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How the urban renewal programme has affect Taipei City's resilience to earthquake, typhoon and flooding

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of the MSc Sustainable Urbanism at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

Yi-Hsuan Chang
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Abstract

Deeply threaten by natural disasters, especially earthquake, typhoon and flooding; Taiwan has been seeking an effective approach to enhance the urban adaptive capacity to hazards. Urban renewal, which was seen as a tool to stimulate urban economic development as well as promote planned redevelopment and utilisation of land, has been transferred to a solution to mitigate the disaster risk from the view of the authority. Therefore, this study aims to examine the effect of urban renewal programmes on urban resilience to natural disasters. A disaster resilience framework was built through literature review first, and then a comprehensive review of the urban renewal programme of Taipei City, including laws, regulations, government's policies and research reports was conducted. Also, interviews among different actors engaging in the process of urban renewal and disaster prevention were carried out to analyse how urban renewal programme has affected the urban resilience, both on the physical and social environment.

The result suggests that urban renewal programme may increase the physical resilience to disaster through improving build environment and natural environment capacity; however, in terms of improving the social adaptive capacity, the effect of urban renewal programme is quite limited. Since the concept of disaster resilience, especially social resilience, have not been involved in the urban renewal relevant policy and plan-making process in the first place, the linkage between urban renewal and building disaster-resilient city is fragmentary. Furthermore, despite similar goals, the different departments in the municipality have worked in parallel, which results in the inefficiency of improving resilience through urban renewal approach.

1 Introduction

Locating on the western edge of the Pacific-rim earthquake belt and Earthquake and lies in the subtropical climate region, earthquake, typhoon and flooding are the three most significant natural hazards in Taiwan. In the past twenty years, there have almost 20 major earthquakes with a magnitude higher than 7.0 struck Taiwan (CWB, 2019). Also, from May to November, Taiwan is often affected by tropical cyclones and heavy rainfall causing disastrous flooding. Taipei City is the capital of Taiwan; the political, economic and educational and cultural centre which also home to about 2.7 million people. However, the adaptive capacity of the city to natural disasters is questioned. It is estimated that over 4,000 dwellings will collapse if a 6.2 magnitude earthquake strikes Taipei City (NCDR, 2014). According to Lloyd's report, Taipei has the highest economic output risk within 301 examined major cities, with a potential 181 billion GDP risk majorly from a natural hazard such as windstorm, earthquake and flooding (Lloyd's, 2015).

To improve the urban resilience to natural hazard, the government has introduced a series of urban renewal policies to increase the seismic capability of buildings. However, the policies have been criticised since the adoption of additional bulk incentive strategy may cause other urban issues such as extreme population density, increase the burden of public facilities. On the other hand, the programmes have put the focus on physical construction and built environment, neglecting the social and economic context. Therefore, this research intends to examine how the urban renewal programmes have affected Taipei City’s resilience to earthquake, typhoon and flooding.

The threats of the natural disaster are getting bigger and bigger as global climate change continues. It is estimated that precipitation will increase and be more intensive with climate becomes more extreme. Also, hurricanes and other storms are likely to

become stronger, which puts Taiwan into an even higher risk situation. Urban renewal has been proposed as an approach to solving various kinds of urban issues in many countries and cities, and Taipei City is not an exception. As Urban Renewal Act was implemented in 1998, the main propose of the legislation is to stimulate economic development as well as promote planned redevelopment and utilisation of land. While from 2003, the authority started to promote urban renewal programme as a disaster preventing approach. Therefore, the impact of urban renewal approach to urban disaster resilience, especially to earthquake, typhoon and flooding need to be further examined. More specifically, the following research questions need to be addressed:

1. Has the urban renewal programme and relevant operational mechanisms improve the Taipei City's disaster resilience by building physical adaptive capacity?
2. Has the urban renewal programme and relevant operational mechanisms improve the Taipei City's disaster resilience by building social adaptive capacity?
3. What are the constraints of the existing urban renewal system? How to resolve the constraints and improve the disaster resilience of Taipei City?

To answer these questions, this study aims to achieve three following objectives:

1. To provide a comprehensive review of urban renewal programme (including include central and local government's laws, regulations, reports, incentive and financial mechanism, education programmes and partnership with institutions etc.) which may have an impact on the natural disaster resilience.
2. To examine how the urban renewal programmes improve the physical and social adaptive capacity for natural disaster resilience of Taipei City.
3. To propose recommendations and modify suggestion to Taiwan's urban renewal programme for increasing the resilience to earthquake, typhoon and flooding.

