



Research article

A hierarchical model of accelerating factors to promote urban renewal and reconstruction of unsafe and old buildings

Shih-Ming Lin^a, Cathy C.W. Hung^a, Kun-Huang Chien^a, Hui-Ling Hu^b, Fang-Jye Shiue^c, Hsin-Yun Lee^{a,*}

^a Department of Civil and Construction Engineering, National Taiwan University of Science and Technology, Taiwan

^b Institute of Creative Design and Management, National Taipei University of Business, Taoyuan, 324022, Taiwan

^c Graduate Institute of Architecture & Sustainable Planning, National Ilan University, Taiwan

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ABSTRACT

The issue of urban renewal is complex and multifaceted. In this study, six specialists in the construction industry were invited to conduct audio interviews, which were compiled into verbatim text. The key phrases were extracted by Grounded theory, and three levels of coding were retrieved. The data were categorized into ten accelerating urban renewal factors in three constructs to establish an Analytic Hierarchy Process framework. Using institutional theory to construct outcomes based on grounded theory, transforming these into specific urban renewal relation issue elements.

113 AHP questionnaires were collected from five types of specialists, including practitioners, professionals, participants in urban renewal, academics, and government staff. The results show that relaxing the plot ratio control and incentives is ranked No. 1 by practitioners, participants in urban renewal, professionals, and academics, indicating that the factor is highly valued by specialists but neglected by government staff. Secondly, practitioners, academics, participants in urban renewal, and professionals identified incentives and rewards for urban renewal and enhancing the trust and credibility of urban renewal projects as crucial factors. However, the government staff showed a different weighting. This indicates that government staff is determined to accelerate urban renewal. Finally, the suggestion of this study is in line with the views of the specialists interviewed, who suggest that the government should hold public hearings regularly and seriously to listen to people and specialists. Only through public hearings can all parties reach a consensus. The government should consolidate the views of all parties to amend or enact a bill on urban renewal that is more in line with the changes of the times, including appropriately relaxing the control of building plot ratio and other accelerating factors, to promote urban renewal in Taiwan.

1. Introduction

In Europe and the U.S., legislation and amendments to urban renewal policies have been initiated since 1950. Economist Miles [1]

* Corresponding author.

E-mail addresses: D10805003@mail.ntust.edu.tw (S.-M. Lin), hungcathy@mail.ntust.edu.tw (C.C.W. Hung), santana@csie.ncu.edu.tw (K.-H. Chien), huling0215@ntub.edu.tw (H.-L. Hu), fajy@ms24.hinet.net (F.-J. Shiue), hylee@niu.edu.tw (H.-Y. Lee).

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discussed urban renewal and future development in the United States. McGee Jr [2] refers to the government's Urban Renewal Department's promotion of urban redevelopment in some parts of the United States through legislation, public discussion, and political debate, and its success in increasing the supply of low-cost housing in U.S. cities. In addition, Dutch urban planners [3] also proposed a study on European urban renewal policies. These studies show the importance of public issues in urban renewal in Europe and the United States. In recent decades, the rapid growth of urban populations worldwide has made renewing old cityscapes and renovating buildings increasingly difficult [4,5]. This has increased the importance of government legislation and amendments to urban regeneration regulations. Academics are also engaged in research on urban planning and regeneration [6,7].

The streets, buildings, parks, green spaces, and public facilities in the old urban areas planned in the early days of Taiwan's metropolitan area lacked an overall design concept, and the mix of old and new buildings made the landscape incompatible and of varying heights [8]. As shown in Fig. 1. Secondly, despite the urban plan, buildings are inadequate for public spaces such as parking and leisure due to poor functional and spatial planning and failure to anticipate rapid urban growth [9]. Furthermore, congested streets and alleys lead to traffic bottlenecks and poor pedestrian and vehicular movement around buildings, which affect traffic and seriously hinder disaster prevention and relief [10]. The above studies found that the problems of buildings in old urban areas include unsightly cityscape, insufficient public space, poor pedestrian and vehicular movement, no elevator access for the elderly, and dangerous and frequent natural earthquake threats [11]. Therefore, Taiwan must accelerate its urban renewal efforts and plan to achieve yearly building renewal goals. To create safer, more suitable, and more livable functional spaces [12]. In particular, developers and citizens should work together to promote urban renewal and reconstruction of unsafe and old buildings through a reasonable negotiation mechanism. The government should promote legislation and legislative amendments to keep up with the times and be responsible for guiding urban renewal policies without delay..

Studies showed that the factors enhancing urban renewal and reconstruction of unsafe and old buildings are diverse and complex [18]. For example, in the United States, natural disasters often cause severe damage to homes, and many families cannot afford to buy or rebuild their homes, resulting in various housing problems. These problems have plagued local building authorities and Housing and Urban Development. Therefore, Tran [19] explored the factors influencing successful urban renewal after natural disasters. His findings suggest that government advocacy, public trust in government credibility, flexible urban renewal strategies, and residents' support are the essential factors enhancing urban renewal successfully. Second, as war leads to building renewal, Vaništa Lazarević, Keković [20] analyzed the factors affecting the demand for urban renewal in Serbia. The study mentioned that the reasons that affect building renewal include: meeting people's living needs, improving the quality of public space, and reducing the risk of building occupancy. Further, Zhang, Lin [21] studied social conflict and threats in the urban renewal process of Beijing and Guangzhou, China. To alleviate these contradictions, the authors analyzed the factors increasing and decreasing the willingness of people to participate in urban renewal. The results indicate that the main factors that increase the willingness of people to participate in urban renewal are policy tools, including legislation, incentives, and appropriate compensation.

In addition, several urban regeneration studies have pointed out that the factors promoting urban renewal include government financial subsidies, plot ratio incentives [22], joint construction agreements between builders and landowners [23,24], government floor-area-bonus and right transformation [25], and government-led urban regeneration promotion [26]. The aforementioned studies



Fig. 1. Taiwan's Urban Landscape Varies Between Old and New Buildings In addition, Taiwan's buildings face a more pressing challenge: the threat of earthquakes. Taiwan is located at the cross of the Eurasian and Philippine plates and is an earthquake-prone region [13], as shown in Figs. 1 and 2. There have been many earthquakes with considerable casualties in the past few decades. For example, the 921 earthquake in 1999 resulted in 13,722 deaths and the destruction of more than 105,479 houses [14], causing unbearable economic and property losses [15]. Urban renewal has become an issue of common concern to the people of Taiwan. Whether it is the capital city of Taipei City or other fast-growing municipalities in Taiwan, promoting urban renewal and building renovation has become a common trend for all counties and cities. According to the June 2022 housing statistics from the Ministry of the Interior of Taiwan, 51.09% of the houses in Taiwan are over 30 years old. The number of old buildings in Taipei City is as high as 71.98%, the highest among the six cities [16]. In addition, in Kaohsiung City and Tainan City, the proportion of older houses over 30 is more than 50% [17]. These statistics have shown that urban housing in Taiwan is dense and old, and the consequences of a major disaster in a metropolitan area are unimaginable. Promoting the accelerated renovation of older houses is a national security issue that the government has to address soon.

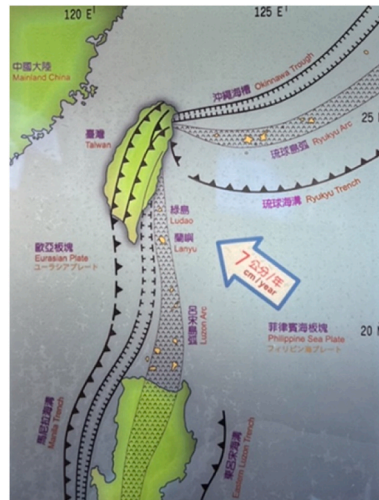


Fig. 2. Taiwan is one of the most earthquake-prone regions in East Asia. (Source: National museum of natural science).

pointed out that the problems of urban renewal are diverse and complex. It is necessary to prioritize the essential impact factors to solve the more important and urgent issues to reduce the difficulty of urban renewal step by step. Studies pointed out that the Analytic Hierarchy Process (AHP) can be used to determine the weights of the factors affecting decision-making. AHP is mainly applied in uncertain situations and decision problems with multiple evaluation criteria; its theory is clear and practical [27]. This study uses AHP to compare and predict the importance of impact factors in pairs [28–30].

