the sense of convenience.

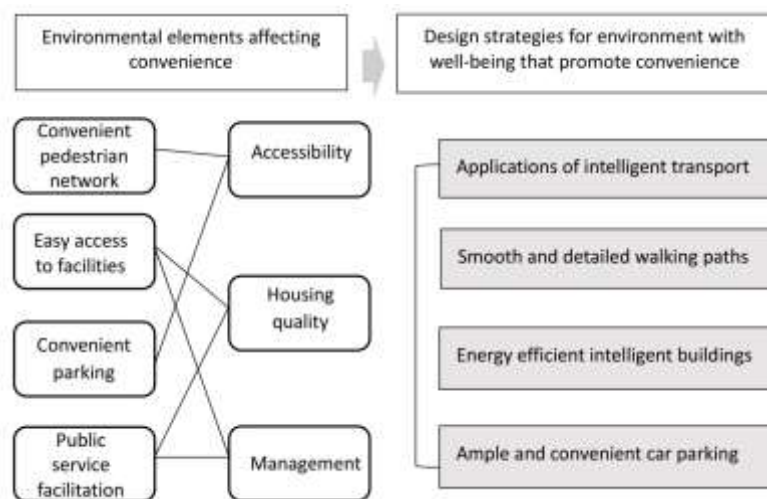


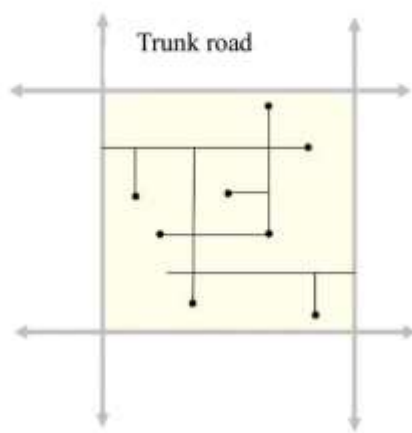
Fig.7-11 Strategies for designing wellbeing environments that promote convenience

(1) Application of intelligent transport systems

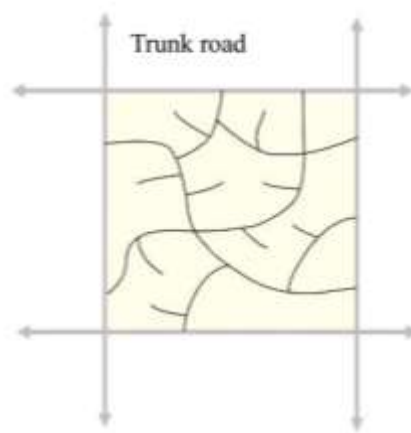
In a modern urban environment, priority should be given to public transport. This can be achieved by dedicating lanes for buses and trams, thereby reducing congestion and improving the speed and reliability of public transport. Frequent and reliable public transport services should also be provided to encourage residents to use public transport rather than private cars.

An integrated multi-modal transport system is a key strategy for designing a smooth and convenient transport layout. The system combines different modes of transport such as buses, trams, bicycles, footpaths and cars to provide seamless transport interchange. Residents can easily switch between different modes of transport, increasing convenience and reducing travel time. Sustainable design involves creating transport networks that minimise environmental impacts. This includes promoting public transport, walking and cycling as they produce fewer emissions than private cars. It also includes the use of energy-efficient vehicles and infrastructure, and the integration of green spaces into the transport network to improve air quality and reduce heat islands.

In terms of transport intelligence, Intelligent Transport Systems (ITS) use technology to improve the efficiency and safety of transport networks. This includes traffic management systems that monitor and control traffic flow, real-time information systems that provide up-to-date traffic conditions and public transport timetables, and smart ticketing systems that allow seamless payment for different modes of transport. Through ITS, people can view real-time traffic conditions in their neighbourhoods at any time on their portable mobile devices. In addition, by constructing a new type of transport system with real-time sensing, instantaneous response and intelligent decision-making it is possible to optimise traffic flow and parking space management within the community, improve traffic efficiency, reduce congestion and energy wastage, and effectively improve the smoothness and convenience of the community's transport layout. Intelligent parking systems, such as intelligent parking buildings and automatic parking equipment, can be used in the design and management of parking spaces. These devices can increase the utilisation rate of parking spaces and reduce the footprint of parking spaces, while facilitating their use by residents.



a) Organically connected curved roads



b) Traffic road network with more end roads

Fig.7-12 Grid pattern of roads in the community

(2) Smooth and detailed pedestrian roads

During the research process, it was found that the internal road grid of the neighbourhoods with higher satisfaction with traffic presents a detailed road grid (e.g. Figure 7-12 a)), which can usually effectively connect and link the residential neighbourhoods with the urban traffic organically, and at the same time provide more path options for the owners and reduce unnecessary traffic detours. The less satisfied with the traffic of the district will appear more linear end of the road (such as Figure 7-12 b)), thus forming the residential area inside and outside of the traffic connection of the break, and with the increase in the size of the residential district such breaks will also be more and more. Many studies at home and abroad also support that the higher degree of integration of the district road grid with the main urban traffic will, to a certain extent, lead to a higher sense of well-being of the residents. Therefore, when planning the internal traffic grid of the neighbourhood, it is necessary to avoid the disconnection of the pedestrian network and the blockage of the accessibility of public transport, pay attention to the two-way traffic communication between the neighbourhood and the city, and create a variety of

choices of traffic paths and comfortable walking scale for the residents of the neighbourhood through the detailed and smooth traffic grid.

In addition, creating pedestrian- and bicycle-friendly infrastructure is an important strategy for pedestrian pathway construction, as well as for enhancing residents' sense of ease of living. This includes designing wide, well-lit pavements, placing zebra crossings, and creating bike lanes. These infrastructures encourage walking and cycling, which is not only a healthy mode of transport but also environmentally friendly. Applying inclusive design in the construction of pedestrian path grids ensures that the transport network is accessible to all residents, including children, the elderly and people with disabilities. This includes designing bus stops and railway stations that are easy to reach, providing clear and easy-to-understand guidance information, and ensuring that vehicles and facilities are accessible to people with reduced mobility.

(3) Energy-efficient and intelligent building facilities

Buildings and facilities in urban community living environments consume large amounts of energy, leading to large amounts of carbon emissions and resource wastage. Adopting energy efficient intelligent construction can reduce energy consumption and carbon emissions by optimising energy use and reducing energy waste. This helps to realise the goal of low-carbon urban development, mitigate climate change and improve environmental quality. At the same time, energy efficient intelligent construction can reduce the operating costs of the community. Through intelligent energy management systems, real-time monitoring and management of energy can be realised, energy loss problems can be identified and repaired in a timely manner, and energy waste can be reduced. Intelligent equipment and systems can also automatically adjust the operating status, reducing energy consumption and equipment maintenance costs. In

addition, the intelligent construction of energy efficient requires the use of advanced technical means and innovative solutions. This promotes the development of technological innovation and application and promotes the progress of intelligent construction in society and even the country.

In terms of community environment construction, intelligent construction can be embodied in community environmental autonomy, public space and facilities, community cultural communication, and community transport networks. First, digital platforms can be used to help community environments achieve autonomy. Intelligent devices and sensors are used to collect real-time data on the community environment, including air quality, noise levels, and traffic flow. Through data analysis and processing, the condition of the community environment can be understood, and problems can be identified in time to provide decision support for autonomous governance. Use intelligent equipment and robots for inspection and maintenance of community facilities and equipment. For example, drones are used to carry out inspections of building exteriors, and smart sensors are used to monitor road conditions and detect and deal with abnormalities in a timely manner. Intelligent equipment and systems can also automatically adjust their operating status, reducing energy consumption and equipment maintenance costs.



a) Shared refrigerators



b) Intelligent waste separation system

Fig.7-13 Shared refrigerator and smart waste sorting system

Reasonable introduction of new intelligent facilities enhances the sense of use of public space and improves work efficiency while contributing to energy conservation and environmental protection. For example, the adoption of intelligent rubbish classification and treatment systems improves the efficiency of rubbish treatment and reduces the impact of rubbish on the environment. At the same time, the recycling rate and utilisation rate of rubbish can be improved through intelligent means. Energy-efficient and intelligent construction can improve the quality of life of community residents. Intelligent lighting systems are adopted to automatically adjust the lighting intensity and mode according to different times and occasions, reducing lighting energy consumption; intelligent air-conditioning systems are adopted in public areas to automatically adjust the operation of air-conditioning according to indoor and outdoor temperatures and humidity and the needs of residents, reducing the energy consumption of air-conditioning. These measures not only reduce energy consumption and ease the work pressure of property and community workers, but also improve residents' sense of comfort and life satisfaction. Establish intelligent community management systems, including intelligent access control systems, intelligent security systems, to improve community security and public order management; promote sharing economic models, such as shared parking spaces, shared refrigerators (e.g., Figure 7-13 a)), to improve the utilisation efficiency of community resources; introduce IoT technology to achieve intelligent management of community facilities, such as intelligent waste classification systems (e.g., Figure 7-13 b)), intelligent energy management system, etc.; through the networking and data analysis of intelligent equipment, real-time response and early warning of community security events can be achieved to improve the community's security prevention capability.

(4) Adequate and convenient car parking allocation

With the increasing number of cars, the travelling demand of residents is growing. The design of adequate and orderly parking space configuration can meet the parking needs of residents, facilitate their travel and improve the quality of life. Adequate parking spaces can reduce the phenomenon of indiscriminate parking and improve the environmental quality of the community. Orderly parking spaces can improve road capacity, reduce congestion and traffic accidents, and improve the safety of the community. At the same time, through reasonable parking space design and planning, it can reduce the waste of land resources and improve the sustainable development of the community. Therefore, when planning and designing urban community environments, it is necessary to consider the allocation of parking spaces to create a living environment in which residents feel comfortable, safe and convenient.

First, it is necessary to fully investigate and assess the population density, travelling habits of residents, vehicle ownership and other data in the community to understand the real situation of parking space demand. In addition, the future development trend of the community should be considered to predict the future demand for car parking spaces and ensure the adequacy of parking spaces. At the same time, the parking needs of special groups, such as the disabled and the elderly, should be considered and special parking spaces should be set up for them. In the planning and design stage, the pedestrian and vehicular flow in the community should be fully considered, and the layout of parking spaces should be reasonably planned. For example, more parking spaces should be set up in areas with frequent resident activities for the convenience of residents. In addition, consideration should be given to the setting up of fire and safety lanes to avoid over-intensive planning of car parking spaces, which will affect the movement of fire and emergency vehicles. Implement time-sharing parking space management for different time periods. For example, some of the parking spaces can be used for commercial purposes during

daytime working hours, and then be made available for using at night when the demand for residents' parking increases. This can improve the utilisation rate of parking spaces and meet the parking demand of residents. During the use of parking spaces, order management should be strengthened to ensure the normal use of parking spaces. Through the installation of monitoring cameras and the establishment of parking management personnel, the behaviour of chaotic parking and parking on the road should be managed and punished in a timely manner, so as to maintain a good parking order. The spatial design of parking spaces in urban communities is summarised in the following strategies.

① Innovative integration of residential and parking spaces. Use the car park not only as a much-needed space, but also can be the focus of design, through innovative design concepts and methods, make the car park become a highlight or feature of the community.

② Utilise existing spatial resources. For established urban settlements, the parking function of commercial, office and other non-residential land can be given full play through the co-ordinated use of parking spaces within the living area and through the sharing of resources. At the same time, new residential communities should allocate motor vehicle parking spaces in accordance with the area and type of residence (in Shenzhen, for example, 1.2-1.5 spaces/household are allocated for more than 144 m² , 1.0-1.2 spaces/household are allocated for 90-144 m² , 0.6-1.0 spaces/household are allocated for 60-90 m² , and 0.4-0.6 spaces/household are allocated for less than 60 m²), and ensure that the parking spaces are constructed with charging facilities or reserved conditions for construction and installation.

③ Improve the problem of parking difficulties in residential areas. Encourage conditional old districts through innovative means to promote liveable and harmonious community parking construction, such as in the old city in the busy area of several non-backbones of the road reasonable planning of temporary parking spaces, night parking berths. At the same time, it is recommended that the government from the planning point of view, as soon as possible to start the old district car park planning, efforts to solve the parking problem.

④ Focus on thinking and methodological innovation. Adhere to innovation, green development, focus on innovation, methodological innovation, through scientific management techniques and comprehensive management measures, actively integrate the existing parking resources, according to the principle of ‘near and on the spot’ for optimal allocation.

7.3.2 Strategies for designing well-being environments that enhance comfort

In exploring the mechanism of ‘the built environment - well-being promotion’, the present study first identifies the key mediating role of comfort. This role is reflected in its positive impact on individual well-being, which is closely related to specific environmental elements. Specifically, green space, quality of housing, and the configuration of public space and facilities have been shown to be significantly associated with residents' environmental satisfaction and well-being (Table 7-2), resulting in a pathway of residential well-being that promotes well-being as shown

Tab.7-2 Analysis of the relationship between comfort and environmental elements

		Green space	Transport accessibility	Public spaces and facilities	Housing quality	Community management	Neighbourhoods	Culture
comfort	Relevance	0.664	0.439	0.648	0.623	0.628	0.439	0.437
	Intermediated benefits	0.193	0.13	0.185	0.182	0.102	0.083	0.082
	Mediated benefits	0.184	0.151	0.181	0.211	0.13	-0.032	0.105

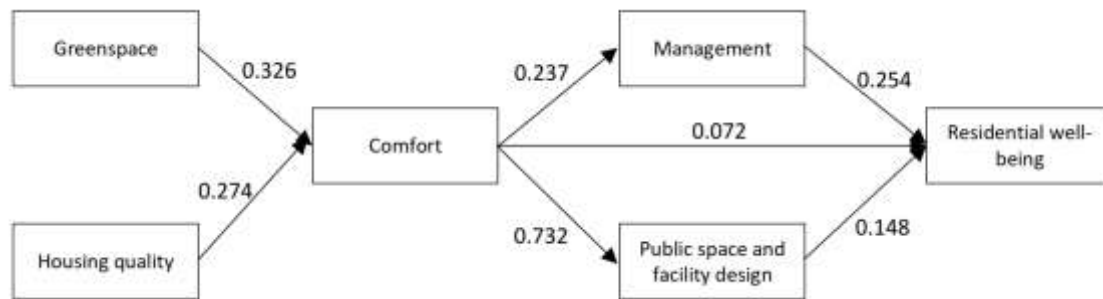


Fig.7-14 Pathways to residential well-being that promote comfort

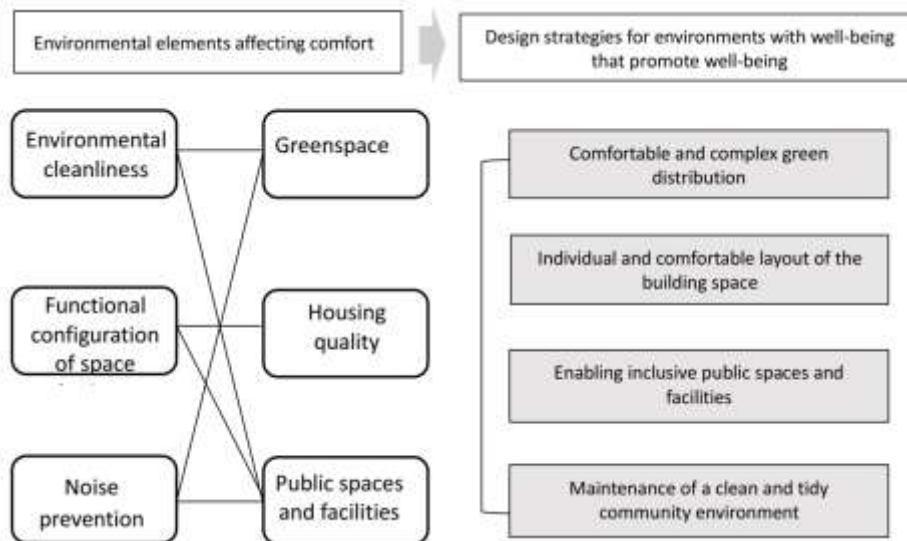


Fig.7-15 Strategies for designing wellbeing environments that promote comfort

in Figure 7-14.