2 Literature Review and Theoretical Framework

2.1 The concept of disaster resilient cities

Although widely used in the literature and policy documents, there is no unified definition of disaster resilient city. The word “resilience” origins from the field of ecology which was described as “a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables”(Holling, 1973). While this concept has been widely mentioned in different fields, it has become a critical term of sustainable development, climate change adaptation and disaster risk management in recent years(Adger, 2000; Manyena, 2006; Nelson et al., 2007; Tiernan et al., 2019). In urban disaster context, resilience could be defined as a city that has “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner”(UNISDR et al., 2012). A city with resilience can cope with hazards with minimum loss and impact(Berke et al., 2006). It incorporates the capacity to decrease or avoid damages, contains the effects of disasters, and recover with minimal social disruptions(Buckle et al., 2000; Bruneau et al., 2003; Manyena, 2006; Tierney et al., 2007).

Traditional hazard mitigation plans have targeted on the resilience of physical systems to disaster force, since they are the body of a city, during the time of the disaster, the physical system should be functional and survival under extreme stresses(Godschalk, 2003; Malalgoda et al., 2013). However, the social system has also been emphasised as a key factor of disaster resilience city since social system acts as a brain of a city and operates all the activities, responses to the needs and learn from the experiences (Godschalk, 2003; Malalgoda et al., 2013).

Therefore, a resilient city is a sustainable network composed of both physical

systems and human communities. The physical system includes built environment and natural environment components, such as buildings, built roads, energy facilities, communications infrastructure, and as well as waterways, soils, topography, geology, and other natural systems. Human communities, on the other hand, refer to the social and institutional components, such as neighbourhoods, organisations, schools, agencies, enterprises, task forces (Godschalk, 2003). When a city has been hit by a disaster, both physical and social functions are critical for a city to survive. A city without either physical system or human communities would be vulnerable to disasters (Malalgoda et al., 2013).

On the other hand, a resilience urban should also equip with an efficient and responsible government, catering for sustainable development with the involvement of all stakeholder groups(UNDRR, 2010). With adequate housing, infrastructures and services; strong understanding of the risk of hazards; the ability to anticipate disaster and protect assets; immediate responses to organizing necessary resource before, during and after a hazard, and restoration of basic services as well as economic, social and institutional activities, many hazards could be avoided (Malalgoda et al., 2013). In summary, a disaster-resilient city can be defined as a city equipped with functional physical systems and human communities which incorporate planning and mitigatory measures to avoid or minimize the impact of disaster before, during and after a hazard.

2.2 The concept of urban renewal

2.2.1 Background

Urban renewal has received great attention from researchers and policymakers in many countries and regions. The growth of urban population gives the rise of the need for old urban areas with decaying buildings to renewal the urban fabric(Couch, 1990;

Zheng et al., 2014). On the other hand, since urban renewal responses the worry to urban sprawl by reusing dismissed urban land and abandoned buildings, it is often considered as a sound approach to pursuing sustainable development and improving environmental quality(Zheng et al., 2014; LaRosa et al., 2017).

2.2.2 Definition

In the urban planning field, urban renewal, urban regeneration, urban rehabilitation and urban redevelopment have similar meaning except for the scale(Zheng et al., 2014). Urban renewal and urban regeneration often refer to relatively larger scale work; some researches describe urban renewal as physical recreation of the urban fabric after clearance of existing buildings(Couch et al., 2011), while urban regeneration is defined as a more comprehensive consideration of improvements on economic, social physical and environmental conditions. (Cowan, 2005; Akkar Ercan, 2011). Urban redevelopment, on the other hand, refers to the new intervention on a specific and smaller site which has pre-existing uses(DeSousa, 2014; Zheng et al., 2014) and urban rehabilitation is a restoration of a building to good operation, condition or capacity(Tooke, 1992). While different definitions in literature, the aim of this paper is to examine the effect of all kind of programmes and policies that involve the rehabilitation of existing structures, redevelopment of buildings, or reuse of urban land to disaster resilience of Taipei City, therefore, urban renewal is used through this paper to indicate any action intends to improve the physical, social-economic and ecological conditions of urban areas through redevelopment, rehabilitation and revitalization.