To summarize the above, this study examines the long-standing phenomenon of high demand but a low promotion of urban renewal in Taiwan. The study also analyzes and explores the influencing factors that accelerate urban renewal. First, the questions of interviewing specialists are developed through literature reviews. Then, architectural specialists and scholars were invited to conduct in-depth interviews to confirm the validity of the content. The interviews were compiled into constructs and accelerating factors, and then the AHP questionnaire was developed. Next, five types of people were asked to fill out the AHP questionnaire: construction-related industries, officials, academics, architects, real estate appraisers, and those involved in urban renewal. The data collected from the questionnaires were analyzed by AHP software to obtain the importance weights of accelerating urban renewal factors. The results of this study will serve as a reference for the government departments in charge of urban renewal, the formulation of relevant regulations, and the implementation of future policies. It can also be a reference for urban renewal builders, the construction industry, financial and construction managers, academia, and related research. It is also expected to contribute to the construction industry's sound cycle and sustainable development.

2. Literature review

This chapter first introduces Taiwan's urban renewal and the reconstruction of unsafe and old buildings. This is followed by describing the specialists' interview process and how the sub-criteria and foremost criteria for accelerating urban renewal are generated. Before the specialists' interview, this study designed the questions by exploring the literature related to urban renewal. In-depth interviews with specialists in construction-related industries, government building authorities, and academia will follow. The key phrases were extracted and coded through the grounded theories, and then the coding levels were conceptualized to create sub-criteria and main criteria to accelerate urban renewal. Among them, the sub-criteria include ten urban renewal impact factors. Then, those ten impact factors are categorized into three main criteria: regulations for lowering the threshold of urban renewal, government incentives and rewards for urban renewal, and enhancing the trust and credibility of urban renewal projects. This study uses urban renewal, shortened as UR, to represent urban renewal and reconstruction of unsafe and old buildings.

2.1. Urban renewal and reconstruction of unsafe and old buildings in Taiwan

To consolidate and solve the complicated problems faced by rebuilding old houses over the past decades, the Taiwan government enacted the Urban Renewal Act and the Statute for Expediting Reconstruction of Urban Unsafe and Old Buildings. The Legislative Yuan passed the Urban Renewal Act in November 1998. This was designed for medium and large UR projects. The purpose is to improve the environmental quality of urban residents, strengthen urban functions, and regenerate urban areas [31]. Urban Renewal in the Act was defined as implementing reconstruction, renovation, or maintenance within the urban plan area by the procedures instituted [32].

In addition, the Taiwan Legislative Yuan passed the Statute for Expediting Reconstruction of Urban Unsafe and Old Buildings in 2017, an urban building retrofitting bill specifically for small areas or restricted building sites. The statute defined unsafe and old buildings as (1) Buildings that are not reaching the minimum level of structural safety. (2) Buildings, ages of which are 30 years or

above, whose seismic resistance is not reaching the standard in the structural safety assessment, and whose improvements were ineffective or did not have a lift [33]. The differences between the two acts are that the application threshold for the former must be at least 1000 square meters in the base area as well and the consent of the UR project must be at least 80 % of all households before the competent authority can initiate the review process [34]. The latter requires that the application must be approved by 100 % of the households and that the building is at least 30 years old, of safety concern, and old or without elevators [35].

The academia has also provided some definitions of UR. For example, scholars Do Alfuqhar and Aysu [36] examined the relationship between UR and building sustainability in older cities. The study defined UR as a process of community restructuring and economic revitalization. The restructuring includes improving transportation, infrastructure, and environmental quality. In addition, Xian and Chai [37] used the Analytic Hierarchy Process (AHP) and Principal Components Analysis (PCA) to analyze the characteristics of old housing in northern China and to obtain the weights of the indicators affecting UR. The study defined UR as a series of redevelopment, rehabilitation, and demolition to make the city look new. In summary, this study defines UR as the process of redeveloping, rehabilitating, and demolishing neighborhoods to improve transportation, infrastructure, and environmental quality.

2.2. Regulations for lowering the threshold of urban renewal

This study extracts three factors that accelerate the promotion of regulations to lower the threshold of UR and reconstruction of unsafe and old buildings. The first is to relax the minimum prerequisite of the building base. Several studies have mentioned that relaxing the minimum prerequisite of the building base can accelerate UR promotion. For example, Chuang [11] analyzed the reasons that dragged down the UR execution rate in Taiwan. The study showed that reducing the small building base limit can improve the UR execution rate. Second, Chen [38] considered the impact of building base size and related factors on UR promotion. The results indicate that when the building base area has reached the UR minimum area prerequisite, the government should help solve other problems and obstacles to improve the UR rate. In addition, Chen [39] mentioned that a small building base is easier to integrate and promote UR projects than a large one. In other words, the chance to successfully coordinate a small building base UR project is relatively higher.

Second, lower the threshold of consent rate for UR households. Many scholars have suggested the impact of reducing the number of consenting households number on UR. For example, Tsai [40] examines a project in which the Taipei City Government compulsorily demolished a small number of buildings of households that did not agree to UR by UR regulations. The study concluded that the requirement that the proportional consent of households must meet a specific threshold at the time of approval of the UR project is inconsistent with the constitutional principle of proportionality. In other words, if an appropriate reduction of the statutory consent ratio can accelerate the promotion of the UR project, the legislature should appropriately reduce it after multiple discussions. Second, Wang [41] explored the impact of power laundering on UR, which suggests that inappropriate ownership area consent rate thresholds would affect the fairness and justice of UR. Furthermore, Lin [42] analyzed the design of the administration of UR regulation enforcement in Taiwan. The study suggests that lowering the rate threshold for UR consent can increase households' willingness to participate in UR and accelerate UR integration.

Third, amend the UR-related regulations to take over demolishing buildings. The relevant studies of this factor are as follows. Chuang (2020) analyzed the reasons that slow down the implementation rate of UR in Taiwan. The study suggests that the government should establish a feasible mechanism to take over demolishing buildings to improve the efficiency of UR promotion. Second, Chen [38] examined the number of successful UR projects in Taipei City and New Taipei City from 2006 to 2017 and dilapidated old houses that required UR. The survey finds that less than five households performed UR, a pretty few rate. The study recommends that the government should have retained the right to demolish the houses of nail households, used to describe homeowners refusing to accept the terms of resettlement even when most of their neighbors have moved away [43]. The goal is to improve the effectiveness of the UR drive and reduce UR uncertainty. In addition, the Department of Urban Development New Taipei City Government [44] is the first in Taiwan to announce that the government can take over demolishing buildings under certain conditions. For example, suppose a UR project is approved, and the implementer fails to negotiate with the demolished households. In that case, it can apply to the city government to take over demolishing buildings so that the UR project can proceed smoothly.

2.3. Government incentives and rewards for urban renewal

This study summarizes the following three accelerating factors after compiling the relevant literature. Firstly, extend the time of plot ratio of reconstruction of unsafe and old buildings rewards. Wang [45] analyzed why the Urban Renewal Act is ineffective from the perspective of a government official. The study recommends simplifying the Urban Renewal Act and the Statute for Expediting Reconstruction of Urban Unsafe and Old Buildings. Among them, to prevent the collapse of unsafe and old buildings caused by earthquakes, the upper limit of the plot ratio of the Statute for Expediting Reconstruction of Urban Unsafe and Old Buildings should be higher than that of the UR Act. Hu [46] mentioned the factors that affect the reconstruction rate in the Statute of the Urban Unsafe and Old Buildings, including plot ratio incentives, extending plot ratio incentive time, etc. According to Zhang and Huang [47], the lengthy government review process, outdated public perceptions, and lack of mutual trust between implementers and UR participants would make promoting the UR and reconstructing unsafe and old buildings difficult. The government should accelerate the redevelopment of unsafe and old buildings through plot ratio incentives and further extension. However, the study also points out that the plot ratio needs to be controlled suitably, or it will increase housing prices [48].

Second, UR tax incentives and deductions. Chao and Hsu [49] examined how UR policies can be improved. The study suggests the government could provide tax incentives and offer UR rewards. Lin [50] analyzed the impact of housing tax incentives on UR. The study mentions that a more realistic tax incentive is needed to benefit households and promote UR. Lam, Lee [51] explored why

implementing the UR Act in Taiwan has been problematic. The study suggests that the government should provide more incentives to attract real estate or financial capital investment, such as capacity incentives and various land and building tax exemptions.