Meanwhile, based on the analysis of social media data on residents' perception of the living environment, the expression of comfort can be composed of three aspects: environmental cleanliness, functional configuration of public space and facilities, and noise prevention. As a result, the study synthesises the relationship between well-being and environmental elements and the results of the social media data analysis and proposes strategies for designing well-being

environments in urban communities that promote well-being from the four aspects of community greening distribution, architectural spatial layout, design of public spaces and facilities, and maintenance of community environments. As shown in Figures 7-15, these strategies form a complete framework that aims to enhance residents' comfort and well-being by improving the environmental quality of urban communities. This is not only an in-depth application of the 'the built environment - well-being promotion' mechanism, but also an important guide for future urban community planning and design.

(1) Comfortably complex distribution of greenery

Green spaces should be designed to promote social interaction, which is essential for mental health and community cohesion. This can be achieved by installing facilities such as picnic areas, community gardens and amphitheatres for community activities in the green space. Community gardens promote social interaction while providing opportunities for physical exercise and access to fresh produce. Considering the planning and design standards for residential areas, including building layouts, spacing of dwellings, and sunlight standards, all need to be integrated with the city's geographic location, building climate zoning, and other factors. This suggests that in cities, greening design needs to take these factors into full consideration to ensure that green space



a) Distribution of monofunctional greenery



b) Semi-enclosed greening distribution

Fig.7-16 Green spaces within the neighbourhood f

meets the living needs of residents.

Taking the district f with the highest satisfaction of green space as an example, the same green space with similar appearance and form, Figure 7-16 a)) only has a single green landscape function for people's enjoyment, while Figure 7-16 b)) adopts a semi-enclosed spatial layout to combine the open space and the green space, which compounds the multiple functions of rest, communication, and greening, and encourages people to carry out communication behaviours in this space. At the same time, the green space should be designed to encourage physical activities such as walking, jogging, cycling and playing. This can be achieved by providing walking and cycling paths, children's playgrounds and open spaces for group activities in the green space. Physical activities are essential for maintaining physical health and reducing stress, while a rich distribution of greenery can effectively reduce the impact of noise generated during recreational activities on residents in the residence and help to enhance their sense of comfort in the living environment.

(2) Individual and comfortable building space layout

In a populated urban environment, noise can be a major problem. Therefore, residential spaces should be designed with acoustic considerations in mind. This can be achieved using sound-absorbing materials, double-glazed windows, well-laid-out walls and partitions. At the same time, the choice of

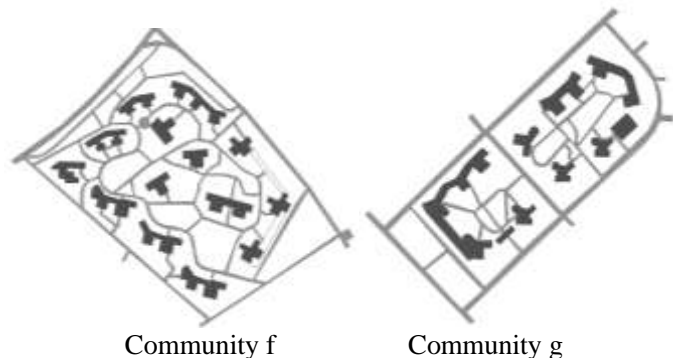


Fig.7-17 Group layout between residential buildings in community f and community g

materials used to decorate interior spaces is key to creating a comfortable residential space. This includes the choice of colours, textures and finishes, as well as furniture and accessories. A uniform colour scheme creates a harmonious appearance, while the matching of textures and finishes adds visual interest. The choice of furniture and accessories should complement the overall design theme. In addition, given the blurring of boundaries in modern living, the building design should support a flexible 'live-work-play' model to accommodate a variety of uses and activities.

In addition, the group layout between residential buildings is a key factor in influencing living space. For example, in the sample districts f and g, which have a high level of residential satisfaction, the spatial layout of the buildings is mainly in the form of clusters (Figure 7-17), in which the residential buildings in district f have a height of 18 floors and an average distance between residential buildings of about 40 metres, whereas in district g, the residential buildings have a height of 30 floors and an average spacing between buildings of about 28 metres. During conversation with the residents, some of them living on the lower floors mentioned that the distance between buildings was narrower and there would be blockage of daylight during daytime. Although urban communities need to utilise compact land space to accommodate as many residents as possible, constructing too many residential buildings with too many storeys will inversely affect residents' living comfort. Therefore, the layout of residential groups in urban communities can optimise the spatial layout by avoiding excessive residential density in planning, maintaining building spacing, and arranging residential buildings regularly or freely around central green areas, water features or supporting buildings to form aesthetically pleasing and varied group forms.

(3) Enabling inclusive public space and facility design

The first step in designing inclusive public spaces and facilities is to understand the needs and desires of the community. This requires engaging with the community through surveys, public meetings and workshops to gather their opinions and ideas. This participatory approach ensures that the design reflects the values and needs of the community and fosters a sense of ownership and pride among residents. Inclusiveness should be the guiding principle of the design process. This means creating Spaces that are accessible and welcome to all, regardless of age, gender, race or ability. Universal design principles should be used to ensure that facilities are accessible to persons with disabilities. For example, ramps and handrails should be included in the design, and signs should be clear and easy to read. Cultural diversity should also be considered in the design of community public spaces and facilities. Public spaces should reflect the cultural heritage and identity of the community and foster a sense of belonging and pride. This requires incorporating elements of local art, architecture and history into the design.

Empowerment is also an important aspect of inclusive public spaces. This includes creating opportunities for residents to participate in the decision-making process and play an active role in managing and maintaining public spaces. This can include forming community groups to oversee the management of public spaces or providing training and resources for residents to take on roles such as community gardeners or park rangers. Strengthening community institutions such as schools, health centres and community centres is another important strategy. These institutions can provide vital services, facilitate social interaction, and be a focal point for community life. They can also provide opportunities for residents to contribute to the community, for example, by volunteering or serving on boards or committees.

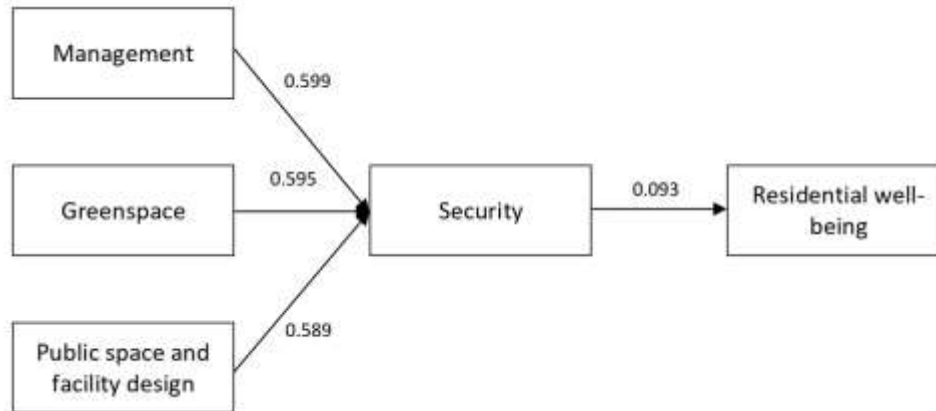
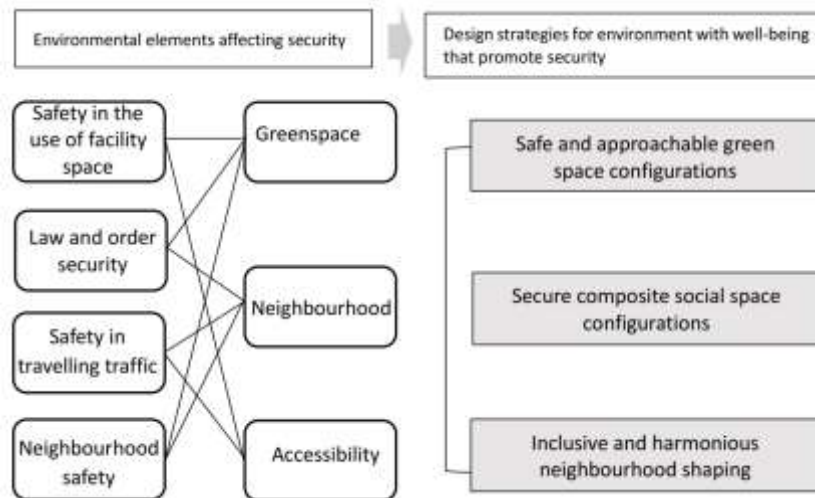
(4) Clean and tidy community environment maintenance

A clean and tidy community environment can effectively enhance the comfort of urban residents, and environmental cleanliness can be maintained through a multi-faceted approach that integrates sustainability, functionality and community participation. From a designer's point of view, in terms of integrating green infrastructure, natural elements are integrated into the urban landscape, such as green walls, green roofs and indoor gardens, to improve air quality and provide peaceful Spaces for residents. At the same time, ensuring convenient public transportation can reduce dependence on personal vehicles, thereby reducing exhaust emissions and air pollution. Installing durable, low maintenance, easy to clean and vandal-proof street furniture and facilities during the design process ensures the longevity and cleanliness of public spaces. For residents, regular activities can be organized to encourage their participation in environmental conservation, providing workshops and materials on sustainable practices, waste reduction and the importance of a clean environment to equip residents with knowledge for positive change. This cultivates residents' sense of ownership and responsibility for community space and facilities and enhances the awareness of maintaining a clean community environment. From the perspective of relevant government departments, regulations against littering and illegal dumping can be implemented and strictly enforced, with penalties for violations and rewards for compliance. In addition, the management of the property is also extremely important, with clear policies in place for regular maintenance of public spaces, green infrastructure and waste management facilities to ensure that they are kept clean and functioning properly.

7.3.3 Strategies for designing well-being environments that enhance security

Tab.7-3 Analysis of the relationship between security and environmental elements

		Green space	Transport accessibility	Public spaces and facilities	Housing quality	Community management	Neighbourhoods	Culture
security	Relevance	0.489	0.55	0.488	0.527	0.477	0.221	0.466
	Intermediated benefits	0.11	0.055	-0.012	-0.008	0.051	0.036	-0.056
	Mediated benefits	0.119	0.069	0.005	0.017	0.052	0.111	-0.045

**Fig.7-18** Pathways to residential well-being that promote security**Fig.7-19** Strategies for designing wellbeing environments that promote security

From the mechanism analysis of "the built environment-well-being promotion", the sense of security, as the key influence in the mechanism of environmental impact on well-being, is closely related to three factors of environmental satisfaction, namely green space, neighbourhood

relationship and accessibility of public transportation, as shown in Table 7-3. As shown in Figure 7-18, the path for promoting the security of urban community environment happiness is formed. At the same time, based on the social media data analysis of residents' perception and expression of living environment, the expression of security can be composed of four aspects: the use safety of public space and facilities, public security, travel and traffic safety and neighbourhood communication safety. Therefore, the relationship between comprehensive security and environmental factors and the analysis results of social media data are studied, and the environment design for well-being strategies for urban communities to promote security are proposed from three aspects: community green space allocation, public social space allocation, and neighbourhood atmosphere shaping (Figure 7-19).

(1) Safe and close green space configuration

Green space can greatly enhance the comfort and beauty of building space. Indoor green spaces not only integrate visually with nature, but also improve air quality and reduce stress. At present, the layout of green space in most residential areas in China is mainly based on the subjective

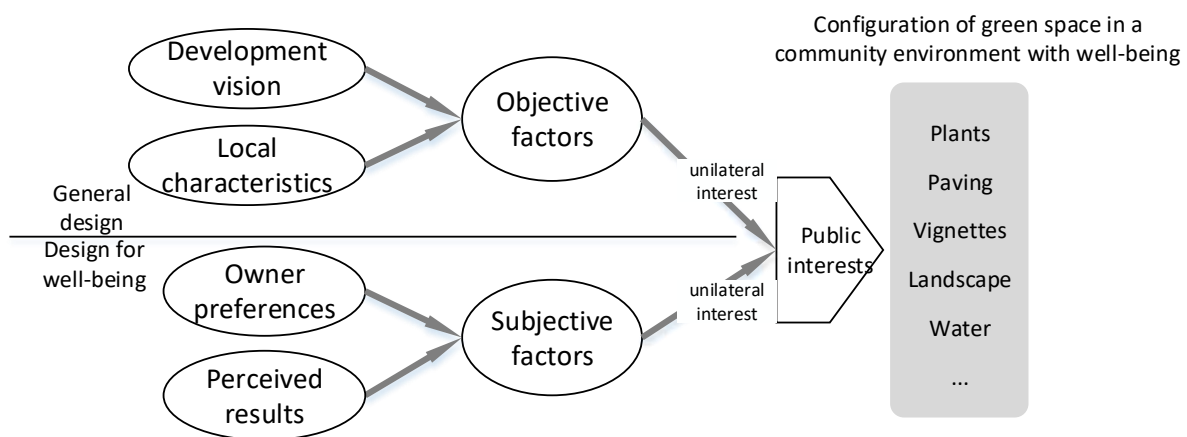


Fig.7-20 Patterns of green space configuration for well-being environments

design of the designer, and the appropriate green space is allocated according to the planning of the residential area or the geographical location. However, for the green space design of urban community happiness space, it is necessary to integrate objective factors such as community collective memory, regional characteristics, vision goals of real estate developers, and subjective factors such as owners' preferences and users' perception results, as shown in Figure 7-20. Due to the different local information carried by each residential area, the configuration of green space should be planned according to regional characteristics and local design guidelines, and further provide clear design guidance for the detailed design of plant selection, paving, landscape pieces and waterfront landscape in green space.

In addition, the green space should be used for all the members of the community, including children, the elderly and the disabled.



Fig.7-21 Easily accessible inter-house green spaces and public green spaces

This applies to inclusive and

accessible design, which can provide ramps for wheelchair users, tactile pavements for the visually impaired, and safe play areas for children. In addition, the green space should be adequately illuminated with clear lines of sight to improve safety. In addition, the green space between houses should be integrated into the built environment, making it easy for residents to reach and use (Figure 7-21). This can be achieved by using similar design elements and materials in both the built and natural environments. In addition, green space should be easily accessible from residential and commercial areas to encourage frequent use of green space.

(2) Safe and complex social space configuration

In urban communities and neighbourhoods with limited land resources and high population density, public space is often very valuable. Therefore, it is critical to fully and efficiently utilise existing spaces and promote the concept of sharing. This may involve creating multi-purpose spaces that can be used for a variety of activities, such as parks that can be used for sports, picnics and community events. Vertical green spaces, such as rooftop gardens and vertical farms, can also be incorporated into the design to provide residents with access to nature and opportunities for outdoor socialising. Taking cell f as an example (see Figure 7-22), a small number of fitness equipment or sitting tables and chairs are set up at the edges of the building to allow residents to engage in recreational activities while relaxing and chatting, which makes efficient use of the vacant building space to provide residents with public facilities and space that can be used at the same time, and improves the utilisation rate of the space while meeting the diversified demand for services. Community activities and clubs are organised in the complex space to bring people together and encourage interaction. These social networks and relationships can provide a sense of belonging, reduce isolation and promote mutual support, which is particularly important in high-density urban environments where people often live near each other but may not be familiar with each other. Public spaces with complex functions can be



a) Building junctions



b) Shelter of the sky corridor



c) Edge of the buildings

Fig.7-22 Public space and facilities in neighbourhood f

used to enable community education programmes, workshops, forums, providing opportunities for residents to learn new skills, share knowledge and experiences, and discuss community issues.