2.2.3 Sustainable urban renewal

There are many functions of urban renewal, including improving living quality, increasing land values, (Adams and Hastings, 2001); solving urban decay issues and

meeting different socio-economic targets(Lee et al., 2008); improving existing social networks; enhancing inclusion of vulnerable groups; and rectifying negative effect on the living environment(Chan et al., 2004). Krieger and Higgins (2002) indicate that urban renewal projects produce high-quality housing and reduce the health risk of the community; also, encouraging the rehabilitation of decaying buildings(Ho et al., 2011). City planners and leadership in large cities utilize urban renewal programmes and policies to help develop cities towards sustainable growth since urban renewal aims to solve social, economic, and environmental problems. Zheng, Shen and Wang (2014) categorize sustainable urban renewal into two sub-systems after reviewing 81 relevant papers: town-planning and social sub-system. Town-planning sub-system includes all physical elements of a city and environmental factors that form the territorial structure, and the social sub-system consists of the various stakeholders involved in urban renewal. Planning sub-system in urban renewal includes four material elements: land, housing, infrastructure and heritage, which all responded by urban design (Figure1). Social sub-system, on the other hand, includes various stakeholders' involvement and community engagement (Figure2)

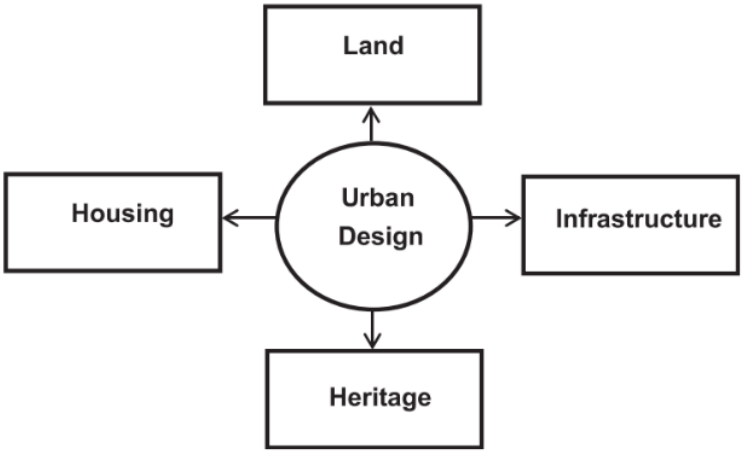

Figure 1.Planning sub-system in urban renewal. Source: Zheng, Shen andWang, 2014

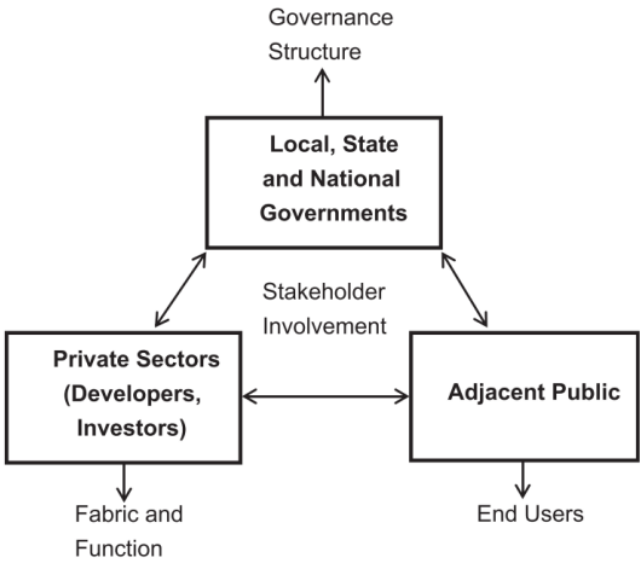

Figure 2. Social sub-system in urban renewal. Source: Zheng, Shen andWang, 2014

2.3 Urban renewal and disaster resilience

Disasters undermine the progress toward to sustainable development since they result in n loss of life and cause injury; destroy housing, schools, hospitals, utilities, and

other social and economic infrastructure as well as damaging the natural environment. Therefore, disaster risk management and building hazard resilient city are essential for sustainability(UN, 2015; Benson, 2016). There is numerous research study on the connection between urban renewal and sustainable development(Zheng et al., 2014), however, the research focus on the effect of urban renewal to disaster resilience remains limited.