Third, the central government relaxes the plot ratio control and incentives. Chen [38] examined why so few UR projects have been completed in Taiwan. The study suggests that UR rates can be improved through moderate and conditional plot ratio incentives, appropriate relaxation of the building coverage ratio, and simpler and clearer incentive values. Lee [52] analyzed the impact of the building base plot ratio on the process of UR and the reconstruction of unsafe and old buildings in Taiwan. The study shows that the plot ratio incentive does contribute to UR's intentions; moreover, the original plot ratio incentive and the relaxation of the total plot ratio incentive cap were helpful to UR. Ouyang, Wu [53] investigated the urgency of reconstructing unsafe and old buildings on Taiwan Island, located in the seismic plate, and the factors that hinder it. The study points out that the government should amend the law according to regional characteristics to increase plot ratio incentives to promote the feasibility of UR promotion.

2.4. Enhance the trust and credibility of urban renewal projects

This study summarizes the following four accelerating factors after compiling the relevant literature related to this construct. The first factor is that the government dominates the UR projects. Lin [54], as a government official, explored how to improve the number of UR projects by establishing complete UR regulations. Lam, Lee [51] pointed out that the government-led UR should focus on the cleanup and demolition of illegal constructions. Under the principle of "build first, demolish later," the government helps households achieve the goals of rehousing, environmental improvement, public facilities construction, and site acquisition to accelerate UR promotion. Chen [38] analyzed why UR projects are too low. The study points out that the government should exercise public power properly and that large areas of UR should be government-led.

Second, the government selects a high-quality implementer (builder). He and Chen [55] use a self-organized UR project in Taipei City, Taiwan, as an example. The study shows that to ensure the smooth implementation of the UR and the change of rights during the period, the credibility of the professional entity should be relied on to reduce the residents' distrust of the construction company or the development unit. Furthermore, scholars further point out that trusted implementers and the help of professional architectural teams can positively influence UR. For example, Bian and Huang [56] explored the influencing factors of UR with theories of collective action and trust. The results show that trust in the implementer positively and significantly affects the success rate of UR. Yang [57] examined the difficulties encountered in autonomous UR. The study mentions the complexity and lengthiness of the UR, as it involves the integration of different professional fields and requires the assistance of good professional architectural teams.

Third, the government selects a real-estate management company. Yang [57] surveyed the impact of the different financial means of households and the inability of disadvantaged ones to afford UR projects. For example, failure to qualify for a loan or a bank's inability to provide an adequate loan amount could put UR projects and residents in a dilemma and affect UR projects. The solution is to appoint a real-estate management company to manage the operation of the UR project. This company can assist the residents when they can not finance the project. Ke [58] analyzed the reasons for the ineffectiveness of UR in Taiwan, including a discussion of the roles, functions, governance strategies, and tools of UR managers. The study points out that UR households' trust in builders, banks, and real-estate management companies helps to promote the UR project. Hu [59] examined the reasons for the poor implementation of the UR Act in Taiwan. The study concludes that UR could solve the professional agency problem between real estate owners, implementers, and real-estate management companies by following the "corporate governance" mechanism. The study also suggests that the government selects real-estate management companies that can enhance trust among UR participants and, in turn, improve the success rate of UR.

Fourth, the government establishes a mechanism for impartial real estate appraisers. Chang [60] explored the inconsistency in real estate appraisal in Taiwan's UR, leading to different valuation results for similar projects and is not convincing enough. The study mentions that by enhancing the objectivity, rigor, independence, and scientific nature of real estate appraisal, the public will trust real estate appraisers more, and their willingness to participate in UR will increase accordingly. Chen [61] suggests that the government should establish a database of good real estate appraisers. To ensure the professionalism and impartialness of the appraisal, the study concluded that at least two of the three appraisers in the UR project were from the recommended database. Chen, Shen [62] analyzed the information that UR processes have to reveal. The study suggests that if appraisers could impartially appraise UR pre- and post-buildings, residents would have more confidence in the entitlement process and increase the chances of successful UR negotiations and bargaining.

2.5. Institutional theory

Institutional theory is a social science theory that primarily explores the impact of institutions, which refer to rules, values, norms, and so on, on individual behavior and organizational operations in society. In 1899, institutional economist Thorstein B. Veblen (1857–1929) defined "institutions" as a way of life, fundamentally constituted by the general ideas and habits of individuals or society regarding certain relationships or functions [63]. What makes organizations so similar? We contend that the engine of rationalization and bureaucratization has moved from the competitive marketplace to the state and the professions. ... To the extent that pluralism is a guiding value in public policy deliberations, we need to discover new forms of intersectoral coordination that will encourage diversification." [64]. The key literature research explicitly points out that, concerning the collaborative relationships among individuals, organizations, and even governments, the connections among them are maintained by "institutions."

This study applies institutional theory to construct outcomes based on grounded theory, transforming these into specific elements. Herein, institutional theory provides a framework for understanding how institutions influence and shape social behaviors and create

industry structures. This includes the development processes and futures of urban renewal and city redevelopment. The differences in data analysis processes of grounded theory by Glaser and Strauss offer insights into how these methods can be applied to studies of urban renewal and city redevelopment [65]. Furthermore, research by Charmaz & Belgrave (2019), analyzed through an institutional theory framework, highlights the importance of theories in qualitative research materials being contextually sensitive, relevant, and persuasive. This approach aids in analyzing urban renewal efforts from the perspective of institutional theory [66].

The research by Erfani & Roe (2020) explores the trends in collaboration among parties in construction cases through an in-depth case study of decision-making processes. The results indicate that decision-making is more smoothly produced when there are fewer participating stakeholders (the general public), facilitating institutional cooperation (between developers and the government). The study suggests the need to establish a pre-agreed mechanism where the roles and responsibilities of each stakeholder are referenced [67]. Furthermore, research by Vandergert et al. (2016) and others on strengthening the institutional foundation for adaptive governance through institutional theory is discussed. This is explored through an empirical study of the Rome metropolitan area in Italy. The results show that clear participation in these topics can lead to more substantial urban transformation strategies. The importance of institutional theory lies in its provision of a powerful framework for understanding and analyzing organizational and societal behavior, especially in terms of how organizations adapt to and respond to social norms and expectations, and how these processes evolve and change over time. With the support of literature, we can gain a deeper understanding of the core content, definitions, and significance of institutional theory, as well as its prospects for application in organizational studies and social sciences [68].

3. Methodology

Chapter 2 used literature reviews to explore the UR-affecting factors, which are used to design the questions for interviewing specialists. This chapter begins with describing the preparation for the specialist interview, the specialists' background, and the interview content. Next, Grounded Theory and coding extraction results are described. In this study, we extracted the factors that may accelerate UR through the three steps of Grounded Theory: open coding, axial coding, and selective coding (Fig. 3). The accelerated UR factors are further categorized into three constructs. A conceptual diagram of the constructs and factors hierarchy is created (Fig. 4). The AHP questionnaire, developed through the constructs and factors hierarchical diagram, was distributed to the participants, and the results were collected. Finally, AHP software Power Choice was used to analyze the weighting of constructs and factors to obtain the results.

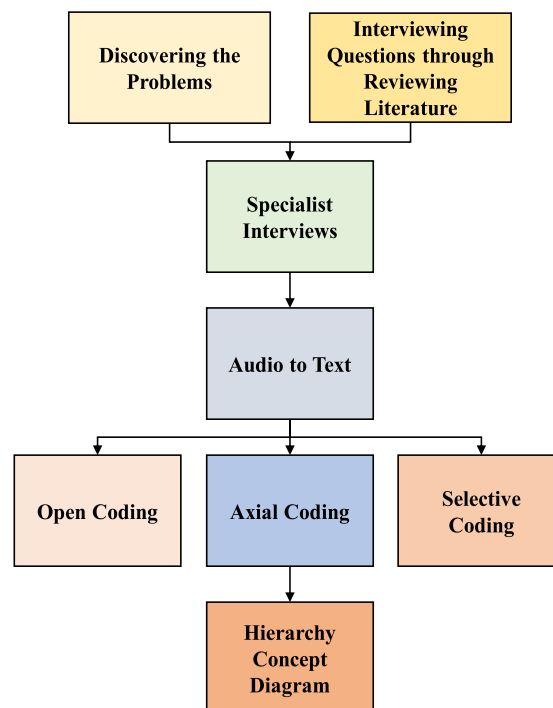


Fig. 3. Workflow of grounded theory.