In summary, the design of inclusive community public spaces and multiple enabling infrastructures in high-density urban neighbourhoods requires an integrated approach that considers community needs and aspirations, cultural diversity, safety and sustainability. By collaborating with a diverse group of designers and applying the principles of design for well-being environments, designers can create community social spaces that are accessible to all residents, inclusive, and have a high level of residential well-being.

(3) Inclusive and harmonious neighbourhood atmosphere shaping

Good lighting, clear sight lines and well-maintained facilities help create a sense of belonging and security for neighbourhood residents. Crime prevention through environmental design, such



a) Access control systems b) Street kiosks c) Parking d) Women's and children's homes

Fig.7-23 Safe and rational mix of public spaces



a) Description of facilities b) Fitness area paving c) Trash can siting

Fig.7-24 Combination of public facilities and spaces

as the installation of owners' access control systems in gated communities (e.g., Figure 7-23 a)), all-round monitoring arrangements without dead ends in the community, the configuration of security booths at entrances and exits of the community and on major streets within the community (e.g., Figure 7-23 b)), and regular security guards patrolling on a timed basis can reduce the likelihood of crimes in the neighbourhood and enhance the sense of security of the people's residence. In addition, the use of free space between buildings to set up a unified non-motorized vehicle parking place (such as Figure 7-23 c)) can be avoided due to indiscriminate parking caused by the blockage of roads in the district and the explosion of electric vehicles into the home and other incidents of security threats to the residents, but also to help the harmony of the neighbourhood, to prevent the occurrence of quarrels and fights due to improper parking. At the same time, the rational use of public libraries or chess rooms in the community to set up neighbourhood women's and children's homes (as shown in Figure 7-23 d)) or care homes for the elderly, to protect the basic rights and interests of the majority of residents in the community and to pay attention to the special needs of the disadvantaged groups, and to improve the sense of security and belonging of women, children and the elderly. In addition, the rational arrangement and safe use of public facilities are also more important. For example, fitness equipment is labelled with instructions and demonstration pictures, and the floors are paved with separate rubber anti-slip materials to ensure that residents understand how to use the facilities and will not be injured (as shown in Figures 7-24 a) and 7-24 b)); bins are placed in the corners next to the buildings to ensure that they do not obstruct the travelling of the residents and that they emit a smell that has a minimal impact on the lives of the residents (as shown in Figure 7-24 c)).

Combined with the case and the previous section, the following strategies can be followed when conducting the shaping of a harmonious neighbourhood atmosphere in an urban community's well-being environment.

① Enhance the accessibility of equity awareness. When organising community activities and designing spatial functions, the needs of users of different ages, cultural backgrounds, social classes and abilities need to be considered to ensure that everyone can freely, easily and comfortably access and use public spaces. For example, for the disadvantaged, there are outdoor facilities to ensure the safety of wheelchairs and walking, and indoor green corridors with clear instructions.

② Build a network of high-quality public spaces. Combined with organic urban renewal, increase the scale and density of community public space, and ensure that there are high-quality public spaces for residents to use in each community living circle, including parks, squares, open spaces, pavements, waterfronts, streets and other spatial elements, which will help to promote positive and harmonious neighbourhood relations.

③ Promote community cohesion. High social cohesion in the community demonstrates significant effects in alleviating depression, which in turn substantially increases residents' satisfaction and perceived well-being in the community. This cohesion not only promotes a harmonious atmosphere in the community, but also provides residents with stronger emotional support and a sense of psychological belonging. Therefore, during the design process, designers should think deeply about how to enhance communication and interaction among community members by optimising public space to further strengthen community cohesion.

④ Consider cultural inclusiveness and avoid traumatic memories. In creating a more inclusive neighbourhood, it is important to consider whether the nature of the public space is culturally inclusive and does not evoke traumatic memories. This means that the design should consider not only the accessibility of the physical space, but also the cultural significance and social impact of the space.

7.3.4 Strategies for designing well-being environments that enhance belonging

Tab.7-4 Analysis of the relationship between belonging and environmental elements

		Green space	Transport accessibility	Public spaces and facilities	Housing quality	Community management	Neighbourhoods	Culture
belonging	Relevance	0.65	0.534	0.622	0.604	0.557	0.477	0.531
	Intermediated benefits	0.051	0.012	0.126	0.065	-0.131	0.316	0.104
	Mediated benefits	0.073	0.008	0.239	0.121	-0.075	0.082	0.127

From the mechanism analysis of "the built environment-well-being promotion", belonging as the key influence in the mechanism of environmental impact on well-being, is closely related to three elements of environmental satisfaction, namely, public space and facility design,

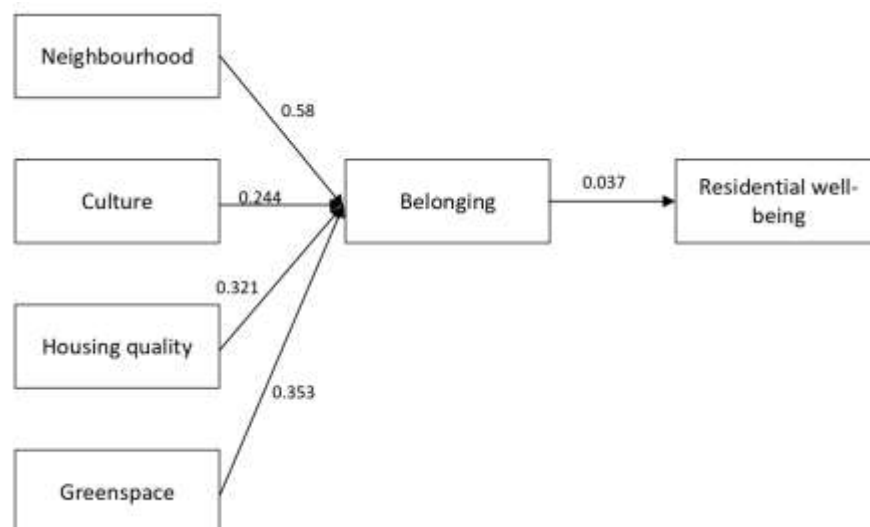


Fig.7-25 Pathways to residential well-being that promote belonging

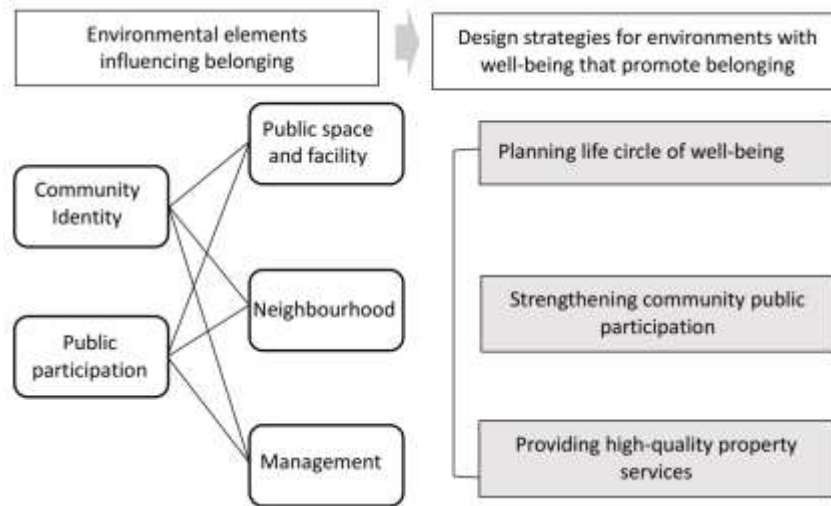


Fig.7-26 Strategies for designing wellbeing environments that promote belonging

neighbourhood relationship, and community management, as shown in Table 7-4. As shown in Figure 7-25, the path of promoting the sense of belonging of urban community environment well-being is formed. At the same time, based on the social media data analysis of residents' perception and expression of living environment, the expression results of belonging are mainly composed of two aspects: community identity and community public participation. Therefore, the relationship between belonging and environmental factors and the analysis results of social media data are studied, and environment design strategies for well-being to promote belonging are proposed from three aspects: planning life circle of well-being, increasing community public participation, and providing high-quality property services (see Figure 7-26).

(1) Planning life circle of well-being

In the past ten years, the "15-minute community life circle" has gradually been advocated by scholars in the field of architecture and planning from the initial concept. The Central Urban Work Conference in 2015 advocated the five major urban development concepts of "innovation, coordination, green, sharing and openness", which provided guidance for the direction of urban

construction. At the same time, Shanghai introduced the concept of "15-minute community life circle" in the new round of master planning, aiming to use it as a basic unit to build community life. This concept is based on the concept of people-oriented living environment and strives to

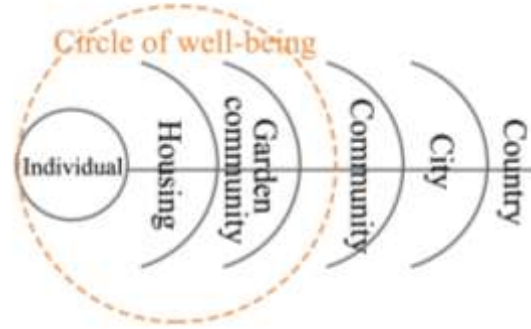


Fig.7-27 Circle of well-being

re-examine and shape the community environment from the perspective of people to create a more liveable community space. China's community area is not very uniform, and some neighbourhoods are far too large to walk. Therefore, the scope of the "happy life circle" is



Fig.7-28 Characterization of the configuration of public spaces and facilities in the neighbourhood f

divided into the community (as shown in Figure 7-27), and the area outside the community within a 15-minute walking distance is equipped with public spaces and facilities to meet the material, social and spiritual needs of residents.

According to the functional configuration of the public space inside the community f and the public space and service facilities within a 15-minute walking distance around the community, the public space and facility feature diagram of the community f as shown in Figure 7-28 is summarized. Within a 15-minute walk, almost all basic service facilities and public spaces needed for daily life are covered, including educational places, medical places, park squares, cultural places, fitness and sports places, shopping places, which are sufficient to meet the material, social and spiritual needs of f residents. The function configuration of the public space inside the community is also more comprehensive. In terms of leisure and entertainment, not only take into account the children's amusement facilities, but also configure space for the elderly to play chess and cards; In terms of life services, infrastructure such as small supermarkets, party and mass service centres, and kindergartens are equipped; In terms of sports and fitness, sports space and facilities such as swimming pool, fitness equipment, table tennis and basketball have been set up to meet the needs of diverse people. In addition, from talking with residents, the clean and tidy garbage sorting area and clear guidance signs are also an advantage of community f. In addition, community f divides a special cultural activity space in the public space, and regularly organizes community cultural activities, such as playing games and giving welfare during holidays, holding community concerts, and carrying out mutual help and volunteer activities to form a social network in the community and enhance the cohesion and sense of belonging of community residents.

In addition, communities can leverage digital platforms to share community culture, promote cultural events and activities through social media, and leverage technology to make cultural experiences more accessible and interactive. Technology can also be used to record and preserve cultural heritage, promote global connections and cultural exchanges, and build self-owned brands. At the same time, social media platforms can also be considered to promote communication and interaction between communities and residents. Establish an intelligent information sharing and interaction platform, so that residents can understand community affairs and participate in community decision-making through mobile applications or online platforms. Residents can report problems, make suggestions, and communicate with community managers to enhance residents' sense of belonging and identity in the community.

(2) Strengthening community public participation

In the field of architecture, public participation plays a multi-faceted role in enhancing the sense of belonging in residence. It can not only improve the material environment of the community, but also promote the development of community spirit and culture and enhance the social connection of residents. The degree of participation of community residents in the process of community planning, design, construction and management determines the satisfaction of residents' subjective needs, increases the possibility of healthy development of residents' neighbourhood relations, and thus builds trust in community management.

① Open public space and facility design

Public spaces should be designed to be open and accessible, encouraging residents to use and interact. For example, a community centre could be designed to be semi-open, with spacious entrances and clear glass walls, allowing residents to always see inside activities. At the same

time, public spaces should be versatile and meet the needs of residents of different ages and interests. For example, a community park may contain a children's playground, fitness area, leisure seating and walking paths. Decorate public spaces with art works or murals to enhance the beauty of the space while reflecting the culture of the community. For example, community walls can display works by local artists or murals created by residents themselves.

② Establishment of mutual assistance platform within the community

Use information service platforms, such as WeChat groups, community websites or other mobile applications, to establish an information platform for neighbourhood assistance, encouraging residents to help each other when needed, such as babysitting, temporary borrowing, etc. Encourage residents to actively participate in the construction of the mutual aid grid and improve residents' sense of participation and belonging by organizing various community activities, such as health lectures, cultural festivals, and environmental cleaning. Make use of public spaces within the community, such as parks and activity centres, as places for neighbourhood assistance activities to promote communication and interaction between residents. In addition, the operation of the Neighbourhood Help Grid is regularly monitored and evaluated to ensure its effectiveness and sustainability, and adjustments and improvements are made based on feedback. Integrate resources inside and outside the community, including government departments, social organizations, enterprises and businesses to provide necessary materials and financial support for the neighbourhood mutual aid grid.

(3) Providing high-quality property services

The quality of community management has a great impact on the sense of belonging of residents. Community management should adhere to the original intention of people-oriented, pay attention

to the needs and wishes of residents, and cultivate a strong sense of community through thoughtful design and management measures. Based on specific environmental factor indicators summarized by systematic literature review, community management involves sanitation and waste management, property service quality, and facility maintenance. To create high-quality community property services, the following measures can be taken.

① Clear property service standards

Establish clear service standards and processes to ensure the quality and efficiency of property services. These standards should cover safety, cleaning, maintenance, customer service and more. Conduct regular training for property staff to improve their professional skills and service awareness. Ensure that staff can treat residents in a friendly and professional manner. Provide regular cleaning services to keep the community clean and tidy. At the same time, focus on greening work to create a liveable community environment.

② Strengthen the interaction mechanism with residents

Establish effective communication channels, such as community bulletin boards, WeChat groups, E-mail lists, so that residents can learn about property service information in a timely manner and provide feedback. Establish multi-channel communication, provide telephone, email, online questionnaire, community bulletin board and other feedback channels to adapt to the communication habits of different residents. Regular design consultation on themes and content ensures comprehensive coverage of all aspects of community management. Set a reasonable consultation cycle, such as monthly, quarterly or yearly.

Regularly organize community activities, such as festival celebrations, health talks, parent-child activities to enhance community cohesion and enhance residents' sense of belonging. Encourage residents to participate in community management, such as through residents' committees or volunteer organizations, so that residents can play a greater role in community affairs. Establish an effective interaction and feedback mechanism for residents, promote the communication between residents and property managers, enhance the transparency of community management and residents' satisfaction, ensure the sustainability and dynamics of the mechanism, and constantly adjust and optimize according to the feedback of residents.

③ Expand value-added services

To enhance the transparency of property services, regularly publish financial reports, service improvement plans, so that residents can understand the use of property fees. Establish a rapid response mechanism to respond quickly to the needs of residents such as repairs and complaints and solve problems in a timely manner. Regularly collect the service needs of residents, timely adjust the provision of value-added services, such as express collection, housekeeping services, rental information release, to improve the convenience of residents' lives.