Güzey (2016) study the impact of the legal regulation of urban renewal in Turkey, which has been reformulated in order to improve the resilience of the society to natural disasters, the study suggests that since economic and social vulnerabilities are not included in the risk assessment in the first place, the urban renewal projects appears difficult to achieve the objective of improving the resilience of societies in Turkey and these projects will bring the gentrification of project areas as it was implemented before. Xiang, Wang and Deng (2017) indicates that most of the current urban renewal projects in China adopt large-scale demolition and relocation model, which result in a serious reduction of urban green spaces and disruption of the ecological environment. Consequently, the acceleration of urban renewal has increased the flooding intensity of areas where frequent flooding occurs, such as Chongqing. LaRosa *et al (*2017) evaluate the environmental benefits, including reduction of seismic risk, increase in accessibility and diversity of land use of urban renewal programmes in Italy with quantitative spatial analysis. The study concludes that there is only limited number of urban renewal areas create environmental benefits, and these benefits largely depend on the combination of the characteristics and location of urban renewal areas, therefore, the foundation to maximize the environmental benefits is to choose the location of prioritized urban renewal areas.

To sum up, urban renewal have been considered one of the most useful approach

to solve the problem of economic, environmental, physical and social issues of contemporary city (Zheng et al., 2014; LaRosa et al., 2017) However, urban renewal is a multidisciplinary field includes many elements such as urban planning, urban design, housing, political economy, community development ,infrastructure and culture industry (Leary et al., 2013), while it is also a variety of stakeholders including local and national government, private developers and residents, each of them has different interests and the relationship between these actors influence the urban renewal policy, process and project implementation largely. Urban renewal is the combination of research, policy-making and practice, and each of the factors guides urban renewal projects to sustainability and disaster resilience in different situations.

2.4 Disaster resilience framework

Evaluating resilience is a complex process because of the dynamic interactions between people, communities, societies, and the environment(Mayunga, 2007). Depending on the theoretical orientation and working definitions, there is a wide range of resilience frameworks from engineering to community resilience. Tiernan et al., (2019) point out the key steps taken in evaluating disaster resilience: 1) considering the whole system and its subcomponents; 2) identifying the scale of analysis and 3) identifying the framework for analysis. In this case, since this study aims to examine the impact of urban renewal programme and policies to disaster (especially refers earthquake, typhoon and flooding) resilience of Taipei City, the framework has been built under these conditions. Instead of national or regional, this study focuses on the analysis of local level, since the outcomes are more straightforward to apply in a policy context when the scale of analysis coincides with administrative boundaries(Henly-Shepard et al., 2015; Yoon et al., 2016). In addition to scale,

earthquake, typhoon and flooding are disasters belong to rapid onset events rather than slow-onset hazards such as sea-level rise and drought, therefore, an immediate response, the time for behaviours modification and practices in the preparedness of pre-event or post-event are necessary, which also affect the selection of the factors in resilience framework (Cutter et al., 2008). Finally, the disaster framework of this study is based on the concept that a resilient city is a sustainable network of physical systems and social systems(Godschalk, 2003). The physical systems include built environment and natural environment; while the social systems include Institution and governance and community. The factors related to urban renewal programme are selected to evaluate the impact on each dimension (Table1).

Table1.Disaster resilience framework

Systems	Dimensions	Factors	References
Physical system	Built environment	Building codes and standards	UNDRR, 2017;Cutter et al., 2008
		Application of zoning, building codes and standards	UNDRR, 2017
		Infrastructure	Mayunga, 2007;Cutter et al., 2008; ARUP, 2015;UNDRR, 2017; Summers et al., 2018
	Natural environment	Integration of green infrastructure into city policy and projects	UNISDR,2017
		The extent of ecosystem types	Mayunga, 2007; Summers et al., 2018
Social system	Institution and governance	Plan making	UNISDR,2017
		Appropriate land use and zoning	ARUP,2014,UNISDR,2017
		Organization, coordination and participation	Cutter et al., 2008; UNISDR,2017
		Public education and	Cutter et al., 2008;

		awareness and Training delivery	UNISDR,2017
		Integration	ARUP,2015;UNISDR,2017
	Community and economy	Community or grassroots" organizations, networks and training	Mayunga, 2007; Norris et al., 2008; UNISDR, 2017; Summers et al., 2018
		Active citizen engagement and techniques	Cutter et al., 2008; Norris et al., 2008 ; ARUP, 2014; UNISDR,2017; Summers et al., 2018
		Value of property	Mayunga, 2007; Cutter et al., 2008
		Insurance	Mayunga, 2007; Summers et al., 2018
		Demographics	Summers et al., 2018 Cutter et al., 2008(Mayunga, 2007)
		Cohesive communities	Cutter et al., 2008; Norris et al., 2008; Summers et al., 2018; ARUP, 2014
		Incentives	UNDRR, 2017