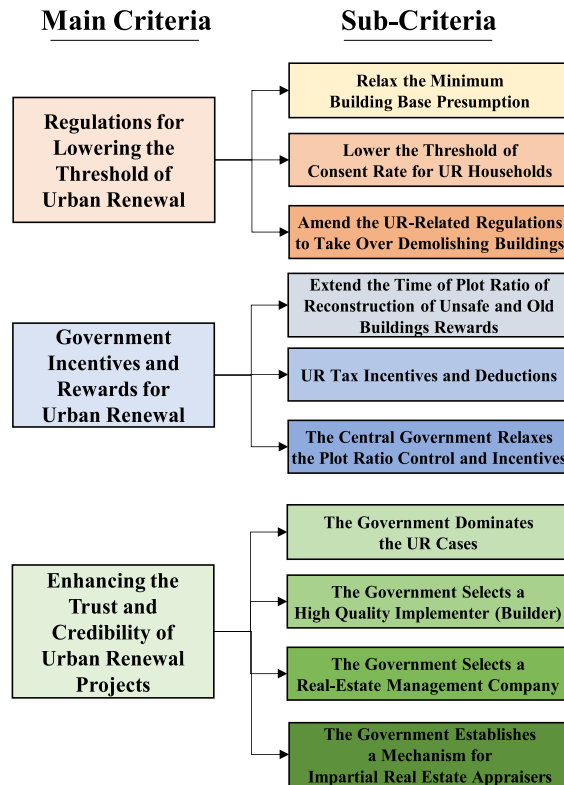


Fig. 4. AHP hierarchy.

3.1. Specialist interviews

The current difficulties in promoting UR in Taiwan are complicated and multifaceted. The general public, academia, related industry, and the government have different perspectives. It is not easy to reach a unanimous conclusion. Therefore, six specialists from various fields, including industry, government, and academia, were invited to conduct one-on-one audio interviews for this study. The interview scope included the current challenges of UR in Taiwan, factors that promote accelerated UR, UR threshold restrictions, and preferential regulations. The following describes the background of the specialists, the preparation, the content, and the results of the interview.

(1) Preparation for Interview Questions

A semi-structured set of 5 questions for the specialist interviews was created from the relevant UR literature. Those include the most significant UR challenges faced by Taiwan and its solution, the reasons why the government-led approach can accelerate UR, its suggestions, and the government’s proposal to amend the regulations to lower the UR threshold restriction and increase UR incentives and rewards. As shown in Table 1.

Table 1
Outline of interview questions.

Questions	Literature
1. Taiwan has been promoting urban renewal for many years. Which ones do you consider are the most significant UR challenges faced by the government? How do you propose to solve these problems?	Ouyang, Wu [53], Chuang [11], Zhang and Huang [47]
2. What are your thoughts on accelerating urban renewal through government-led initiatives? How do you propose to proceed?	Lin [54], Lam, Lee [51], Chen [38]
3. What are your thoughts on accelerating urban renewal by lowering its threshold? How do you propose to proceed?	Chen [39], Tsai [40], Lin [42]
4. What are your thoughts on accelerating the promotion of UR through legislative amendments? Any recommendations on how to proceed?	Chao and Hsu [49], Lin [50], Lee [52]
5. To enhance public credibility and expedite the promotion of UR, what are your thoughts on this? Any recommendations on how to proceed?	Lin [54], Yang [57], Ke [58]

(2) Specialists' Background and Interview Content

This study invited six specialists of construction-related financiers, the construction industry, the architectural award selection society, the Urban Renewal Association, scholars, and the UR review committee. The in-depth interviews were conducted in three steps. The background of the interviewed specialists, who have an average of more than 20 years of experience in the industry, is summarized in Table 2.

The highlights of the interviews with five of these specialists are summarized below. The first specialist interviewed is a former general manager of a government share bank who retired at the age of 40 years in finance-related business and then became the general manager of a public share bank to investment construction manager for five years; he retired from the position of general manager of the construction manager in 2021. Respondents suggested that the government should promote UR by the law to demonstrate its credibility and replace the dismantling of public power and that the government should take the lead in the main tasks promoted by UR. The following is an excerpt from the interview:

"Often, landowners do not trust the professionalism or experience of the UR implementer enough and believe that the implementer is making too much money. The truth is that the average household does not quite understand the reality of the situation. The greed and fear of suffering losses make landowners or residents think that once they agree to participate in UR, others will get more than they do."

"There are many landlords and residents, which makes communication difficult. Integrating UR projects can take up to 5 or 10 years or more. The longer the integration period, the more costly the builder has to spend and the less willing it is to invest in UR."

"In addition, the lack of public power in the government is also a problem. UR implementers often fail to move forward even after following government administrative requirements. For example, the implementer has applied according to the regulations, such as a variation of rights, a UR implementation plan, and future allocations, and has successfully obtained a Building Permit. However, when the house is to be demolished, why are there still various problems or obstacles? If the government cannot help eliminate issues or barriers, why does it have to make UR implementers work for nothing? This type of situation still occurs from time to time."

The second interviewee has complete education and experience. He holds a degree in Architecture from the National University and has over 40 years of practical experience in construction and company management. He is currently the Chairman of one of Taiwan's top 10 listed construction companies. The Chairman discussed the current situation and insights into the UR in Taiwan. Also, he gave constructive suggestions, including the government setting up a UR center to lead the related business, appropriately raising the capacity incentive, and establishing a selection mechanism for quality builders. The following is an excerpt from the interview:

"The government seems to limit UR to a specific area. What I mean is that the government should help integrate the UR push. I was visited by staff from the Housing and Urban Regeneration Center, which is the role of the Incorporated Administrative

Table 2
Specialists' background.

Respondent No.	Type of Respondent	Gender	Overview of the Interviewees' Background	Interview Time
1	Financiers	M	From 2013 to 2015, he was the General Manager of Agricultural Bank, a government share bank.	16'00"
2	Construction Industry	M	From 2016 to 2021, he was the General Manager of China Real Estate Management. Founder and current Chairman of a Taiwan Stock Exchange-listed construction company (stock code 5524).	29'30"
3	Architectural Award Selection Society	M	He graduated from National Cheng Kung University with a degree in Civil Engineering and is the author of the book "Taikei No. 1" (ISBN: 9789862162156). Since 1999, he has served as the CEO of the National Architecture Gold Award Selection Committee.	19'30"
4	UR Association	M	He has been the Chairman of the Taiwan Association for Sustainable Care (TASC) since 2022. M.S., College of Management, National Taiwan University of Science and Technology.	14'00"
5	Scholars	M	Since 2016, he has been the Chairman of the only county government-approved "Zhongxing Theatre Renewal Association" in Penghu County, Taiwan, and is one of the landlords of the UR project. Currently, he is the department head of HSBC Bank Taiwan.	29'10"
6	UR Review Committee	F	He was a member of the National Park Planning Committee of the Department of Construction, Ministry of the Interior, Taiwan, a general consultant of the National Park Environmental Landscape Architecture, and the Dean of the College of Design, Chung Yuan University, Taiwan. Master of Architecture, University of Michigan, USA.	20'05"
			In recent years, he has served as a member of the UR committee of five counties and cities, including Taipei City, New Taipei City, and Keelung City. Currently, he is the Senior Vice President of China Real Estate Management.	

Agency. I think it is right to set up this organization. In other words, the center should play the role of an implementer and then find a larger-scale builder for development and construction."

The third interviewee was the CEO of the impartial third-party selection agency for the Taiwan Architecture Gold Award, a position he has held continuously for more than 20 years. The agency is the most representative NGO of the construction industry in Taiwan. The interview mentioned that the government should take the lead in UR, demonstrate its credibility, enhance the public's trust in UR, amend the law to compel demolition on behalf of UR, and amend the law to lower the threshold of consent for UR households. The following is an excerpt from the interview:

"The government's UR policy should be clear, protect builders and participants, and create a win-win-win situation for all three. For example, the government should protect the interests of legitimate builders by the law so that they will be willing to participate in UR. In other words, if the government wants to lead UR, it should make the information transparent and establish an open information platform. For example, websites like the Housing and Urban Regeneration Center in the Minister of the Interior must present the necessary UR policy information."

"Of course, appropriately amending the regulations to relax the UR restrictions is necessary. Because houses and people in Taiwan are getting older and older, an appropriate relaxation of the relevant threshold is helpful to accelerate the promotion of UR. The 1999 Jiji earthquake, for example, caused countless casualties and huge losses of life and property. A major disaster would be unthinkable if it happened in a metropolitan area. UR needs to keep up with the times. Increasing incentives and rewards, but not without limitation, or even infringing on people's rights."