7.3.5 Strategies for designing well-being environments that enhance pleasure

According to the mechanism analysis of "the built environment - well-being promotion", as one

Tab.7-5 Analysis of the relationship between pleasure and environmental elements

		Green space	Transport accessibility	Public spaces and facilities	Housing quality	Community management	Neighbourhoods	Culture
pleasure	Relevance	0.715	0.465	0.753	0.622	0.74	0.396	0.324
	Intermediated benefits	0.493	0.005	0.282	0.238	0.289	0.021	0.017
	Mediated benefits	0.213	-0.031	0.076	0.141	0.199	-0.038	0.015

of the positive emotions that urban residents can perceive in their living environment, pleasure is closely related to three factors of environmental satisfaction, namely green space, community management and housing quality, as shown in Table 7-5. As shown in Figure 7-29, the improvement path of urban community residential well-being that promotes pleasure is formed. At the same time, based on the social media data analysis of residents' perception and expression of living environment, the expression results of pleasure can be composed of three aspects: community space atmosphere creation, architectural appearance identification, and green

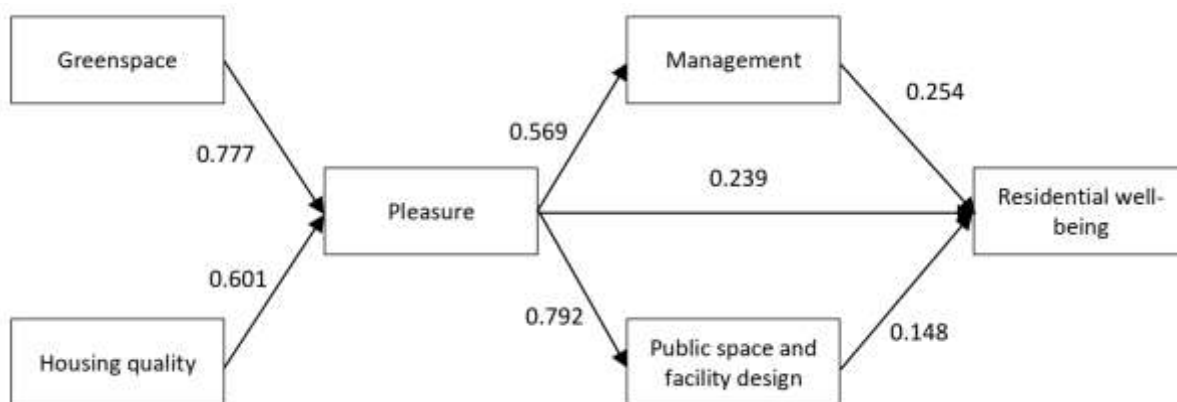


Fig.7-29 Pathways to residential well-being that promote pleasure

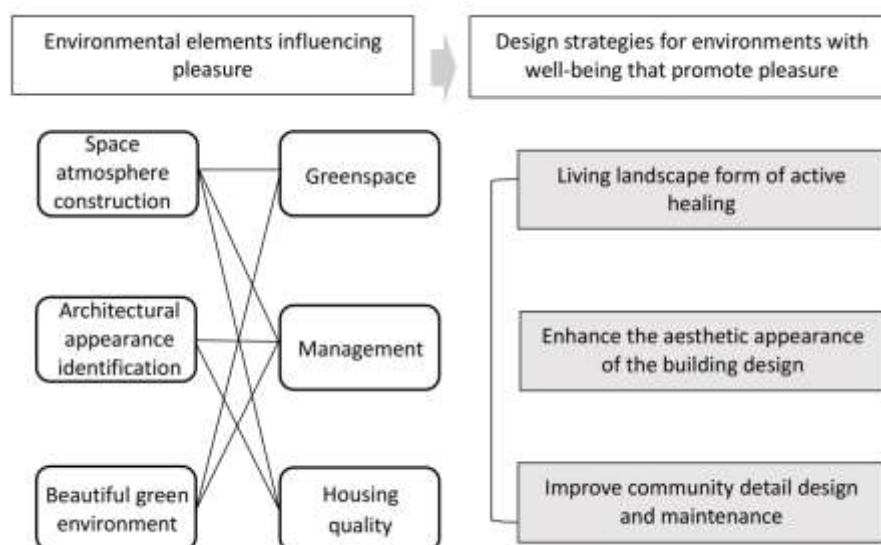


Fig.7-30 Strategies for designing wellbeing environments that promote pleasure

environment aesthetics. Therefore, the relationship between pleasure and environmental factors and the analysis results of social media data are studied, and the environment design for well-being strategies for urban communities that promote pleasure are proposed from three aspects: active healing residential landscape form, architectural appearance design that enhances aesthetic feeling, and detailed community design that improves community design (see Figure 7-30).

(1) Living landscape form of active healing

In high-density urban environments, noise pollution can be a significant problem. Green spaces should therefore include quiet areas for people to relax, meditate or engage in other quiet



Fig.7-31 Creating quiet spaces through greenspaces

activities. These areas can be created by using trees and shrubs as natural sound barriers and by placing benches or other seating in secluded areas (Figure 7-31). Green spaces should incorporate natural elements such as trees, shrubs, flowers, grass, water and rocks. These elements not only enhance the beauty of green spaces, but also provide habitat for a variety of species and promote biodiversity. The presence of bodies of water can have a calming effect, while the colours and smells of different plants can stimulate the senses and promote mental health.

In addition, to enhance the healing of green spaces, the principles of therapeutic landscape design can be adopted to build green spaces. Therapeutic landscape design principles focus on creating

environments that promote healing and wellness. This can be achieved by incorporating elements such as healing gardens, sensory gardens and healing paths. Wellness gardens are designed to provide a peaceful environment that promotes relaxation and reduces stress. The sensory garden stimulates the senses using brightly coloured, aromatic and richly textured plants. Healing trails are paths designed to provide a variety of physical challenges that promote physical health and recovery.

To sum up, in the design of urban community green environment, the allocation of safe and close green space needs to consider many factors comprehensively to ensure the safety, comfort and convenience of residents. Combined with case research and existing design principles and literature research, how to design green space for health healing in urban communities can be summarized as the following strategies.

① Follow the principle of ecological priority. The design should follow the principles of "ecological priority, local conditions, safe connectivity, and economic rationality", while considering the principle of low-impact development, and rationally using the site space to set up green rain gardens. This helps to protect important ecological elements of the community, maintain the integrity of the community ecological spatial structure, and ensure the community ecological security.

② Security and continuity. It is essential to ensure the safety and continuity of the greenway. Urban green space involving the safety of visitors must be set up corresponding warning signs, and in the design to consider the needs of different groups, such as children's play area safety measures.

③ Design of hydrophilic space. Where possible, create a hydrophilic space, such as setting up a hydrophilic platform, and design the necessary safety measures. This will not only increase the interest of the green space, but also provide residents with the opportunity to get close to nature.

④ Multi-functional space planning. Urban green space design should consider a variety of functions, such as recreation, ecological protection, culture and education. Through the scientific formulation of afforestation related plans, reasonable layout of green space, and comprehensive construction of natural protection areas and urban green space system.

⑤ Use roof greening and three-dimensional greening. In the multi-storey layout, the roof greening of public buildings can be used while the building density can be appropriately increased. This approach can not only increase the green area, but also improve the urban microclimate and improve the quality of life of residents.

⑥ Construction of community parks and pocket parks. The construction of community parks and similar parks will be strengthened to promote the construction and maintenance of tree-lined roads, and comprehensively develop three-dimensional greening. These small parks and pocket parks can provide residents with easily accessible green spaces to meet their daily recreational needs.

To sum up, the design of green space for health healing in high-density urban community living environment needs to consider many factors such as the physiological, psychological and social needs of community residents. Through design strategies such as incorporating diverse natural elements, promoting physical activity and social interaction, creating quiet and therapeutic

Spaces, and ensuring accessibility and safety, green spaces can significantly enhance the quality of life and well-being of residents in urban communities.

(2) Architectural appearance design to enhance aesthetic feeling

The use of high-quality materials can greatly enhance the beauty of residential buildings. When selecting materials, consider their visual effects, durability and ease of maintenance. Natural materials such as wood, stone and leather can add warmth and texture, while metal and glass can add a modern touch. Using modern building materials and technology to look back at the history, which can bring fresh leisure experience to residents while maintaining the traditional style of the community. In addition, the exterior design of the residential building should reflect the personality and lifestyle of the occupants. At present, due to some economic reasons, most residential buildings look identical in appearance, and real estate developers always hope to achieve the design goal of low risk at low cost, which leads to the appearance design of residential buildings in the same area is almost the same lacking individuality. For interior design, refined finishes are sold in a way that makes it impossible for residents to personalize colours, materials, furniture and space arrangements to their own preferences. Developers and designers should use modern building materials and technologies to break through traditional building facade design, such as innovative insulation wall materials such as local seaweed, and low-radiation glass Windows, effectively control energy consumption and improve thermal performance, while considering budget control through high-performance facade design can significantly improve occupant productivity and building appearance. It also helps to make residents feel more cheerful and a greater sense of belonging.

Natural light plays a vital role in creating beautiful residential Spaces, and maximizing the use of natural light can not only save energy but also promote residents' enjoyment of living. It not only enhances the visual appeal of the space, but also promotes physical and mental health. The design strategy should include large Windows, skylights and open floor plans that allow natural light to penetrate the living space. Research on the application of colour design in urban residential buildings shows that the appearance colour of buildings has a direct impact on people's psychological emotions. Therefore, the rational use of colour in the appearance design can not only beautify the appearance of the building, but also enhance the emotional experience of the occupants and further improve the happiness of living. Light-coloured walls and reflective surfaces also help distribute light evenly. In high-density urban community housing, architectural space is often very valuable. Therefore, efficient use of space is key. This can be achieved through multi-functional furniture, built-in storage solutions, and flexible layouts that can be easily reconfigured to meet changing needs. Vertical space can also be exploited through loft beds, elevated and hanging storage, increasing the utilization of compact spaces.

(3) Improve the detailed design and maintenance of the community

The construction of community space atmosphere can help enhance the pleasant experience of residents. Combined with the environmental indicators corresponding to community management and the emotional indicators included in the sense of pleasure summarized above, the construction of community space atmosphere may involve the pavement design of community walking roads, the colour matching of public spaces and facilities, the design of cultural publicity areas, the design of guiding street signs, the arrangement of lighting facilities,

and the maintenance of barrier-free facilities. The specific design strategy is proposed from the following aspects.

① Pavement design of community walking road

In terms of material selection, environmentally friendly and durable materials such as pervious concrete or imprinted concrete are used to adapt to different climatic conditions. Ensure that the width of the pedestrian road is appropriate to meet the needs of traffic, but also leave room for greening or other functional areas. To increase the interest of walking, the road can be designed in a curved shape, while setting up rest areas or viewing points at the turns.

② Colour matching of community public spaces and facilities

The colour of the facade of the building should be as warm and soft as possible, such as beige, light grey to create a comfortable living atmosphere. The colour of the ground pavement in the public area uses contrasting colours or similar colours to distinguish different functional areas, such as the children's play area can use bright colours to attract attention. To attract residents to actively participate in fitness activities, the colour of fitness facilities can choose bright and lively colours, such as blue, yellow, red, and green.

③ The placement of guiding street signs in the community

A complete sign system should be established in the community, including direction instructions, facility descriptions, to improve the convenience of residents. Since there are generally children, the elderly, the disabled and other multi-feature groups in the community, the design of the street sign should be clear and easy to understand, and the font size and colour should be suitable for

residents of all ages. At the same time, the street sign should be placed in a prominent and easily identifiable location, such as intersections, building entrances and other resident traffic route points, to avoid being too hidden. The design style of the street sign should be coordinated with the overall style of the community and have a certain role in enhancing the beauty of the community environment.

④ Other details design elements

The lighting design should be rationally arranged according to the lighting range to ensure the safety at night and create a warm atmosphere through the lighting. In addition, despite the relatively low use of some barrier-free facilities, it is important to ensure that all public spaces and facilities are designed with accessibility in mind for the elderly and people with disabilities. At the same time, community managers should pay attention to the regular maintenance and maintenance of public facilities to ensure usability.

7.4 Strategies for designing community environments with well-being towards different characteristic groups

Through the multivariate analysis of variance on the results of the questionnaire, it can be determined whether different levels of multiple categorical variables have a significant impact on residential well-being, that is, whether the perceived results of groups with different characteristics on residential well-being are affected by gender, age and education level. After multivariate analysis of variance, the analysis results in Table 7-6 can be obtained. From the analysis of the results of F test, the influence of age, gender and education level on residential well-being is significant. Therefore, when discussing the happiness environment design strategies for urban community oriented to well-being promotion, this study can propose the

happiness environment design strategies for urban community oriented to well-being promotion for different characteristic groups according to the different well-being needs of different groups and the different perception results of the living environment.

7.4.1 Aging-oriented design strategy of community environment with well-being

Through the previous analysis of the different needs of the elderly, the study concluded that although the elderly have a higher emphasis on basic physiological needs, they are also very concerned about the needs to improve the quality of life, such as access to nature, personal interests, community culture, social identity. This requires community workers and designers to comprehensively consider their diversified happiness needs when designing happiness

Tab.7-6 Multifactor ANOVA on residential well-being with different characteristic variables

	Sum of squares	Degree of freedom	Mean square	F	P	R ²	AdjustR ²
Age	7.448	2	3.724	4.85	0.009***		
Gender	6.072	2	3.036	3.953	0.020**	0.217	0.174
Education level	5.837	2	2.918	3.801	0.024**		

environments and services for the elderly, and jointly meet their environmental and emotional

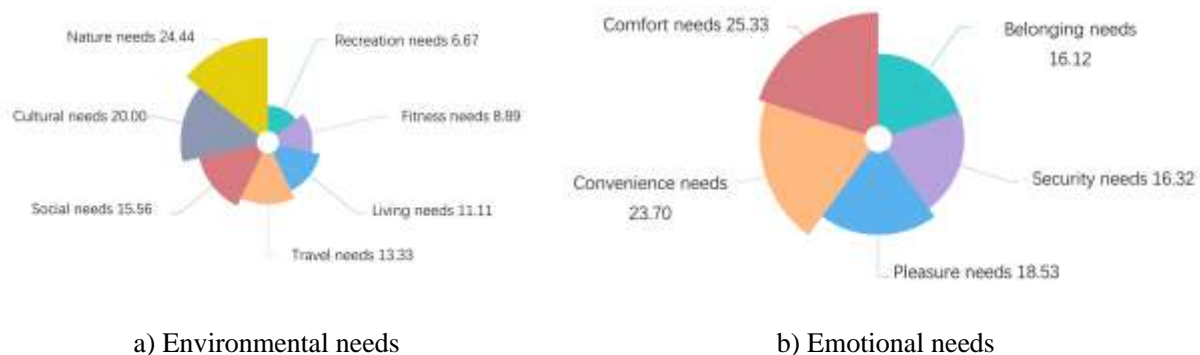


Fig.7-32 Analysis of the well-being needs of the elderly

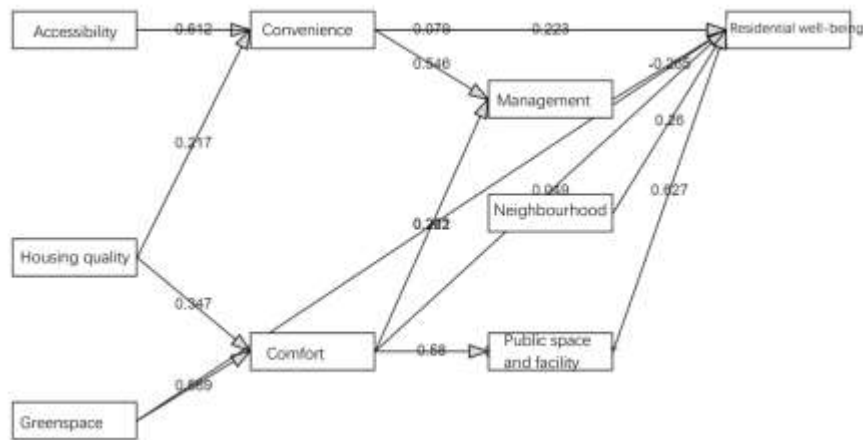


Fig.7-33 Path analysis of residential well-being in the elderly

needs to promote their overall residential well-being. This study makes a separate statistical analysis of the data of the elderly group. Figure 7-32 shows the analysis results of the elderly's needs for well-being. It can be found that the elderly's needs for nature, culture, communication and travel, as well as their needs for comfort and convenience, are relatively important among environmental and emotional needs respectively. According to the three-dimensional value

Tab.7-7 Strategic directions for designing wellbeing environments for the elderly

	Well-being needs	Elements	Environmental index
Material needs	Nature needs	Greenspace	Diversity of landscape vignette forms Percentage of green space area Quality of green space
	Travelling needs	Accessibility	Accessibility to public transport Allocation of car parking spaces Connectivity to urban roads Integrity of pedestrian paths
Social needs	Social needs	Neighbourhoods	Neighbourhood communication Neighbourhood trust
	Cultural needs	Community management	Waste segregation and hygiene Quality of property services Maintenance of space and facilities
Spiritual needs	Convenience needs	Convenience	Convenience of walking network Convenience of facility use (activities, leisure) Convenience of parking Convenience of public services (medical, commercial, educational)
	Comfort needs	Comfort	Environmental cleanliness Functional configuration of facilities Noise prevention

orientation of environment design for well-being and the set of influencing factors of residential well-being, combined with the interview results of field investigation, this study summarizes the corresponding environmental indicators for the well-being needs of the elderly according to the three-dimensional value orientation of environment design for well-being, namely material needs, social needs and spiritual needs, as shown in Table 7-7.