3 Research Methodology

3.1 Study focus

This study aims to explore the impact and challenges for urban renewal programmes and policies of Taiwan in creating disaster resilience within Taipei City. To achieve this aim, a qualitative research methodology was adopted. Since the effect of urban renewal to both physical and social capacity are examined, it is difficult to use quantitative approach and publicly available data to measure some subjective aspects of resilience such as community support and cohesiveness(Sherrieb et al., 2010); in addition, according to the statistical data, there are 139 finished urban renewal projects within Taipei City since the implementation of Urban Renewal Act in 1988, which only account for 2% of the Taipei City's developed area (TCURO, 2019), thus, it is hard to observe significant effects of urban renewal projects to the resilience of whole Taipei City with quantitative approach. Therefore, the primary research method for this research includes literature review and interviews. The literature review consists of a comprehensive review of the urban renewal programme of Taipei City, including laws, regulations, government's policies, plans and research reports relating to disaster reduction, prevention and resilience. The urban renewal business plan which has been approved by the municipality of Taipei City will be examined and analysed. While the focus of this research is the local level, some important laws, regulations or policies of the central government relates to the urban renewal of Taipei City are also reviewed. Besides, to better understand the disaster prevention mechanism and the integration of the urban renewal programme and disaster management system, related disaster risk identification and reduction plans and policies are involved in the analysis.

3.2 Interview

In-depth semi-structured interviews with stakeholders were carried out. The

stakeholders interviewed have participated in the process of urban renewal (including investigating relevant policies, regulations, urban plans, review and promoting) or the preparation and promotion of urban disaster prevention plans of Taipei City. Nine interviews were conducted, with one senior policy advisor from urban renewal department of the central government, one senior planner of the local planning department, two officers of local urban renewal office; one senior officer of local disaster prevention planning office, two developers and two residents of urban renewal projects. Since there are various stakeholders in urban renewal projects and different stakeholders guide resilience in different situations(Zheng et al., 2014), it is critical to gather the view from all perspectives. The interviews were designed to explore the origins of urban renewal policies, the impact of urban renewal programme to disaster resilience and how the urban renewal mechanism integrated with disaster prevention system. All interviews were audio-recorded and transcribed with the permission of the interviewees.

3.3 Content analysis

The interviews gathered and documents available were analysed with content analysis. Content analysis is a widely employed qualitative research technique(Zhang et al., 2005). Hsieh and Shannon (2005) categorize the applications of content analysis into three approaches: conventional, directed and summative. Although all used to interpret meaning from the content of text data and adhere to the naturalistic paradigm, the coding categories of conventional content analysis are derived directly from the text data; on the other hand, the analysis of directed approach begins with a theory or relevant research findings as guidance for initial codes; counting and comparisons of keywords or content are usually involved in summative content analysis. This study aims to examine the impact of urban renewal on disaster resilience with the theoretical

framework reviewed from literature. Therefore, directed content analysis is adopted in this research.

3.4 Ethics and risk

Before the research was undertaken, a risk assessment was conducted and approved (Appendix A). The data which will be analysed such as laws, plans and government reports are available for the public. For the interviews, all interviewees were fully briefed on the research and signed a consent form (Appendix B) before the interview. To protect the privacy of interviewees, the names, specific job titles, gender will not be disclosed in this study. The data was anonymised and securely saved.

4 Towards Disaster Resilient Cities In Taiwan

4.1 Hazard profile

Due to the physical geographical environment such as steep terrain, erodible soil, weak geological formation, intensive rainfall, Taiwan has suffered great damage from natural hazard since early time(Chang, 1996). Typhoon is the most frequent hazard in Taiwan, followed by earthquake and flood (Figure3). However, Earthquakes cause the largest portion of mortality and economy loss (Figure4, Figure5).