The fourth interviewed specialist was the Chairman of the first UR project renewal association in Penghu County, Taiwan. The UR project is currently the only landowner-run project in Penghu County, and the government is participating and leading the selection of the builder to build it. The interviewee has served as the Chairman of Wenkang UR Association in Magong City, Penghu County, since 2016. The interview summarized that the government should take the lead in UR projects, select quality builders, enhance UR trust, improve the credibility of the reconstruction of unsafe and old buildings projects, and lower the threshold for UR households' consent ratio. The following is an excerpt from the interview:

"The former site of the UR project in the Wenkang area of Magong City, Penghu, was originally a movie theater. Due to the age of the building, it is in a hazardous condition and no longer usable. Private landowners have always wanted to build their land. However, the state land has surrounded the private land, making the private land an inner one. Self-renovation also has the realistic problem of reduced plot ratio. Fortunately 2016, the county government started a UR project with nation-owned and county-owned land. The county government formed the UR committee to select the best implementer to build the Wenkang District Zhongxing Theater. In 2020, the old buildings were demolished, and construction began."

"At that time, when the county government was promoting the UR project, many brokers also came to lobby individual landowners and offered favorable terms, such as allowing the landowner to exchange one square foot for one square foot and various other unrealistic incentives. At this time, the role of the Chairman of the UR Association is to communicate with each landowner and consolidate their needs so that the entire association and landowners can agree on the same views and make concessions with the builders to form a mutual benefit."

"The government-led approach will indeed accelerate the UR drive. However, in this UR project, the county government-owned and the nation-owned land is less than the landowners'. Therefore, if we set up an independent UR association, we can have more initiative and follow the landowner's opinions. If the county government takes the lead in UR, the deliberation process will be more time-consuming."

The fifth interviewee is currently a professor in the College of Design at Chung Yuan University in Taiwan and was the former dean of the same college. The following is an excerpt from the interview:

"There are still a few successful projects of UR in various metropolitan areas in Taiwan. Taking these successful projects as examples for analysis, I think the government should have integrity. I suggest that the government be open and transparent, administered by the law, and credible. The consortium participating in UR must be honest. Most residents must be rational. If these premises are met, the consortium can execute and make a reasonable amount of money, and the public will be willing to accept the UR with a plan from the government."

"A city that is this large as Taipei has a high percentage of places that require UR. Approximately 70% or more of the buildings need UR."

3.2. Grounded theory and results of coding extraction

Grounded Theory is a well-known theoretical construct established by Glaser and Strauss [69]. It uses the process of actual observation, interviews, data collection, and analysis to generalize research concepts. With its continuous development and application, Grounded Theory has become one of the most impactful research methods in the social sciences [70]. The theory uses coding to transform the interview content into axial concepts. The first stage is called open coding, in which the respondents' original semantic meaning is broken down sentence by sentence into corresponding factors, and then categorized, matched, and focused one by one, and grouped into axial concepts [71,72]. Open coding can be identified as clearly visible codes or codes seeking interpretation [73]. The

second stage is theoretical coding or axial coding. According to Corbin and Strauss [71], axial coding is the linking process of primary and secondary levels. For example, this study establishes the connection between constructs, factors, and interview data. Among them, constructs are more generalized categories that are categorized after open coding. The third stage is selective coding. Strauss and Corbin [72] state that selective coding aims to analyze the data and establish causal or hierarchical relationships between selective and axial coding [74].

The study was conducted from October 8 to 24, 2022, with audio interviews of six specialists in different fields. The interviews were compiled into textual data, and the factors that might accelerate the UR were extracted using open, axial, and selective coding. The text data was finally organized into 367 sentences, coded into 232 open codings, entered the analysis phase, and linked to different AHP levels. Table 3 shows several examples of open coding for this study.

The function of selective coding is to explain the relationship between open coding and axial coding orientation. Because there is a considerable distinction between the primary and secondary levels of selective coding, Corbin and Strauss [71] and Strauss and Corbin [72] suggest that researchers can build a conditional matrix based on this. The interviews of 6 specialists were converted into text and then into 232 open codings, 31 of which eventually formed ten axial codings, as shown in Table 4.

To examine the theoretical saturation of the results obtained from this grounded theory, two additional interviewees were included in this study: a frontline practitioner involved in integrating urban renewal cases, and the other was a senior executive in real estate sales. Through interviews using the same set of questions, the results were subjected to open coding to extract conceptual statements. Ultimately, no new elements of open coding were added. Besides based on the theory, this study focuses on practical data collection and analysis and further summarizes and extracts the primary and secondary acceleration factors of urban renewal in the framework. However, according to institutional theory, it is possible to connect AHP research with the framework of grounded theory to form a complete research framework and understand more reasonably how institutions can affect and shape changes in social behavior and structure, including the process of urban renewal and urban redevelopment and future social development.

3.3. Establish AHP hierarchy

AHP is a set of decision-making methods proposed by Satty [75], which are simple and easy to use. One of its functions is to assist

Table 3
Extraction of original phrase as an open coding example.

Original Phrase	Open Coding
1-01: The landowner does not trust the implementer enough, and the participating UR residents think the implementer is making too much money.	C3F8-11: Building up the trust of residents in the implementer
1-03: Doubts about the professionalism or experience of the implementer lead to distrust of landowners and residents.	C3F8-13: The implementer should strengthen their professionalism.
1-04: Too many landowners and residents make it difficult to reach a consensus and cause the integration period to be too long.	C3F8-14: Integrating an urban renewal project for the implementer is not easy.
1-05: Most implementers are reluctant to invest in UR integration because of the high cost caused by the long-term project.	C3F8-15: The implementer integrates the UR project at a too-high cost.
1-08: The exchange of rights, the UR implementation plan, and the future distribution have all been carried out by the regulations and complete submission. Why is there still a problem when the house is to be demolished? This is disadvantageous for the implementer.	C1F3-11: The government should amend the UR-related regulations to take over demolishing buildings.
2-01: Government officials seem to have set the scope of the UR. I mean that the government should integrate the UR to promote.	C3F7-21: The government should dominate the UR projects.
2-02: If all people can perform UR or can be UR implementers, it will reduce the quality of UR.	C3F8-21: The government should select a high-quality implementer.
2-03: A moderate increase in the UR plot ratio incentives can raise the intention to participate in UR for the public.	C2F6-21: The plot ratio incentives should be increased appropriately.
3-01: If the government can lead UR, it can make UR information transparent.	C3F7-31: The government should lead the UR projects.
3-02: Appropriate amendments to the law to allow the government to take over demolishing buildings are necessary. Because the houses and people in Taiwan are getting older and older.	C1F3-31: The government should amend the UR-related regulations to take over demolishing buildings.
3-03: Appropriate relaxation of the UR households' consent threshold is necessary to accelerate UR promotion.	C1F2-31: Lower the threshold of consent rate for UR households
3-04: Now that construction materials are rising and there is a shortage of workers, wages keep going up significantly. If UR incentives are not extended or renewed, future UR promotions will be a concern.	C2F4-31: Extend the time of reconstruction of unsafe and old buildings' rewards
4-01: Tax incentives or reductions, such as stamp duty, land tax, and housing tax, are also incentives for people to participate in UR.	C2F5-41: UR tax incentives and deductions
4-02: A higher plot ratio reward will increase the public's willingness to participate in UR.	C2F6-41: The central government relaxes the plot ratio control and incentives
5-01: The government should set rules on whether public land should be built or maintained.	C3F7-51: The government-led approach to UR should be clear and definite.
5-02: The government can use the plot ratio to incentivize new construction projects to encourage the public and builders to participate in UR.	C2F6-51: The central government should relax the plot ratio control and incentives.
6-01: After more than 20 years of adjustment and amendment, most factors have been considered, including the handling of households' disagreement.	C1F3-61: Amend the UR-related regulations to take over demolishing buildings
6-02: If the number of participating UR households agrees to more than 90 %, the case can be allowed, and the building can be demolished forcibly.	C1F2-61: Lower the threshold of consent rate for UR households

Table 4
Selective coding.