According to the influence mechanism of ‘the built environment - well-being promotion’, the mediating path of convenience and comfort and the path of the needs of the elderly group are combined with the path analysis of the perception data of the elderly, and the results of the path analysis of the sense of well-being of the environment can be obtained as shown in Figure 7-33. Combined with the environmental indicators in Table 7-7, it can be found that for the elderly, green space and public transport accessibility have a more significant impact on residential well-being whether through the mediating or direct effect of the sense of convenience and comfort. Perceptions of community management and the design of public spaces and facilities, on the other hand, influence the enhancement of residential well-being for older people as a mediator of convenience or comfort, while perceptions of neighbourhood relations also have a direct effect on the residential well-being outcomes for older people. Therefore, ageing-oriented design or optimisation of urban community well-being environments from these aspects can effectively enhance older people's residential well-being, mainly following the following strategies.

(1) Barrier-free public space and facility design

Typically, the scope of travelling activities of the elderly mostly takes place within the community, and the accessibility and comfort of the living environment in urban communities have a significant impact on the elderly's sense of social belonging and the reduction of loneliness. First, in terms of the relationship between environmental barriers to outdoor mobility and loneliness, environmental barriers (e.g., snow and ice cover, distance to service points, and slopes in the neighbourhood) increase the likelihood that older adults will feel lonely, even after adjusting for walking difficulties, autonomy in outdoor participation, perceived financial status, living alone, and health status. Improving environmental barriers to outdoor activity can increase older people's outdoor participation autonomy, thereby reducing their feelings of loneliness. In contrast, public open spaces have a positive impact on older people's well-being, particularly by enhancing neighbourhood communication opportunities through increased frequency of public space use, thereby developing neighbourhood social cohesion and neighbourhood trust, which can facilitate the expression of positive emotions. In addition, building age-friendly living environments can enhance the

functional autonomy of older people, including by improving the adaptability of public facilities, health services and community lighting. These adaptive improvements help older people to better integrate into the community and reduce loneliness. Adding adaptive



a) Age-friendly handles



b) Non-slip floor coverings



c) Facilities connected by steps



d) Uneven pavement

Fig.7-34 Age-friendly public spaces and facilities

handles to the use of public facilities in the community, such as staircases, public seating, height drops, fitness facilities and corridors (e.g., Figure 7-34 a)), encourages older people to engage in self-directed exercise and at the same time enhances older people's sense of security in the use of the facilities and the satisfaction of self-fulfilment. At the same time, the pavement in the community should be made of large and flat non-slip materials (Figure 7-34 b)) to enhance the safety and convenience of the elderly in the community, and to avoid installing too many facilities that require steps to reach them (Figure 7-34 c)) or uneven walking surfaces due to the splicing of different materials (Figure 7-34 d)), which would reduce the participation of the elderly in outdoor activity facilities. (Figure 7-34 d)), thus reducing the participation of the elderly in the outdoor activity facilities.

(2) Convenient walking path design

In view of the natural decline of the physical functions of the elderly, their walking speed and endurance are significantly affected. Therefore, when planning walking routes, priority should be given to placing all kinds of activity venues and necessary service facilities close to the entrances and exits of residential buildings and easy to reach, to reduce the walking distance and physical exertion of the elderly. The design of walking paths in the district should pursue high efficiency and convenience, avoiding unnecessary detours, to effectively reduce the time and physical cost of daily activities for the elderly. In addition, through prior research and

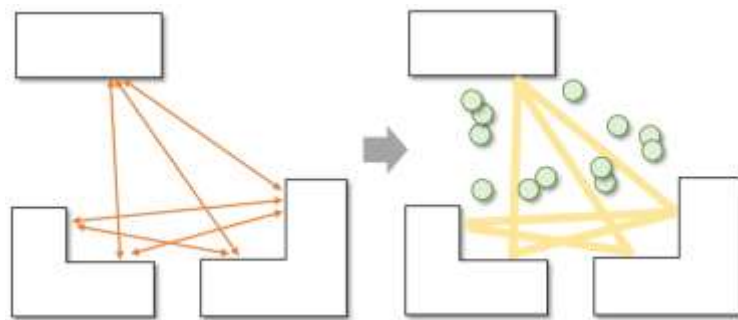


Fig.7-35 Convenient walking path presets

assessment, designers can more accurately predict the travelling needs and living habits of residents, and then optimise the design of the walking path system, using shortcuts that are closer to the actual needs of residents as the basis of the design (as shown in Figure 7-35).

(3) Enhancing the healing function of green space

Due to the change of life roles and the natural deterioration of physiological functions, the scope of activities of the elderly has been reduced and their free time has increased. In addition to some public spaces and facilities in the community, green spaces in the community provide rich natural elements and enough space for leisure and interaction for the elderly. Therefore, design tools can be used to build places in the community green environment that are conducive to the elderly's interaction with others, integrating the green landscape with the place to promote group behavioural activities such as chatting, chess and mahjong, Tai Chi. (as shown in Figure 7-36 a) and b), creating a comfortable and private activity space. Or to enhance the interaction with the green landscape green

landscape design, in the choice of plants first choose for the elderly have a healing effect of the species, the different forms of plants in a hierarchy with the formation of staggered green groups (as shown in Figure 7-36 c)). At the same time, as shown in Figure 7-36



a) Recreation space and greenery



b) Chat and greenery



c) Greening groups



d) landscape nodes

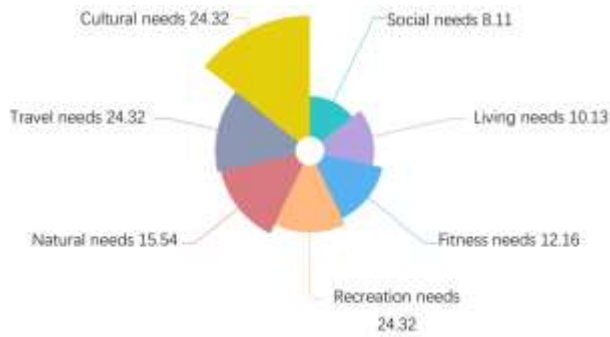
Fig.7-36 Green spaces with healing features

d)), warm ground paving with greenery, glass and wooden seats are used to form a central landscape node in the community. The construction of green spaces with both healing functions and encouraging social behaviours is essential for older people to establish positive neighbourhood relationships within the community and to promote a healthy community social environment.

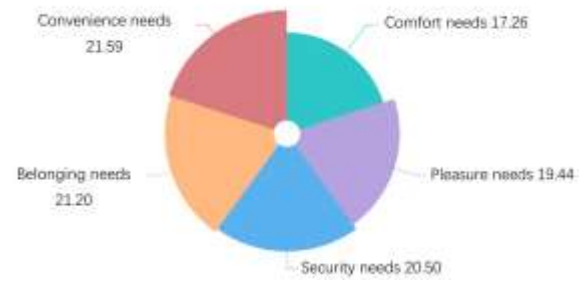
(4) Digital technologies for ageing-friendly community services

The study also found that ensuring the safety and functionality of residential environmental services, as well as providing supportive community services and facilities, are effective ways to enhance the positive emotional expression of the elderly. Between the popularity of Internet applications and the development of various emerging technologies, digital technology has made great progress in supporting ageing-friendly services. Through technologies such as the IT, big data and AI, the construction of smart community-based ageing service systems and the popularisation of the application of smart health and ageing products such as smart senior citizen bracelets and smart guardian wristwatches can help the elderly to better manage their health conditions, and at the same time improve the quality and efficiency of ageing services. In addition, it is essential to provide targeted digital skills training and education. This will not only help older persons make better use of the digital resources available to them, but also enhance their self-confidence and enable them to participate more actively in digital life.

7.4.2 Design strategies for community well-being environments that accommodate individualised lifestyles



a) Environmental needs



b) Emotional needs

Fig.7-37 Analysis of the well-being needs of the youth

Through statistical analysis, it can be obtained that the environmental needs of young people are mainly based on cultural needs, travelling needs, natural needs, and entertainment needs, while

Tab.7-8 Strategic directions for designing wellbeing environments for the youth

	Well-being needs	Elements	Environmental index
Material needs	Nature needs	Green space	Diversity of landscape vignette forms Percentage of green space area Quality of green space
	Travelling needs	Transport accessibility	Accessibility to public transport Allocation of car parking spaces Connectivity to urban roads Integrity of pedestrian paths
	Recreational needs	Public space and facility design	Distribution of accessibility facilities Accessibility of service facilities Diversity of activity facilities
Social needs	Cultural needs	Community culture	Area share of public space Participation in community activities Community Cultural Care
Spiritual needs	Convenience needs	Convenience	Convenience of walking path network Convenience of facility use (activities, leisure) Convenience of Parking Convenience of public services (medical, commercial, education)
	Belonging needs	Belonging	Community Identity Community public participation
	Security needs	Security	Safety of facility space use Security and safety Safety in travelling and transport
	Pleasure needs	Pleasure	Safety of neighbourhood interaction Atmosphere creation (floor coverings, colours, etc.) Architectural identity
			Aesthetic green environment

the emotional needs present the results of similar degree of demand in terms of convenience needs, belonging needs, safety needs, and pleasurable needs, as shown in Figure 7-37. It can be found that when choosing a place to live, the youth group not only values the conditions of the physical environment, but also attaches great importance to the participation of community culture and activities. This is because young people usually have more frequent social activities, they tend to choose those communities that can provide rich social opportunities, and youth groups like to pursue individualised lifestyles, they like to explore different cultures and activities, so communities with multiple cultures and diverse activities are more attractive to young people. Combined with the results of the interviews, and in accordance with the three-dimensional value orientation of the design of well-being environments, Tables 8 summarise the elements of residential well-being and the environmental factor of well-being needs that are geared towards meeting the material, social and spiritual needs of young people.

According to the influence mechanism of ‘the built environment - well-being promotion’,

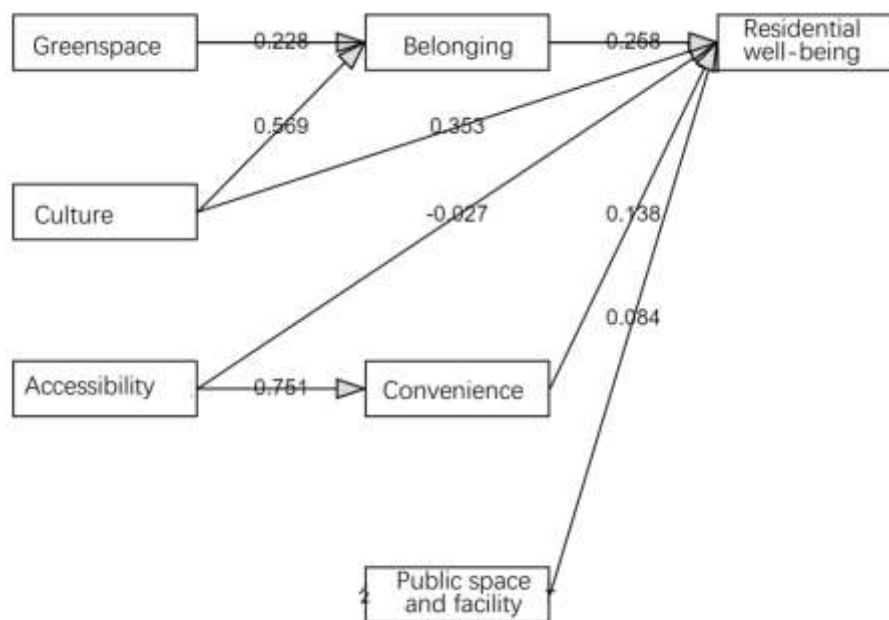


Fig.7-38 Path analysis of residential well-being in the youth

combining the mediating paths of convenience and comfort and the demand path of the youth population with the path analysis of young people's perception data, the results of the path analysis of residential well-being are shown in Figure 7-38. Combined with the environmental indicators in Table 7-8, it can be found that for young people, green space, community culture and public transport accessibility have a more significant impact on residential well-being whether through the mediating or direct effect of the sense of convenience and sense of belonging. Perceptions of the design of public spaces and amenities, on the other hand, directly contribute to young people's residential well-being outcomes. Therefore, the design or optimisation of urban community well-being environments adapted to individualised lifestyles from these aspects can effectively enhance young people's residential well-being. The youth group in this study is mainly concentrated in the age group of 15-34 years old, who are still in the stage of going to school or just starting their careers, and the need for culture also represents the importance that the youth group attaches to the value of residence and community identity. Combining the results of the actual research and the environmental indicators in Tables 7-8, this study summarises the following community environmental design strategies to adapt to young people's individualised lifestyles.

(1) Shaping community space for multiple sharing

To enhance the shaping of the cultural environment of urban communities, it is necessary to consider from multiple dimensions, including the construction of the public cultural service system, the design of the public space of residential buildings, the landscape design of community public space, and the design strategy of community cultural services. In the planning and construction history of traditional residential areas in China, the concept of 'neighbourhood

unit' has long dominated. This concept stresses that through a relatively closed space layout, combined with access control systems, fences and green belts and other means, the roads, parking spaces, landscapes, shops and other resources in the residential area are limited to the exclusive use of the residents of the district, thus creating a safe and peaceful living environment. However, the limitations of this closed design are gradually highlighted in the context of increasingly tight urban land resources. On the one hand, it restricts the smoothness of urban traffic, which may lead to traffic congestion and inconvenience in travelling; on the other hand, it also limits the coverage of public utility services, which may affect the quality of life of the neighbourhood residents. With the rise of the sharing concept and the shift in demand for living environments by the younger generation, designers have begun to re-examine the planning and design of traditional residential areas. Spaces with shared attributes are gradually receiving widespread attention and discussion, and they not only help to improve the efficiency of urban space utilisation, but also promote communication and interaction within the community, enhancing the cohesion and vitality of the community.