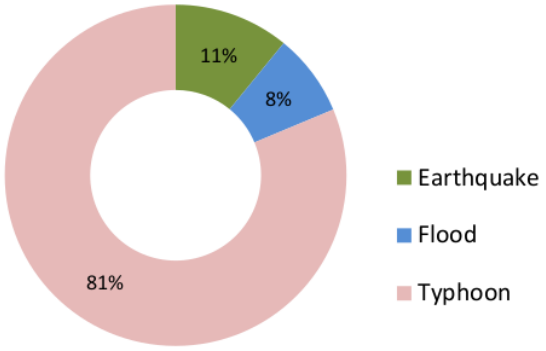

Figure 3. The hazard frenquency of Taiwan from 1990-2014. Source: NFA, 2019

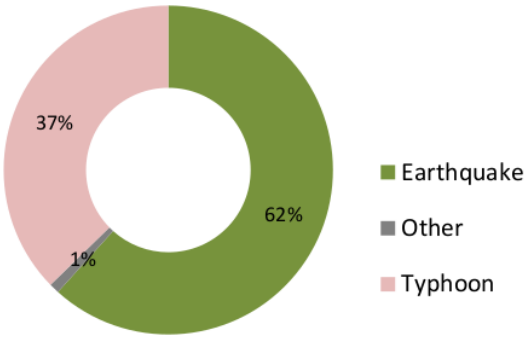

Figure 4.The hazard Mortality of Taiwan from 1990-2014. Source: NFA, 2019

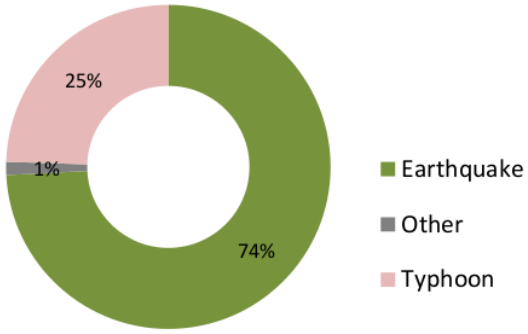

Figure 5.The economic loss by hazard of Taiwan from 1990-2014. Source: NFA, 2019

4.1.1 Earthquake

According to the statistical data of Taiwan Central Weather Bureau, in the past 10 years, the average number of earthquakes in Taiwan was 32,581 per year, of which 936 were sensible earthquake, and with 2 earthquake s magnitude over 6 per year (CWB, 2019) The most recent major earthquake was the 921 earthquake, which struck on 21 September 1999, and claimed 2,415 lives. Also, since most of the buildings in Taipei city were built before the 1970s without comprehensive building regulations, it is estimated that over 4,000 dwellings will collapse if a 6.2 magnitude earthquake strikes Taipei City (NCDR, 2014)

4.1.2 Flooding

Most of the flooding in Taiwan has resulted from typhoon and cyclone. The torrential rainfall exceeds the capacity of the stream channel and drainage ditch. While Taipei is developed in a basin, a river mouth, and low-lying topography in a coastal zone, it has a higher risk of flooding geographically. On the other hand, the rapid urbanization and development of Taipei City have increased the impermeable land areas, which lead to higher levels of runoff and a subsequent increase in peak storm flows(Swan, 2010) In 2001, Typhoon Nari invaded northern Taiwan and brought

torrential rainfall. The heavy rainfall and the overflow from the Keelung River consequently caused the inundation of a wide area of Taipei city, including important infrastructures such as underground station and the rapid transit system (Teng et al., 2006). The devastating flood has caused more than 20 million US dollars lost.

4.1.3 Typhoon

Apart from earthquake, typhoon is the most destructive natural hazard in Taiwan. According to the Taiwan Central Weather Bureau, an average of 3.6 typhoons has hit Taiwan every year from 1898 to 2010, which resulted in 667 million US dollars of loss annually. While as global climate change continues, the numbers of typhoons have increased. From 1975 to 2014, there are an average 6 typhoons hit Taiwan per year(CWB, 2019). The economic losses are expected to increase by double, reaching at least 1 billion US dollars.

4.2 Urban renewal programme in Taiwan

4.2.1 History of urban renewal in Taiwan

The legislation - Urban Regeneration Policy from 1974 to 1998

It is a milestone of urban-renewal legislation that Urban Planning Act was amended in 1974 to add a new chapter titled “Old Urban Renewal” which indicated for the deteriorated or disorderly area, the authority may implement the corresponding renewal plans with three approaches: reconstruction; renovation; and maintenance (Urban planning Act of 1974). However, there are insufficient implement modes regulated in the chapter to carry out the urban renewal plans. The government did not have sufficient budget to expropriate private lands and building, it was difficult to execute urban renewal according to this Act. In order to encourage private investment initiatives, the Urban Renewal Act and related regulations were launched in 1998; it

creates a fundamental mechanism of urban renewal implementation. In the Act, the transformation of rights is based on a statutory basis. The systems and policies of urban regeneration in Taiwan have been formally activated since the launch of the Act.