Selective Coding	Axial Coding	Open Coding
Regulations for lowering the threshold of urban renewal	Relax the minimum prerequisite of the building base	C1F1-11: The government should help relax the recognition of small building bases reconstruction. C1F1-41: The government should offer preferential terms to help landowners of small construction bases to carry out joint reconstruction. C1F1-51: The government can slightly relax the joint construction requirement for small building bases.
	Lower the threshold of consent rate for UR households	C1F2-11: Reducing the consent ratio can accelerate UR projects C1F2-31: Lower the threshold of consent rate for UR households C1F2-61: Lower the threshold of consent rate for UR households
	Amend the UR-related regulations to take over demolishing buildings	C1F3-11: The government should amend the UR-related regulations to take over demolishing buildings. C1F3-31: The government should amend the UR-related regulations to take over demolishing buildings. C1F3-61: Amend the UR-related regulations to take over demolishing buildings
Government incentives and rewards for urban renewal	Extend the time of plot ratio of reconstruction of unsafe and old buildings' rewards	C2F4-21: The existing UR or unsafe and old building incentive schedule should be extended appropriately. C2F4-31: Extend the time of reconstruction of unsafe and old buildings' rewards C2F4-61: Unsafe and old buildings or UR rewards should be extended to give the residents enough time to integrate.
	UR tax incentives and deductions	C2F5-21: The government should provide tax incentives or real rewards to the participating UR builders. C2F5-41: UR tax incentives and deductions C2F5-51: UR should use tax and other related incentives to enhance participation.
	The central government relaxes the plot ratio control and incentives	C2F6-41: The central government relaxes the plot ratio control and incentives. C2F6-51: The central government should relax the plot ratio control and incentives. C2F6-61: Government offers UR incentives
		C3F7-11: Government-led UR reconstruction to accelerate UR promotion. C3F7-13: Government-led UR can give the public greater trust. C3F7-21: The government should dominate the UR projects. C3F7-51: The government-led approach to UR should be clear and definite.
Enhance the trust and credibility of urban renewal projects	The government dominates the UR projects	C3F8-11: Building up the trust of residents in the implementer C3F8-21: The government should select a high-quality implementer. C3F8-61: The government selects a high-quality implementer (builder). C3F9-21: The government should allow real-estate management companies with a financial background to participate in UR. C3F9-31: The government should combine with the professional real-estate management company to accelerate the promotion of UR. C3F9-61: The government selects a suitable real-estate management company.
	The government selects a high-quality implementer (builder)	
	The government selects a real-estate management company	
	The government establishes a mechanism for impartial real estate appraisers.	C3F10-31: The government establishes a mechanism for impartial real estate appraisers to win the residents' trust. C3F10-51: The government must help establish an appropriate appraisal mechanism. C3F10-61 The government should establish a mechanism for impartial real estate appraisers

decision-makers in converting qualitative research indexes into quantitative decision values for systematic decision-making in uncertain situations with multiple evaluation criteria. In this study, complex decisions are first divided into sub-criteria (factors) and main criteria (constructs). The order of importance and weight of the main and sub-criteria are compiled from specialists' interviews. This helps the decision-makers choose the appropriate solution and reduce the risk of decision errors.

3.4. AHP questionnaire

After interviews with specialists, this study designed the AHP questionnaire based on the ten factors of UR promotion extracted from grounded theory and the three constructs to which they belong. The factors and their respective constructs are compared in pairwise matrices to give a quantitative evaluation scale of importance: 1–9. After the questionnaires were collected, Power Choice 3.1 software was used to check the consistency of the questionnaires, and valid samples with a Consistency Ratio ≤ 0.1 were selected. Then, a weight ranking analysis [76] was conducted to identify the key accelerating factors that drive UR and unsafe and old building renovation.

The questionnaire design was divided into two levels. The first level of assessment was based on the main criteria of comparison between the three structures: regulations for lowering the threshold of urban renewal, government incentives and rewards for urban renewal, and enhancing the trust and credibility of urban renewal projects. The relative weights were evaluated. There are three questions in total. The second level assessed the sub-criteria. Respondents conducted pairwise comparisons for the three, three, and four factors of the three constructs, respectively. The relative weights were evaluated. There are fifteen questions in total. An example of the AHP questionnaire evaluation scale and description is shown in Fig. 5.

4. Results

4.1. Descriptive analysis

This study investigates the factors that promote urban renewal and reconstruction of unsafe and old buildings and uses AHP to analyze the order of importance and weight of each influencing factor and construction. The study used SurveyCake to create, distribute, and collect the AHP online questionnaire. The participants were five types of specialists who are familiar with UR and unsafe and old building renovation promotion in Taiwan, including construction-related industry executives, professors of the department of construction at the university, personnel of government building authority or third-party impartial organizations, professionals, such as an architect or a real estate appraiser, households that have been involved in an urban renewal project. The survey period is from December 1, 2022, to December 15, 2022. The following is a description of the questionnaire collection.

A total of 113 questionnaires were collected after distribution. All 113 questionnaires were valid. The number of cached copies of each type of UR specialist is as follows: 43 from construction-related industry executives, 24 from professionals, such as an architect or a real estate appraiser, 22 from households that have been involved in an urban renewal project, 13 from the professors of the department of construction at the university, and 11 from the personnel of government building authority or third-party impartial organizations. In this study, Normalization of the Geometric Mean of the rows was used to calculate the weights. The results of the AHP weight analysis for each of the five types of specialists are described in the next section.

4.2. AHP hierarchy analysis

(1) Importance Ranking and Weighting of Constructs

The results of specialist interviews were coded by grounded theory and conceptualized at different levels to obtain the main and sub-criteria for accelerating UR. Among them, the main criteria include three constructs: regulations for lowering the threshold of urban renewal, government incentives and rewards for urban renewal, and enhancing the trust and credibility of urban renewal projects. The sub-criteria includes ten factors. Then, this study obtained two pairwise comparisons of the constructs and factors of the five types of UR specialists through the AHP main and sub-criteria questionnaire. The C.I. (Consistency Index) and C.R. (Consistency Ratio) of the consistency matrix were both less than 0.1 when compared using the decision tool Power Choice 3.1. In which $C.R. = C.I./R.I.$ (Random Index). About calculation formulas in the Analytic Hierarchy Process (AHP), the Consistency Index (CI) and Consistency Ratio (CR), descriptions are as follows:

(1-1) Consistency Index (CI)

The Consistency Index is a measure of the inconsistency in the pairwise comparisons made in the decision matrix. For an n matrix, the CI is calculated using the formula: $CI = \frac{\lambda_{max} - n}{n - 1}$. Here, λ_{max} is the largest eigenvalue of the decision matrix, and n is the order or size of the matrix. A smaller CI value indicates better consistency in the matrix.

(1-2) Consistency Ratio (CR)

The Consistency Ratio is a measure that evaluates whether the calculated Consistency Index (CI) is within an acceptable range. It is

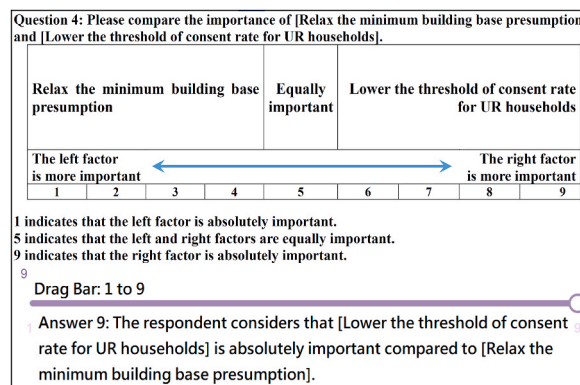


Fig. 5. An example of an AHP questionnaire evaluation scale.

calculated using the formula:

$CR = \frac{CI}{RI} n - 1$ Here, RI (Random Index) is a pre-determined constant derived from statistical tables. Typically, the acceptable range for CR is 0 to 0.1. If CR is less than or equal to 0.1, it is generally considered acceptable consistency; if CR is greater than 0.1, it suggests potential inconsistency in the matrix. AHP utilizes these formulas to assess the consistency of the decision matrix, ensuring that the comparisons and weight assignments made by decision-makers are coherent and reliable.

This result indicates that the AHP questionnaire data of the specialists in this study met the consistency requirement. According to the AHP decision criteria, the participants were divided into five types of specialists. The AHP questionnaire was sent to survey the importance and weight of acceleration factors to promote UR and reconstruction of the unsafe and old building. The following results were obtained from Table 5.

First, the data show that the construction-related industry executives and scholars ranked the constructs in the same order of importance: UR incentives > enhancing UR project trust and credibility > lowering the UR threshold. Secondly, the weighting of constructs for households and professionals is the same: enhancing UR project trust and credibility > UR incentives > lowering the UR threshold. However, the data show that personnel of government building authority ranked the constructs in the following order of importance: enhancing UR project trust and credibility > lowering the UR threshold > UR incentives. This result indicates a considerable difference in ranking the constructs of personnel of government building authority with the other four categories of UR specialist groups.