Therefore, in the future planning and construction of residential areas, designers should pay more attention to openness and sharing, break the traditional closed design, and introduce more shared spaces and service facilities. This will not only improve the efficiency of urban space utilisation, but also satisfy the residents' demand for diversified, convenient and socialised living, and promote the sustainable development of the city. For the youth group, they generally show a positive attitude towards opening and sharing spaces with a high degree of publicity to the outside community. This openness helps to promote communication and interaction between youth groups in the community and external groups with different cultural backgrounds and values. By opening up to the outside world, it can not only effectively alleviate the problem of

land resources constraints in high-density cities, but also build a bridge for residents to communicate with outsiders, thus promoting the diversified development of the community and the harmonious integration of society. The residential areas preferred by the youth group are mostly located in the city centre with convenient transportation, but such locations often face parking difficulties and traffic congestion on weekdays. According to the pre-study questionnaire, most youths tend to choose public transport as their travelling mode. Therefore, to alleviate the pressure of urban traffic and optimise the allocation of community resources, the study suggests opening up the parking area in the community to the public during weekday working hours, so as to achieve the sharing of parking resources. This measure will not only help alleviate urban traffic congestion, but also bring additional economic benefits to the community. These proceeds can be used to improve the community environment, such as greening upgrades and facility maintenance, or to organise colourful cultural activities to further enrich the community life of young people and enhance their residential experience and well-being.

(2) Convenient and intelligent public service facilities

With the rapid development of the information age, designers have ushered in new technological tools for reshaping the function of architectural space. Against this backdrop, the deep integration of digital technology with the community environment offers the possibility of intelligent transformation of public service facilities. It is particularly noteworthy that the youth group, as a highly receptive group of people to new things, has shown a significantly high level of concern and interest in technological products in their daily lives and work. This characteristic makes the youth group play an important role in promoting the construction of intelligent community. In the construction of youth-oriented community environment, adding intelligent

service facilities, the use of the Internet of Things, wireless control technology, micro sensors, burglar alarms and other technologies for the integrated use of automatic 24-hour monitoring and networking alarm security system facilities, intelligent parking car wash guidance facilities, can facilitate the user to report repair appointment services, community management digital platform, etc., can be realised in the smart home, anti-theft alarm, emergency help and other functions. For example, if infrared grating is installed on doors and windows, once someone breaks in illegally, the infrared grating will automatically alarm and push abnormal information to the occupants, and at the same time, it can link the camera to take pictures and provide networked one-button alarm service, and so on. In the community public space, the use of AI face recognition, access control, video surveillance, building intercom, car park systems and other technologies to achieve community security management and vehicle access control, giving full play to the advantages of intelligent facilities and the digital age to improve the sense of convenience and security of young people living in urban communities.

(3) Personalised cultural landscape arrangement

Young people tend to pursue diversified lifestyles and personalized living environments. In personalized cultural landscape arrangement, it is necessary to pay attention to the attractiveness of the visual level and create a fashionable and energetic visual environment to attract the attention of young people and stimulate their vitality using distinctive colours, modern design elements and decorations reflecting the cultural characteristics of young people. By adding elements in the public landscape that can arouse the emotional resonance of the youth group, cultural landscape facilities such as art installations and theme parks can be formed, thus enhancing their sense of belonging and identity to the community. And to create a personalised

community cultural atmosphere, it is necessary to recognise and promote the unique identity and lifestyle of young people. This can be achieved by involving them in the design process and allowing them to contribute to the cultural expression and greening of the community. Therefore, the public landscape design of the community should be based on participatory programme workshops, where young people are actively involved in the decision-making process of greening and landscape design. Different community landscape design options should be visualised and tested through workshops, surveys and interactive planning tools, such as virtual reality and digital platforms, to ensure that the result is in line with the aesthetic preferences of young community residents.

7.4.3 Strategies for designing community well-being environments conducive to midlife health promotion

By analysing the different needs of middle-aged people in the previous section, as Figure 7-39 shows the results of the analysis of middle-aged people's well-being needs, it can be found that middle-aged people's needs for culture, recreation, travelling and fitness, and their needs for convenience and belonging are all in a more important position in the environmental and

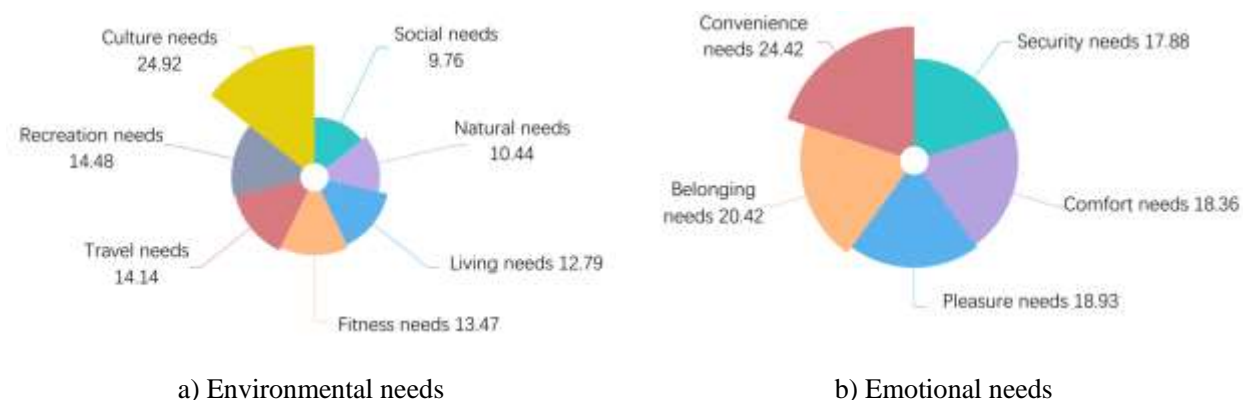


Fig.7-39 Analysis of the well-being needs of the middle-aged

emotional needs respectively. The study concluded that middle-aged people attach great importance to community culture, and in addition, they are also very concerned about the needs to improve the quality of life, such as fitness activities, travelling and transportation, leisure and entertainment. Middle-aged people are often in the position of family support, take on the responsibility of the elderly and children, so the biggest difference with the needs of the elderly and youth groups is that middle-aged people pay more attention to their own health, and have a higher demand for fitness activities. This requires that community workers and designers need to focus on their needs for health and activity when designing environments and services for middle-aged people to promote their overall residential well-being. In accordance with the three-dimensional value orientation of well-being environment design, combined with the results of the interviews, this study summarises the corresponding environmental indicators for middle-aged people's well-being needs in accordance with the three-dimensional value orientation of

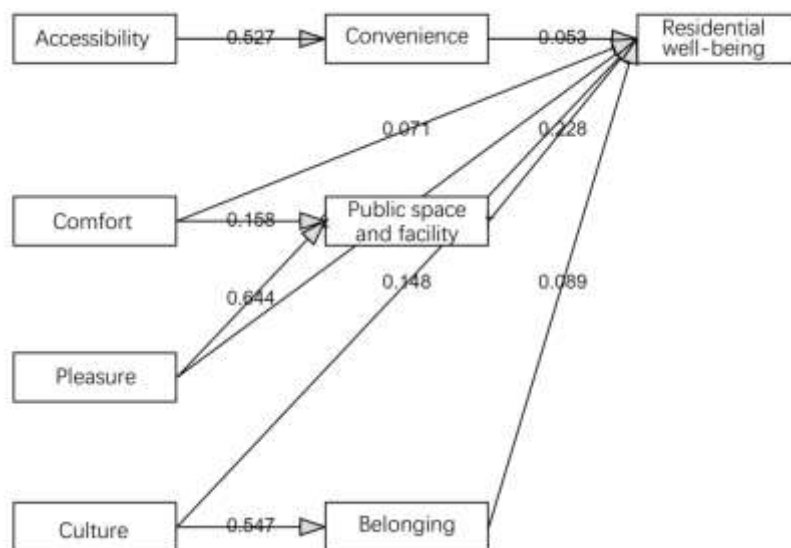


Fig.7-40 Path analysis of residential well-being in the middle-aged

well-being environment design, as shown in Table 7-9.

Tab.7-9 Strategic directions for designing wellbeing environments for the middle-aged

Well-being needs		Elements	Environmental index
Material needs	Fitness needs	Design of public spaces and facilities	Distribution of barrier-free facilities
			Accessibility of service facilities
	Recreation needs	Transport accessibility	Diversity of Activity Facilities
			Area share of public space
Social needs	Travelling needs		Accessibility to public transport
			Allocation of car parking spaces
			Connectivity to urban roads
			Integrity of walking paths
Spiritual needs	Cultural needs	Community Culture	Participation in community activities
			Cultural care of the community
	Convenience needs	Sense of Convenience	Convenience of the pedestrian pathway network
			Convenience of facility use (activities, recreation)
			Convenience of Parking
			Convenience of public services (medical, commercial, education)
	Belonging needs	Sense of belonging	Community Identity
			Community public participation
	Pleasure needs	Pleasure	Atmosphere creation (floor coverings, colours, etc.)
			Building appearance identity
			Green environment aesthetics
	Comfort needs	Comfort	Environmental cleanliness
			Functional configuration of facilities
			Noise prevention

According to the influence mechanism of ‘the built environment - well-being promotion’, combining the mediating paths of convenience, comfort, sense of belonging and pleasure with the demand paths of middle-aged people, the path analysis results of residential well-being are shown in Figure 7-40. Combined with the environmental indicators in Table 7-9, it can be found that for middle-aged people, community culture and public transport accessibility have a more significant positive impact on residential well-being, whether through the mediating or direct effect of the sense of convenience and sense of belonging. Perceptions of the design of public spaces and facilities, on the other hand, influenced middle-aged people's residential well-being as a mediator of pleasure or comfort. Therefore, when designing or optimising urban community

well-being environments conducive to middle-aged health promotion, the following aspects can be considered to enhance middle-aged people's residential well-being in urban communities.

(1) Construction of cultural space to enhance community belonging

With the development of society, middle-aged people are paying more and more attention to the humanistic care and cultural atmosphere of the living environment. According to interview surveys of middle-aged groups, most of them hope to live in communities that can provide spiritual satisfaction and distinctive community cultures, to enhance their own sense of belonging to and identification with the community they live in. Research on the construction of urban community culture shows that organising various types of community cultural activities, such as neighbourhood activities, festivals and parent-child educational activities, on rest days or holidays can effectively construct the basic unit of urban culture based on a specific geographical area, increase the middle-aged group's participation in community activities and cultural experiences, and thus enhance the residents' sense of community identity.

(2) Public space configuration

that encourages healthy behaviours

The middle-aged group has been shouldering the burden of raising a family in urban life and facing multiple pressures both physically and

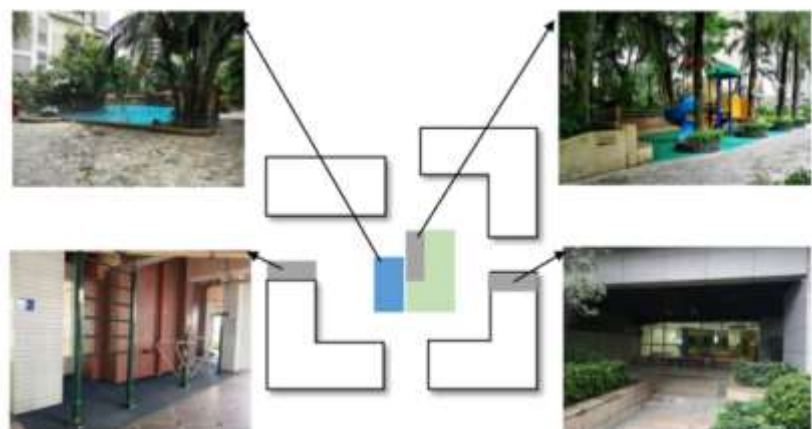


Fig.7-41 Configuration of public space to encourage healthy behaviour

psychologically, so they need lifestyles and environments that help to maintain good health. In

terms of public space configuration, most of the existing research focuses on how children or the elderly feel about using public space, and the needs of middle-aged people for healthy behaviours are easily overlooked. As a group that accounts for many residents in urban communities, their use and perception of public space plays an extremely important role in enhancing overall residential well-being. Therefore, when targeting the middle-aged group, designers need to think about configuring as many fitness facilities and activity spaces as possible in urban communities. Taking communities d and f, where the middle-aged group has a high sense of residential well-being, as an example, simple fitness equipment can be flexibly arranged by using the corner space of the residential building blocks or small spaces on the elevated ground floor (e.g., Figure 7-41). At the same time, some rest or fitness facilities can be set up near the children's activity space for middle-aged groups to engage in fitness activities while accompanying their children (e.g., Figure 7-41), to enhance the sense of comfort in the use of composite spaces in the community.

7.4.4 Design strategies for community well-being environments that focus on women's spatial perceptions

Rethinking many issues in the field of planning based on a female perspective in the design of urban community well-being environments requires, first, the recognition that gender and spatial and social structures are mutually constitutive (Spain, 2014). This means that community living environments are not only about the design of buildings and roads, but also about how gender relations are reflected and reinforced. To achieve a more inclusive and egalitarian design of urban neighbourhood environments, design should move from gender-blindness to gender-sensitivity (Qin, 2019). This includes actively responding to the differentiated needs of different groups of people, with a particular focus on women's safety issues and urban community

environment design issues that promote gender equality in space. In addition, the significance of incorporating gender difference awareness into the process of designing urban community well-being environments is that it can help scholars to examine the problems that exist in the planning and spatial design of urban community well-being environments from a gender perspective, for example, whether the safety design of public spaces ignores women's special well-being needs and environmental experiences. According to the field survey, it can be found that female residents are mainly concerned with culture, fitness, housing, and travelling needs in terms of physical environment, while their needs in terms of emotion are also focused on convenience, belonging, pleasure, and safety (see Figure 7-42). Combined with the results of the interviews, and in accordance with the three-dimensional value orientation of the design of well-being environment, Table 7-10 summarises the elements of residential well-being and environmental indicators corresponding to well-being needs oriented towards satisfying women's material, social and spiritual needs.

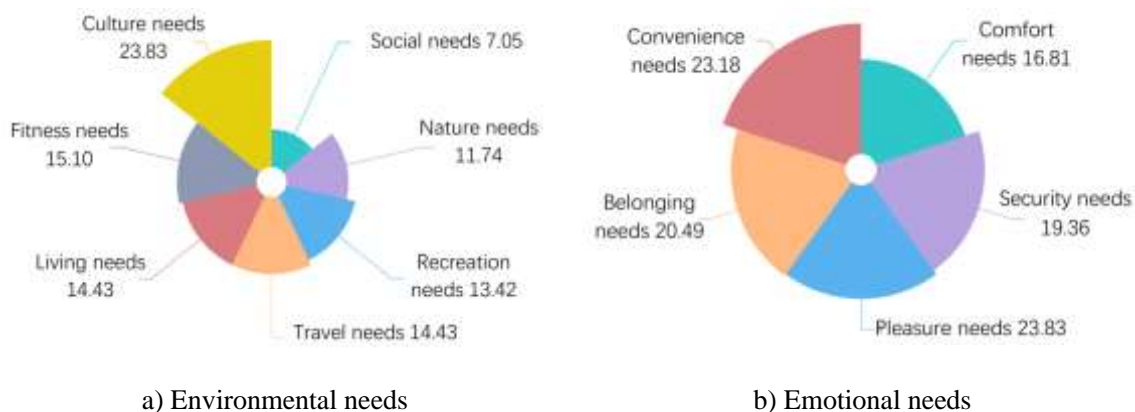


Fig.7-42 Analysis of the well-being needs of the female

According to the influence mechanism of ‘the built environment - well-being promotion’, by combining the mediating paths of convenience, sense of belonging and pleasure and the demand paths of the female population with the path

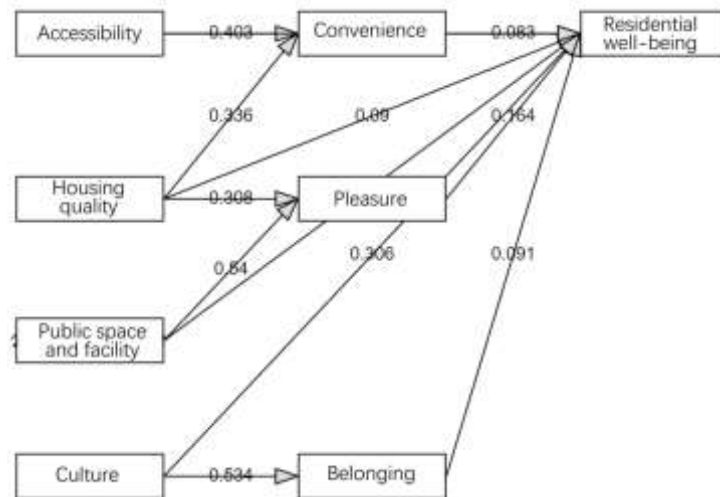


Fig.7-43 Path analysis of residential well-being in the female

analysis of women's perceptual data, the results of the path analysis of residential well-being are shown in Figure 7-43. Combined with the environmental indicators in Table 7-10, it can be

Tab.7-10 Strategic directions for designing wellbeing environments for the female

Well-being needs		Elements	Environmental index
Material Needs	Fitness Needs	Space and Facility Design	Distribution of barrier-free facilities
			Accessibility of service facilities Diversity of Activity Facilities Area share of public space
	Travelling Needs	Accessibility	Accessibility to public transport Allocation of car parking spaces Connectivity to urban roads Integrity of pedestrian paths
	Residential Needs	Housing quality	Residential building appearance Quality of building materials Building Floor Plans
Social Needs	Cultural Needs	Community culture	Community Involvement Community Culture
Spiritual needs	Convenience	Convenience	Convenience of walking network Convenience of facility use (activities, recreation) Convenience of Parking Convenience of public services (medical, commercial, education)
	Belonging	Belonging	Community Identity Community public participation
	Pleasure	Pleasure	Atmosphere creation (floor coverings, colours, etc.) Building appearance identity Green environment aesthetics

found that, for the female population, the quality of housing, community culture, public space and facilities, and public transport accessibility have a more significant impact on women's residential well-being, whether through the mediating or direct effect of the sense of convenience, pleasure, or sense of belonging. Among them, what distinguishes them from other characteristic groups is that the quality of the dwelling is relatively more important in influencing women's perceptions, which means that when geared towards enhancing the residential well-being of female residents, designers can focus primarily on the relevant design of the residential building, such as the building materials, the floor plan layout, and the aesthetic of the façade, among other things.

With the change of gender roles in society, the proportion of young women purchasing houses has increased, breaking the traditional male-dominated gender purchasing structure. This indicates that in the housing market, women's individual independence and occupational economic capacity have increased, and their needs for housing are changing. Policy makers should pay attention to women's individualised needs for residential well-being and establish a more equal and inclusive system for allocating space in urban communities. In the design of urban community residential well-being environments, the following aspects can be focused on in proposing design strategies for women's well-being promotion.

(1) Emotional design

When discussing women's emotional needs for living space, the design should consider multiple dimensions comprehensively, that is, starting from three levels: deep instinctive feelings, daily behavioural interaction and deep reflection, to fully meet women's emotional expectations. This design concept aims to build a living space that not only conforms to women's instinctive

feelings but also ADAPTS to their daily behaviours and habits and can trigger deep thinking. First, at the instinctive level, through the intuitive and basic use of design elements that can quickly attract women's attention, for example, using soft colours, comfortable materials and warm lighting to create a beautiful and comfortable living environment. In addition, considering women's sensitivity to space details, the design should also include some small objects or decorations that can trigger women's emotional resonance, such as flowers, art paintings, etc., to enhance the emotional expression of the space. At the behavioural level, designers can provide humanized, functional design to stimulate the pleasure of emotional experience, which includes the personalized needs of the space based on the instinctive level, such as personalized material selection, colour and light treatment, as well as the optimization of spatial function. On the reflection level, the design stimulates women's memories of existing experiences and thinking about self-image, enhances the emotional value of the space, and makes it a place to express women's emotions and culture. This involves a higher level of emotional communication, such as enhancing the humanistic care of the space through artistic decoration and layout.

(2) Security and affinity

In the planning and design of urban public space, special emphasis should be placed on the three aspects of "security", "affinity" and "particularity". This means that the design must not only consider the safety of women, but also create a friendly and inclusive space environment, while retaining a certain uniqueness and personal characteristics.

(3) Gender integration space

In the design of commercial space environment, it is proposed to establish gender integrated space, strengthen the identifiability of space, strengthen the perceived security and stimulate the

participation of female public. These strategies can also be applied to the design of living environments in urban communities, creating a more humane and diverse living environment by integrating the needs and preferences of different genders.

(4) Outdoor activity space design

For the outdoor space design of residential community, it should face squarely the needs of women and pay attention to the difference of gender. The design should consider the differences of different gender users in outdoor activities, space selection, behaviour distribution and space needs, so as to provide comfortable, safe and convenient for women to carry out "family" outdoor activities.

(5) Gender sensitivity

In the design of public space in residential areas, women's demands for public space in residential areas should be discussed from the perspective of women and the relationship between women and space. This requires designers not only to pay attention to the spatial needs of women, but also to understand and respect their socio-cultural background and personal preferences.

To sum up, the design strategy of urban community living happiness environment focusing on women's spatial perception should comprehensively consider women's emotional needs, safety, agreeableness and outdoor activity space needs, and adopt measures such as emotional design, gender integration space, and strengthening space identification and security. To create a community living happy environment that not only meets the needs of women but also has the characteristics of humanity and diversity.

7.4.4 Inclusive sharing strategy of urban community space facilities

As mentioned above, people with different characteristics have significant differences in their demands for the aesthetic design and cultural atmosphere of urban communities, which are mainly reflected in the environmental convenience, the content and organization of cultural activities, and aesthetic preferences.

From the perspective of environmental convenience, different age groups attach different importance to the convenience of transportation and the integrity of supporting facilities. Young people may be more inclined to convenient transportation and abundant recreational facilities, while older people may be more concerned about residential safety, health care services, and age-friendly public spaces. This is also reflected in the research on the environmental design of elderly communities, which emphasizes the importance of creating a perfect living environment for the elderly (Li, 2014).

In terms of the content and organization of cultural activities, people of different ages have obvious differences in their demands for public cultural services. Younger generations may prefer innovative and interactive cultural activities, while older generations may prefer traditional and stable forms of cultural activities. This difference requires urban communities to consider the characteristics and needs of different age groups when providing public cultural services, to realize the effective operation of the public cultural service system.

In terms of aesthetic preference, research shows that there are differences in aesthetic perception and preference among people of different ages. For example, younger people may prefer simple and graphic interfaces, while older people may prefer designs that mimic real-world elements (Pereira et al., 2022). In addition, young groups such as the post-90s generation have unique

aesthetic needs for the visual image design of cultural blocks, and they pursue personalized and diversified cultural experience. This shows that the aesthetic preferences of different age groups need to be considered in the aesthetic design of urban communities to attract more residents to participate.

As mentioned above, there are significant differences in the needs of different characteristic groups for the aesthetic design and cultural atmosphere of urban communities. To meet these needs, urban community environment designers need to adopt inclusive design concepts, take into account the characteristics and needs of different feature groups, and improve the overall residential well-being and liveability of urban communities by providing diverse cultural activities and services, optimizing the convenience of the living environment, and respecting the aesthetic preferences and well-being needs of people with different characteristics.

In addition, the actual effect of time-sharing and classified sharing of public facilities on improving the friendliness of different groups in residential areas is positive. First of all, through the sharing of facilities, the old community has been transformed and upgraded, and the community supporting facilities have been improved, making the community more liveable and friendly to all ages, and improving the comfort of residents' lives. By promoting the construction of a friendly and inclusive society for all ages, Chengdu focuses on the "one old and one young" and special groups, and provides public services for the whole population, which shows the importance of time-sharing and classified sharing of public facilities to meet the needs of different age groups. In addition, the guidelines for the construction of embedded service facilities in urban communities emphasize the importance of all-age friendliness and functional integration, giving priority to service functions such as elderly care services and infant care,

which also reflects the positive role of time-sharing classified and shared public facilities in improving the all-age friendliness of residential areas. In the practice of Shanghai, the 15-minute community living circle planning guideline advocates the strategy of sharing the use of community public service facilities by time sharing. This approach not only effectively broadens the diversity of service types, but also gives community residents greater choice to use these facilities in the appropriate time according to their individual needs, which significantly improves the community friendliness and the convenience of life for residents.

Time-sharing classified and shared public facilities have played an important role in improving the friendliness of groups with different characteristics in residential areas. By transforming and upgrading old residential areas, providing public services for the whole population, and prioritizing service functions to meet the needs of different age levels, the quality of life and satisfaction of residents of different ages, genders and education levels have been effectively improved.

7.5 Summary

Based on the theoretical foundation of the "the built environment-well-being promotion" model, this chapter proposes an overall strategy for designing residential well-being for well-being promotion in densely populated cities based on the environmental problems that exist in densely populated cities' environments when they are orientated towards material, social and spiritual needs. Based on this study's screening of the environmental elements that affect residential well-being in densely populated cities' environments, design for well-being strategies that can enhance residents' satisfaction with the environment and positive emotional experiences are proposed in

terms of optimising material residential well-being and creating non-material residential well-being.

Firstly, based on the three dimensions of community well-being needs, environmental problems of densely populated cities communities oriented to different needs are summarised in combination with residents' suggestions for improvement of their neighbourhoods in response to the questionnaire and the characteristics of densely populated cities communities. On this basis, four principles of community environment design for well-being promotion are proposed, namely, the principle of well-being orientation, the principle of public participation, the principle of sustainable development and the principle of geographical differences.

Then, the environmental design for well-being promotion in densely populated cities is proposed as a response to the theory and practice of the "environment-well-being" relationship in the previous section. The design for well-being in densely populated cities should be based on pluralistic shared governance, the principle of trust and negotiation, the value orientation of well-being promotion, the concept of establishing a neighbourhood community and the goal of integrating resources as the overall strategic direction, which guides the proposal of optimisation of the physical environment of the community with well-being and the shaping of the non-physical environment. The overall strategy is to optimise the physical environment and shape the non-physical environment to promote residents' happiness. Based on the basic procedure of design for well-being and the concept of community environment creation proposed in this study, five overall strategies for designing well-being for densely populated cities are proposed, including a community organisation model based on pluralistic shared governance, a survey on the demand for a well-being environment based on the principle of trust and consultation, the

formulation of an environmental policy with well-being promotion as a value orientation, the promotion of a culture of well-being with community with shared well-being promotion as a concept and the allocation of community space with the goal of integrating resources.

Finally, according to the factors affecting the residential well-being of urban communities and the survey results of sample communities, the score results of different communities are compared, and the actual environmental survey is summarized, and the five aspects of convenience, comfort, security, belonging and pleasure are promoted from the perspective of architecture. According to the correlation degree of each material environment element and different positive emotion expression perceived by residents in the community environment, this paper summarizes the design strategies of happy environment space to promote different positive emotion expression and puts forward targeted happy environment design strategies for urban communities for different characteristic groups.

CHAPTER 8 CONCLUSIONS

Against the social backdrop of China's accelerated urbanisation and rapid development of the modern economy and society, socialism with Chinese characteristics has entered a new era, where densely populated cities and fast-paced lifestyles have brought about a series of psychological problems in people's lives and the issue of mental health has increasingly become a hot topic of common concern for all walks of life. During China's rapid economic and social transformation, the pressure of survival has been intensifying and abnormalities in individual psychological behaviours have gradually emerged. Researchers have found that the improvement in living standards has not been accompanied by an overall improvement in well-being. As the basic environmental space where city residents spend most of their time and have the most frequent contact, the design for well-being populated cities is unable to satisfy the material, social and spiritual needs of city residents. Therefore, the study introduces the concept of "design for well-being" and explores a new type of value-oriented workflow and practice path for environmental design of densely populated cities with the value of well-being promotion. Therefore, the study introduces the concept of "design for well-being" to explore the workflow and practice path of a new type of high-density urban community design oriented to promote well-being.

From the perspective of environmental psychology, this study puts forward the concept of "design for well-being" as the design of urban community environments and explores the basic procedures and practical methods of design for well-being based on the ethical values of living in home - living in peace - living well - living in well-being"; it also combines psychology, architecture, environmental psychology and sociology, The conceptual model of residential well-being is proposed by combining literature research in the fields of psychology, architecture,

environmental psychology, sociology, etc.; the key elements affecting residential well-being in densely populated cities are extracted qualitatively and quantitatively by combining relevant literature research, stakeholder surveys, stakeholder surveys and interviews and case study analysis; and the concept of "Built Environment - Well-being promotion" is explored at the community level. Then, the theoretical framework of quantitative indicators is explored, relationship model and mechanism of "built environment - well-being promotion" at the community level. Combined with the research on community environment construction in Shenzhen and typical positive cases, the design for well-being promotion based on the strategy of residential well-being in densely populated cities is put forward.

8.1 Answering the research questions

This study tells a story about a problem of environmental design of living space caused by progressively smaller living space per capita and a declining trend in people's mental health during modern urban development. The study aims to answer the questions "what", "how to influence" and "how to design". During the research, the research question arose naturally. What is residential well-being? What factors in urban living spaces have an impact on residential well-being? How can residential well-being be enhanced through the design of urban residential community environments? This study not only answers these questions one by one, but also describes the process of discovering, interpreting and finding answers.

8.1.1 Q1: What is residential well-being?

The study of well-being first originated in the field of psychology in the 1950s, focusing mainly on the subjective feelings and psychological experiences of individuals. According to Miao Yuanjiang, well-being is "a feeling of self-identification and self-appreciation in which the

subject is in harmony with the real-life situation and has achieved complete unity with the self, and the resulting psychological state in which positive emotions prevail". Deng Xianqi et al. believe that well-being not only refers to the individual's pursuit of life, the potential to show, the value of the fulfilment of the sense of satisfaction, but also need to include the individual and others, the individual and the social relationship between the sense of identity, harmony, so he divided the sense of well-being into subjective well-being, psychological well-being and social well-being.

The study of well-being focuses more on people's subjective feelings, so the related research mainly focuses on subjective well-being, and the study of subjective well-being that emerged in the mid-20th century mainly starts from people's own evaluation of the level of happiness, and studies their own attitudes towards their own life status, including three aspects of life satisfaction, positive emotional evaluation, and negative emotional evaluation, and so on. Foreign scholars Diener has put forward the concept of subjective well-being: subjective well-being is an individual's comprehensive judgement of his or her overall quality of life based on self-defined criteria, and he believes that the main measurement dimensions of subjective well-being are life satisfaction and emotional balance. Life satisfaction is an individual's comprehensive judgement and overall perception of the state of life, while emotional balance is a state of happiness in which positive emotions prevail and is an individual's overall emotional response to various events in life. Veenhoven, a Dutch economist, believes that the expression of subjective well-being consists of emotion-based evaluation of hedonic feelings and cognitive-based evaluation of life satisfaction. Domestic scholar Li Yanling also argues based on Diener's study that subjective well-being is the evaluator's holistic assessment of his/her quality of life

based on self-defined criteria and is an important comprehensive psychological indicator of people's quality of life.