(2) Importance Ranking and Weighting of the Factors Promoting UR

Table 6 shows that different types of specialists place slightly different emphases on facilitating UR factors. The top 5 ranked weights in the table are shown in bold font. Among them, the Construction-Related Executives category has a presence in the top five rankings for all five Accelerating Factors (No. 3, 4, 5, 6, 8). Similarly, the Professionals category holds top-five rankings in all five Accelerating Factors (No. 3, 5, 6, 7, 10). Additionally, UR Households, in this category, has its Accelerating Factors (No. 3, 5, 6, 9, 10) weighted within the top five as well. However, only Scholars and Government Personnel, among these categories, have four Accelerating Factors each ranked in the top five. In addition, for the Accelerating Factor of "The central government relaxes the plot ratio control and incentives," the weights of all five categories of experts are ranked within the top five. Besides the Accelerating Factor of "UR tax incentives and deductions," where the weights of all expert categories, except for Government Personnel, are concentrated within the top five.

It's worth noting that in this study, after summing up and averaging the weights of all Accelerating Factors, the ranking order provides a clearer presentation. Firstly, it should be highlighted that for No.6, "The central government relaxes the plot ratio control and incentives," the average total score is the lowest at 1.6, ranking first. This indicates that it is highly valued by all five categories of experts. Secondly, for No.10, "The government establishes a mechanism for impartial real estate appraisers," the average total score is 3.8, ranking second. It is highly valued by all expert categories except Construction-Related Executives.

Furthermore, the Accelerating Factor ranked third, "Amend the UR-related regulations to take over demolishing buildings," is only highly regarded by Construction-Related Executives, Professionals, and UR Households. Their weights are all in the top five, but they receive comparatively less attention from Scholars and Government Personnel. Particularly noteworthy are items No.4, "Extend the time of plot ratio of reconstruction of unsafe and old buildings rewards," No.7, "The government dominates the UR projects," and No.1, "Relax the minimum prerequisite of the building base." These three Accelerating Factors have the highest average total scores, ranking eighth, ninth, and tenth, respectively. This indicates that they are relatively less prioritized by these five categories of experts.

5. Conclusion and discussion

In this study, the questions from interviews with six UR specialists in Taiwan were compiled through literature reviews, and they were interviewed with those questions. Then, the interview recordings were compiled into a transcript, and the sentences were extracted into open coding, axial coding, and selective coding using grounded theory. Subsequently, these codes were coded to form the AHP hierarchy, including three constructs and ten factors for facilitating UR. Based on this hierarchy, an online AHP questionnaire was created by SurveyCake for five types of UR-related specialists. The importance of pairwise constructs and factors to promote UR are included in the questionnaire. Finally, Power Choice confirmed that the Consistency Index and Consistency Ratio of the 113 valid

Table 5
The weighting and ranking of constructs of the five types of specialists.

Number	Constructs	Construction-related executives	Professionals	UR households	Scholars	Government personnel
1	Regulations for lowering the threshold of UR	0.2737 (3)	0.2145 (3)	0.2321 (3)	0.3231 (3)	0.2650 (2)
2	Government incentives and rewards for UR	0.3910 (1)	0.3061 (2)	0.3831 (2)	0.3487 (1)	0.2497 (3)
3	Enhancing the trust and credibility of UR projects	0.3354 (2)	0.4794 (1)	0.3848 (1)	0.3282 (2)	0.4853 (1)

Note: The numbers in brackets represent the order of importance, (1)>(2)>(3)—source: compiled by the authors.

Table 6
The weighting and ranking of UR factors of the five types of specialists.

NO.	Constructs	Accelerating Factors	Construction-Related Executives	Professionals	UR Households	Scholar	Government Personnel	Score	Ranking
1	Regulations for lowering the threshold of UR	Relax the minimum prerequisite of the building base	0.0534 (10)	0.0595 (10)	0.0404 (10)	0.0824 (7)	0.0996 (5)	42/5 = 8.4	10
2		Lower the threshold of consent rate for UR households	0.0827 (6)	0.0950 (6)	0.0949 (6)	0.1346 (2)	0.0671 (8)	28/5 = 5.6	6
3		Amend the UR-related regulations to take over demolishing buildings	0.1376 (2)	0.1198 (2)	0.0969 (4)	0.1061 (6)	0.0983 (6)	20/5 = 4.0	3
4	Government incentives and rewards for UR	Extend the time of plot ratio of reconstruction of unsafe and old buildings rewards	0.1363 (3)	0.0744 (8)	0.089 (8)	0.0641 (9)	0.0552 (10)	38/5 = 7.6	8
5		UR tax incentives and deductions	0.0944 (5)	0.1062 (5)	0.1086 (2)	0.1303 (3)	0.0876 (7)	22/5 = 4.4	4
6	Enhancing the trust and credibility of UR projects	The central government relaxes the plot ratio control and incentives	0.1603 (1)	0.1662 (1)	0.1846 (1)	0.1543 (1)	0.1070 (4)	8/5 = 1.6	1
7		The government dominates the UR projects	0.0808 (8)	0.1106 (4)	0.0890 (9)	0.0412 (10)	0.0626 (9)	40/5 = 8.0	9
8		The government selects a high-quality implementer (builder)	0.1006 (4)	0.0896 (8)	0.0931 (7)	0.1069 (5)	0.1780 (1)	25/5 = 5.0	5
9		The government selects a real-estate management company	0.0717 (9)	0.0627 (9)	0.0962 (5)	0.0694 (9)	0.1160 (3)	35/5 = 7.0	7
10		The government establishes a mechanism for impartial real estate appraisers	0.0823 (7)	0.1160 (3)	0.1066 (3)	0.1107 (4)	0.1287 (2)	19/5 = 3.8	2

Note: The numbers in brackets represent the order of importance, (1)>(2)>(3). The top 5 ranked weights are shown in bold. Sort by Score, No.6 > 10>3 > 5>8 > 2>9 > 4>7 > 1. font—source: compiled by the authors.

respondents were less than 0.1. Indicates that the results of the AHP questionnaire are consistent. Based on the findings of Chapter 4, the following analysis and suggestions are proposed.

5.1. Four types of UR specialists have reached a consensus: the crucial factor in accelerating UR is the relaxation of plot ratio control and incentives

This study found that the factor of relaxing the plot ratio control and incentives is ranked first for construction-related industry executives, UR households, professionals, and scholars. This indicates that all UR specialists highly value relaxing the plot ratio control and incentives. However, it reflects the neglect of the importance of this factor by government building authorities. From this, it should be inferred that the biggest obstacle to UR projects in Taiwan is the government's control of the UR plot ratio. The results of this study are similar to those of Chen [38], Lee [52] and Ouyang, Wu [53]. According to the local autonomy, the UR plot ratio is controlled by the local government in Taiwan. In other words, each local government in Taiwan can set the land use zoning and building plot ratio development intensity suitable for regional development according to the area and road section. The purpose is to promote or suppress urban population density, optimize living space and functions, and build safe and livable cities through flexible plot ratio control. Compared to policies on UR plot ratio control in other countries, the Taiwanese government is more concerned about the environmental impact. Therefore, the intensity of plot ratio control in metropolitan areas is generally too strict [77]. Therefore, this study recommends that local governments, central building authorities, and legislatures cooperate to consolidate their views to revise or enact UR acts to keep up with the times. The most important is the appropriate relaxation of plot ratio control and incentives. In addition, it is recommended that government authorities hold public hearings frequently and seriously to listen to the views of specialists, academics, construction-related industry executives, and UR participants. Through full communication between industry, officials, academia, and UR residents to gain consensus to accelerate the promotion of UR.

5.2. Analysis and suggestions for construction-related industry executives and scholars VS UR households and professionals

First, the AHP analysis results showed that the construction-related industry executives and scholars ranked the importance of the three constructs in the same order. The ranking is: providing UR incentives > enhancing trust and credibility > lowering the UR

threshold. Second, the importance ranking of the three constructions by UR households and professionals is also consistent. The importance ranking is enhancing trust and credibility > providing UR incentives > lowering the UR threshold. However, government personnel believe that enhancing trust and credibility > lowering the UR threshold > providing UR incentives.

Construction-related industry executives and scholars agree that providing UR incentives is the most significant construct influencing the acceleration of UR. This result is similar to the findings of Wang [45] and Hu [46]. Because UR incentives can directly benefit construction-related industry executives, it is intuitive that this construct is the most important to them. Scholars may argue that the success or failure of UR projects depends on whether the builder has something to gain. This is because the builder has to bear the risk of UR projects, including investing in various and high costs. This has caused builders to hesitate. They would purchase land for new construction rather than participate in complex, risky, and potentially unprofitable UR projects. Therefore, construction-related industry executives rank the importance of providing UR incentives first. In other words, increasing builders' profits is one of the key incentives to increase their participation in UR.