Residential well-being in this study is concerned with the surface meaning of human well-being of the environment in which they live, and it refers specifically to the residents' well-being of the environment in which they live in their neighbourhoods, which is a comprehensive concept that connects sociology, psychology, and architecture, and is designed to explore the link between the built environment and people's psychological feelings. In summary, this study considers residential well-being as the combined perceived result of residents' overall satisfaction with their neighbourhood's residential environment (cognitive level) and individual expression of positive emotions (emotional level).

8.1.2 Q2: How do multi-factors affect residential well-being in urban residential areas?

There is a complex association between urban neighbourhood environments and residential well-being, and a nested relationship between their influences, which influences the causal and causal effects characterising the individual well-being influences. In this study, the community environment mainly affects residential well-being through two paths: the satisfaction of residents with environmental elements and the positive emotions generated by residents. In the first path, environmental factors directly stimulate satisfactions with various aspects of the community environment, and at the same time, environmental factors indirectly affect residents' residential well-being by stimulating residents to generate positive emotions. In the second path, the expression of positive emotions by residents stimulated by the community environment can directly affect residential well-being, while the expression of positive emotions will also prompt

residents to produce cognitive evaluation of the community environment, i.e., satisfaction with environmental elements, thus indirectly affecting residential well-being.

This study used mediation effect analysis to explain the complex relationship between the role of satisfactions with the environment and expression of positive emotions on residential well-being. In the influence path of environmental satisfaction on residential well-being, positive affect has a mediating role to some extent, making an additional mediating influence path between environmental perception to residential well-being. Satisfactions with the design of public spaces and facilities and their satisfaction with community management can act indirectly on residential well-being by influencing pleasure. And to some extent, pleasure greatly masks the effect of residential quality on residential well-being, and the indirect effect of security also masks the effect of satisfaction with green space on residential well-being to some extent. In addition, in response to the path of influence in the role of positive affect on residential well-being, environmental satisfaction also plays a mediating role. Among them, residential convenience is considered to act on residential well-being entirely indirectly through the influence of satisfaction with community management. Comfort indirectly affects residential well-being through the mediating effects of satisfaction with the design of public spaces and facilities and satisfaction with community management, respectively. Satisfaction with neighbourhood relations accounted for a great deal of indirect benefit in the influence of belongingness on residential well-being, while satisfaction with the design of public spaces and facilities also contributed to some extent to the influence of belongingness on residential well-being.

Overall, the mediating role of positive affect is more pronounced in the built environment - well-being promotion mechanism than in environmental satisfaction. It is worth noting that

satisfactions with green space and residential quality affects residential well-being through the mediating role of comfort, which also affects residential well-being by influencing satisfactions with community management and the design of public spaces and facilities. Pleasure acts as a mediator unidirectionally influencing satisfactions with green space and residential quality to act on residential well-being, but pleasure and satisfactions with community management and the design of public spaces and facilities show a bidirectional mediating effect in influencing residential well-being. In addition, the mediating effect of sense of belonging intervenes in the indirect effect of satisfactions with residential quality, community culture, and green space on residential well-being, while sense of belonging indirectly affects residential well-being through satisfactions with neighbourhood relations and the design of public space and facilities. The mediating effect of convenience is more significant in the influence of satisfactions with the quality of housing and accessibility to public transport on residential well-being, while satisfactions with community management also indirectly influences the effect of convenience on residential well-being.

8.1.3 Q3: How to improve residential well-being in urban residential areas through the community environment design?

Based on the research on the relationship between environment and well-being, this study summarises the design strategies for well-being in densely populated cities from the perspective of architecture, starting from the three dimensions of the well-being needs of the community residents, and considering the environmental problems and design guidelines of densely populated cities that are geared towards different needs, and through the research cases.

At the macro level, the overall strategy is based on pluralistic shared governance, trust and negotiation, well-being promotion, establishment of "community with well-being", and integration of resources, which responds to the previous theoretical study on the relationship between "environment and well-being". Based on the basic procedure of design for well-being and the concept of community environment creation proposed in this study, the five overall strategies of design for well-being in densely populated cities are: community organisation model based on pluralistic shared governance, survey of needs for a well-being environment based on the principle of trust and negotiation, formulation of environmental policy with well-being promotion as a value orientation, promotion of a well-being culture based on the concept of community with shared well-being, and allocation of community space based on the goal of resource integration.

Based on the research foundation of design ethics and design procedure of this study, according to the influencing factors of residential well-being in densely populated cities and the findings of the sample communities, comparing the scoring results of different neighbourhoods combined with the actual environmental survey, five aspects of environmental design for well-being for densely populated cities are proposed, namely, inclusive and empowering public space and facilities, healthy and therapeutic green space, comfortable and aesthetically-pleasing residential architectural space, unimpeded and convenient traffic network layout, and energy-efficient and intelligent community construction. Community Intelligent Construction five aspects of densely populated cities community physical environment well-being optimisation strategy. At the same time, to enhance the positive emotional experience of residents in the community living environment, the well-being creation strategy for the non-physical environment of densely populated cities is proposed from the four aspects of community self-governance system of

collaborative and mutual assistance, fair and shared neighbourhood resource integration, complementary social capital allocation, and harmonious and cohesive well-being culture advocacy.

8.2 Contributions to the fields

This study contributes to theory in the field of knowledge of architectural design, as well as a practical contribution to the design of residential environments. This study contributes from the following three innovative points:

8.2.1 Direction and aim of the study

The direction of this research is to understand the relationship between human well-being and environmental elements from an architect's point of view, with the hope that environmental design can be used to enhance the residential well-being of residents. This means that well-being, as a subjective term in the field of psychology, is applied relatively rationally to the field of environment design and residential well-being is quantified through research studies. This enhances the depth of the disciplinary intersection between architecture and psychology and sets the direction for further applications of psychology in architecture afterwards. Future research could explore whether the meaning of residential well-being differs for people with different roles in the community from the perspectives of other stakeholders, including residents, community workers, and government decision-making authorities.

In addition, the research direction of well-being with environment can also be applied in other disciplines or fields, for example, in philosophy to explore what effects the environment can have on people's self-perception or self-actualisation, or in a sociological context to explore the

effects of residents' perceptions of the environment as part of the community and their interrelationships with their presence in the community. In turn, the focus of such research has shifted from people who exist as individuals to people who exist as part of a community, with the aim of exploring the impact that a person's multiple identities have on their perceived residential well-being, and how one's residential well-being can be enhanced by shaping the community's physical and non-physical environments.

8.2.2 Design methods and procedure

The concept, ethical values, basic methods, procedures and practical methods of design for well-being are proposed. Based on China's development strategies of "Beautiful China" and "Dream of China for well-being", the study uses inductive and deductive methods to integrate the values of well-being into the concept of design for well-being in socialist community environments with Chinese characteristics from the designers' viewpoints. Combining relevant theories and literature research in the fields of psychology, sociology, architecture and urban and rural planning, the role of designers in design for well-being is interpreted from a "bottom-up" perspective and construct ethical values and procedural methods for "design for well-being" in urban community environments.

The concept of design for well-being can be applied in all major fields, including but not limited to industrial design, product design, game design, etc. The ethical values of design for well-being may also have similarities with different cultures around the globe and can be used as a reference when studying design for well-being in other countries or cities. The methodology proposed in this study for design for well-being can be applied in other contexts as well, with the main aim of proposing a methodology for integrating and quantifying subjective concepts into the design

process. At the same time, the basic procedures of design for well-being are universal and can be applied to other fields and design projects for other cultures. By referring to the procedures of design for well-being, designers can better integrate the concept of well-being into design products in various fields to enhance the well-being of users. The methods and procedures of design for well-being can likewise be applied to the study of the interactions between the non-physical environment with human perceptions in a community, which can also be referred to as inter-being.

8.2.3 Potential application of the study outputs

The concept of "residential well-being" is proposed and the theoretical relationship and mechanism of "the built environment - well-being promotion" in densely populated cities are explained. The concept of "residential well-being" is proposed as an evaluation index of the quality of the urban community environment by integrating the theories and literature from sociology, psychology and architectural studies, i.e., the overall satisfaction of residents with the living environment in their neighbourhoods (cognitive level) and the combined perception of individual positive emotions (emotional level). Using stakeholder questionnaires, multi-stakeholder questionnaires, field surveys and other methods, the influencing factors of residential well-being are qualitatively analysed and screened out, and then the indicator weights of the influencing factors are quantitatively analysed. A fuzzy evaluation model of environment and well-being is constructed and the specific mechanism of the "the built environment - well-being promotion" is quantitatively analysed.

The concept of residential well-being can help designers to identify which perspectives on a cognitive and emotional level can improve the design of the actual living environment.

Meanwhile, the theoretical mechanism of built environment-being facilitation proposed in this study provides foundational support for future scholars to study other relationships between the environment and human psychology or cognition. The method of obtaining the mechanism of influence can also be applied or referenced in the study of environmental design and human subjective thoughts.

In addition, the overall strategy of design for well-being in densely populated cities, strategies for design community environment with well-being promoting different positive emotions and towards different characteristics of people are proposed. Using the interview method and inductive summary method, the study qualitatively proposes the principles of optimal design for well-being promotion of community environments in the face of the problems that exist in densely populated cities' community environments in the face of material, social and spiritual needs. And the study combines the results of quantitative research and analysis with the principles of optimal design for well-being promotion of community environments in the face of well-being promotion of community environments in densely populated cities. Strategies for optimising the well-being of the physical environment of densely populated cities with regard to public space and facilities, green space, residential building space, traffic network layout and intelligent community construction and strategies for creating the well-being of the non-physical environment of densely populated cities with regard to community self-governance, resource integration, social capital allocation and advocacy of a culture of well-being, are proposed from an architectural point of view.

In summary, this study innovatively proposed the concepts of design for well-being and residential well-being, constructed a set of methods and a procedure for designing urban

community environments for well-being and explained the relationship between "the built environment and well-being promotion". This study provides a scientific guidance strategy for the future design of environment in densely populated cities and the results of the study will be an inspiration for the improvement of the construction of urban community environment in China. The results of the study can be applied to other communities with similar characteristics to the Shenzhen community in the future. In addition, the introduction of the ethical value of well-being promotion provides new perspectives and ideas for the study of urban community environment construction and community buildings. These findings can be applied to future community regeneration projects in Chinese cities, providing concrete and practicable methods and strategies. The data and results of the study can also provide data support at the governmental decision-making level, which can help city authorities to make decisions and judgements. At the same time, the data collection methods and questionnaires in this study can be used as important references to collect data on community perceptions in cities across the country, to enrich the database of environment and residents' perceptions.

8.3 Limitations of the study

8.3.1 Scope and topic

The scope of this study defines the research area as densely populated cities communities. The study discusses the psychological state and emotional expression of residents in relation to their living environment. Representative case studies of densely populated cities communities were selected for the study. Interviews and questionnaires were conducted with users of the community environment. Focusing on the study area was appropriate and effective as the study focused on a specific and characterised area. However, Shenzhen is an emerging city that

combines the cultures of both northern and southern China. Residential communities in Shenzhen tend to have a relatively good environmental package. Future research could be conducted in other typical urban neighbourhoods to compare with these results to determine the generalisable effects of environment on residential well-being in densely populated cities. In addition, design information can be obtained by observing the characteristics of the living environments in different densely populated cities communities, such as those in Chongqing, Beijing, and Shanghai.

Abstract concepts about residential well-being are discussed concretely. This flying method can be used for other specific environments, such as well-being in the work environment, well-being in the school environment, and so on. Both work and residential environments require a balance between built environment and well-being. Future research that can be conducted on well-being in other specific built environments will extend this study.

8.3.2 Methodology and data collection

The study used both qualitative and quantitative research methods, following a step-by-step research framework. Due to time and financial constraints, the research methodology can be improved in further studies in the future. The case studies were selected from neighbourhoods in different administrative districts.

Due to some uncontrollable reasons, the data collected from the questionnaire of the residents in this study mainly came from the end of 2019, that is, before the occurrence of the New Crown Epidemic. In the recent years since the beginning of the epidemic, residents' perception and evaluation of their living environment may have undergone some shifts due to the outbreak, so the impact of the outbreak of infectious diseases on residential well-being needs to be taken into

account in future research and it may need to be supplemented by adding new influencing factors based on the new questionnaire and interview data.

8.3.3 Strategies

This study, using the example of an urban neighbourhood in Shenzhen, does not comprehensively cover all the typical characteristics of densely populated cities' community environments and some of the specific design strategies may not be universally applicable, using the optimisation of well-being in Shenzhen's urban community environments as an exemplary study to demonstrate the overall process of design for well-being and the process of proposing strategies. Future research can consider the complex and diversified economic development background, regional cultural differences and unique social problems of China's cities as categories to explore and supplement the design strategies for well-being of densely populated cities' urban community environments.

The design strategies for promoting the positive emotions and strategies towards different characteristics of people are only given qualitative classification strategies without specific quantitative criteria; future research should be more refined to propose more scientific and reasonable design criteria to guide the design of the environment in densely populated urban communities and to promote the enhancement of residential well-being.

8.4 Further research

Further research has already been mentioned in the limitations section of this study, which encompasses work on expanding a richer research methodology, expanding the geographic scope

of the case studies, and comparing the relationship between the environment and residential well-being in different densely populated cities' neighbourhoods.

The application of big data and artificial intelligence to design research has great potential. The mathematical model presented in this study is not yet ready for application in the strictest sense, and more practical work must be carried out to validate and identify model flaws for iterative revision. Such a workload is huge and difficult to be completed by a few people in a short time, which requires the use of massive data to ease the work of researchers. The use of big data to quantify and scientific design research is currently a hot topic and will bring great advantages in future research.

In addition, the popularity of artificial intelligence will increase the design possibilities. Future research should make good use of this new technology to objectively collect residents' emotional expressions, which can effectively avoid the error between human subjective expressions and real emotions.

This study investigated the interaction between community environment and residential well-being in Shenzhen. Suggestions for future research are as follows.

Determine the direction of design for well-being residential environments under different regional cultures by comparing the relationship between the characteristics of community environments and well-being in typical northern and southern densely populated cities.

Propose residential environment design strategies with generality by investigating the residential well-being of residents in densely populated cities in different cities, and to provide detailed classification and guidance on design details.

Determine how vulnerable groups can live in densely populated cities by comparing the perceptual evaluations of different populations with pregnant women, children, the elderly, and the disabled in densely populated cities' community environments.

The interdisciplinary research between psychology and architecture has been constantly updated and both happiness and well-being are relatively abstract and subjective concepts; the concepts of "design for well-being" and "residential well-being" proposed in this study are relatively new and the relevant theoretical construction and methodology need to be continuously researched and practiced in the future. In the future, continuous research and practice are needed to achieve further optimisation and improvement.

In addition, the procedures and methods of design for well-being in this study can be applied to a wider range of fields. For example, designers in the field of industrial design can apply the procedures and methods of this study to study the relationship between users and products and design products that are more well-being for users. Similarly, the methods and procedures of this study can be applied in clothing design or other design fields to design for well-being and contribute to human happiness.

Also, the relationship between inter-being and the community and the environment in sociology and philosophy can be examined in greater depth in future research. Human beings, as part of the society they live in, have multiple identities, and how to enhance the residential well-being of different human identities through the design of residential environments is also a topic that should be explored.

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