In addition, UR households and professionals agree that enhancing trust and credibility is the most significant construct. This result is similar to the findings of Lin [54], Lam, Lee [51], and Chen [38]. This indicates that if the government can take the lead in promoting UR projects, it will enhance the public's trust and credibility in the UR program. In other words, UR participants expect the government to take the lead in UR projects to protect their property rights and participate in UR relievedly. The reason is that the general public does not trust the builders [78] and fears that they are not professional enough to be deceived by the builders and that their property rights will be damaged. This result is also consistent with the views of architects and real estate appraisers in frontline UR practices. This is because, at the beginning of the negotiation between the builder and UR households, professionals will be involved in UR projects and initial planning to provide the builder with the opportunity to integrate UR. However, the integration of UR projects is often put on hold due to a lack of trust and a conflict of interest between the participating UR households and the builder. The feelings of frontline professionals and UR residents are direct and identical. Because both of them share the same feelings and believe that enhancing the trust and credibility of the project is crucial.

Furthermore, the results show that government personnel ranks the weights of constructs differently from the other four types of UR specialists. Because the government building authority is responsible for UR regulations and policy implementation, they naturally believe that the construct enhancing trust and credibility is more important than lowering the threshold of urban renewal and incentives and rewards for UR. In addition, the government does not promote UR for profit, and the direct beneficiaries of UR incentives are not government employees. Therefore, the other constructs are ranked next by them. The results of this study indicate that due to insufficient public expertise and long-standing distrust in developers, there is an expectation for the government to take the lead in promoting Urban Renewal (UR). However, whether it is Government Personnel or the other four respondent groups, all of them have tangible connections to current issues such as urban renewal and home purchasing. Therefore, it is suggested that the relevant government authorities prioritize and reconcile the interests and objectives of all parties through institutional theory and legislative amendments. This approach can expedite urban renewal and urban transformation.

5.3. *The ranking of the importance of each type of specialist in promoting UR factors*

The weights of the three government incentives and rewards factors for construction-related industry executives are ranked in the top 5. This indicates that the three facilitating UR factors relate directly to construction-related industry executives' profits. However, government personnel emphasizes enhancing the trust and credibility of UR projects more. They ranked three key accelerating factors: the government selects a high-quality implementer and a real-estate management company. It establishes a mechanism for impartial real estate appraisers in the top five. This means that government authorities personnel look forward to strengthening the public's peace of mind and trust through a sound selection mechanism to accelerate the promotion of UR. However, it also shows a gap between the expectations of government personnel and the construction-related industry executives to promote UR. Therefore, this study suggests that the government building authorities of UR and the construction-related industry executives should hold consultation meetings on each factor of the incentives and rewards and invite the legislators to participate in adjusting the policies and regulations. In addition, except for the construction-related industry executives, establishing a mechanism for impartial real estate appraisers was ranked in the top 5 by the other four types of participants. The reason is that although construction is a highly profitable industry, the construction-related tax rates in Taiwan have not overwhelmed the industry. So, the response to tax incentives factors has been relatively insignificant to the executives. Furthermore, the construction-related industry executives may deliberately minimize the importance of the government establishing a mechanism for impartial real estate appraisers. The reason is that a fair real estate appraiser mechanism may allow the business model of the construction-related industry to be made public. This will lead to cost disclosure and limit the builder's profit margin. The Construction-related industry executives might not be happy to see this mechanism implemented. Therefore, this study suggests that the government should legislate a fair real estate appraiser mechanism. As well as providing appropriate incentives and rewards allowed by law to encourage builders and households to participate in UR projects. In addition, except for government personnel, the other four types of respondents ranked UR tax incentives and deductions in the top 5. The reason is that the construction industry is one of the main traditional industries in Taiwan that contributes significantly to the government's fiscal revenue. Excessive increases in the incentive deduction may affect government tax revenues. Therefore, this study suggests that the government should balance taxation and promoting Urban Renewal (UR). For example, administrative authorities should explore practical UR tax incentives and related regulations adjustments, and legislative bodies should enact or amend laws promptly. Additionally, local governments at the county and city levels can utilize their local autonomy to reduce local tax subjects related to urban renewal and increase UR incentive measures. Through the conceptual framework of institutional theory and the weighted ranking of various Accelerating Factors in this study, the government should pay closer attention to the issues present in

urban renewal. Simultaneously, there should be a careful balance in incentivizing policies for developers and participating urban renewal residents, ensuring that all parties achieve appropriate harmony. Throughout this process, all relevant stakeholders should be willing to relinquish unreasonable stances, fostering mutual understanding and making concessions to one another. Such coordinated and cooperative efforts will contribute to improving the standards of urban construction, ensuring housing safety, accelerating the realization of urban renewal goals, and promoting the development of the urban revitalization industry.

5.4. Theoretical contributions

This study, through a comprehensive review of the literature and expert interviews, has generated a text employing grounded theory, institutional theory, and AHP theory to quantify the factors influencing urban renewal and form weighted rankings of their importance. Furthermore, it provides research support for global urban renewal policies and practices, contributing to theoretical advancements in several dimensions.

(1) Innovative Research Methodology:

By holistically examining urban renewal issues and combining qualitative grounded theory with institutional theory to strengthen the AHP research methodology, this study has pioneered a novel research approach. This integration facilitates the quantification of statistical data and expedites the weighting and ranking of urban renewal factors, enhancing the reliability and applicability of research outcomes.

(2) Multi-field integration:

This research amalgamates knowledge and perspectives from various fields. Involving experts with diverse backgrounds, such as professionals in the construction industry, urban renewal participants, scholars, and government officials, enriches the theoretical depth of urban renewal research. It underscores the importance of interdisciplinary collaboration in addressing complex urban issues.

(3) Revealing New Insights into Urban Renewal Key Factors:

The study highlights the significance of key factors such as relaxing plot ratios and implementing incentive measures in the urban renewal process. This insight provides a crucial theoretical foundation for devising more effective urban renewal policies and measures.

5.5. Practical application

This study applies institutional theory to construct outcomes based on grounded theory and links AHP research to transforming these into specific elements. Herein, institutional theory provides a framework for understanding how institutions influence and shape social behaviors and create industry structures. The following list of practical Applications.

(1) Facilitating Interdepartmental Collaboration:

Encouraging efficient coordination between different departments of government administration and legislative bodies, as well as fostering collaboration between the government and real estate developers or general redevelopment stakeholders. Expanding consensus to integrate resources and share transparent information enhances the efficiency and effectiveness of urban renewal projects.

(2) Enhancing Communication and Community Involvement:

Establishing effective communication mechanisms and platforms for positive interaction with the community ensures that residents and other stakeholders have the opportunity to express their opinions and suggestions fully during the urban renewal process. This, in turn, improves project transparency and public trust.

(3) Development and Implementation of Incentive Measures:

Formulating specific and compelling incentive measures, coupled with robust advocacy, to encourage public and corporate participation in urban renewal projects. These policy incentives may include bank interest rates, enhanced personal or corporate tax benefits for declaring redevelopment projects, local government incentives for specific redevelopment zones, and increased building plot ratios, among others.

5.6. Limitations and future research

The subjects of this study were five types of UR-related industries, government, academia, and households who had participated in

UR projects in Taiwan. Future studies will expand to include the general public who have not attended UR and the people in four regions of Taiwan: North, Central, South, and East, to compare the differences in demand for UR among residents in those regions; in particular, to explore the differences in accelerating UR factors among residents living at houses aging greater than 30 years old who do not have elevators or have concerns about building safety. Second, this study focuses on accelerating factors that promote UR and unsafe and old building renovation in Taiwan. Future research will examine the factors that could inhibit UR, including the districts where the buildings are located, the condition of the facilities, buildings distribution, population density, the ratio of elderly to newborn population, global aggregate economic linkages, relations across the Taiwan strait, and political factors. In addition, the impact on UR will be investigated by combining acceleration, disincentives, and the Theory of Planned Behavior (TPB) through quantitative statistical modeling.

CRedit authorship contribution statement

Shih-Ming Lin: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Cathy C. W. Hung:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Kun-Huang Chien:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Hui-Ling Hu:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Fang-Jye Shiue:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Hsin-Yun Lee:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e30857>.

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