Reconstruction of 921 Earthquake from 1999 to 2004

On September 21, 1999, a magnitude 7.3 violent earthquake struck Taiwan. The 921 earthquake resulted in 51,711 buildings completely destroyed and 53,768 buildings severely damaged, many people became homeless and numerous buildings were in desperate need of reconstruction. However, this hazard provided an opportunity to examine the Urban Renewal Act and the existing mechanism. The Act and its renewal mechanism were modified for the radical reconstruction of the disaster areas, with the consideration of creating safer as well as higher quality living environments.

Urban Renewal Demonstration Plan from 2005 to 2008

The central government launched the 2005-2008 Urban Renewal Demonstration Plan in 2005(MOI,2005), the main objectives includes to improve the quality of housing and living environment; to utilize and develop vacant government-owned land through government-led urban renewal project; to stimulate the real estate market and economy and to preserve the cultural heritage. Five sites had been selected as pilot projects to demonstrate different types of urban renewal for different goals.

Love-Taiwan Infrastructure Project from 2009 to 2013

In 2009, the Ministry of the Interior launched "i-Taiwan 12 Projects - Urban renewal Plan", focusing on six national level flagship urban renewal projects in five major cities in Taiwan, at the same time, the government also set up more government-led urban renewal potential zones to attract private investment and assist public-led community renewal projects(MOI, 2009). The strategy in this period is to promote urban renewal in a comprehensive approach, including changing the pathway from the redevelopment of a single site to area-based regeneration; from reconstruction

to rehabilitation and conservation; and from an investment of developer to community self-help urban renewal. The plan reflects the enthusiasm of government to boost economic development; increase working opportunities; encourage private-sector participation and sustainable development through urban renewal approach.

Urban renewal for natural disaster prevention 2013

Since several areas in Taiwan including Taipei City are identified as high potential soil liquefaction area, which could result in major damage if violent earthquake happens, the Executive Yuan [1] started a series of seminars to intestate disaster prevention-oriented urban renewal, and CPAMI[2] has proposed a subsidy plan for local municipalities to carry out the pilot project. According to CPAMI, there are four steps to implement disaster prevention-oriented urban renewal: the first step is the disaster potential analysis, such as earthquake, flood and soil liquefaction, the next step is disaster risk assessment, which can be categorized into high, medium and low level according to the degree of vulnerability. The third is pilot site selection, those areas with high vulnerability are further evaluated with "Disaster Prevention-oriented Urban Renewal Assessment Indicators" (Table2) to choose the priority implementation areas. Finally, develop the urban renewal strategies and decide the mode of implementation according to the level of risk assessment, which includes: 1) remote construction and relocation; 2) relocation on the government-owned land and moving back when reconstruction; 3) on-site reconstruction to enhance the seismic structure.

Urban-Renewal Plan, 2015-2018

The goal to enhance the urban adaptive capability to disasters has been reflected in the Urban-renewal Plan proposed by CAMPI in 2015. The plan identified the issue

[1] In Taiwan, the official entity of this highest-ranking executive government is the Executive Yuan

[2] Construction and Planning Agency, Minister of Interior, is the central authority of urban planning and urban renewal.

that while threatening by natural hazards, especially for urban areas, the concepts of disaster prevention have not been intergraded in urban planning. Furthermore, the current regional plan of disaster prevention and protection, which refers to the Disaster Prevention and Protection plan prepared by the municipality government, only focus on the stage of disaster response and relief, the strategies of hazard prevention and adaption is still unclear. Therefore, the plan indicated five strategies: 1) Review of urban renewal laws and regulations. 2) Subsidise local governments to promote urban renewal pilot projects. 3) Government-led urban renewal projects. 4) Encourage private investment in urban renewal projects. 5) Improve the transparency of urban renewal information and promote public participation(CPAMI, 2015). Following the plan, Urban Renewal Act and related regulations have been modified in 2019.

Table 2. Disaster Prevention-oriented Urban Renewal Assessment Indicators.

Source: CPAMI, 2013

Index	Subject	Assessment Area	Indicative measurement scale	Score
Policy Index	Subject 1	Earthquake potential	Within 1 km to 3 km from the seismic fault zone	+15
			Within 3 km to 6 km from the seismic fault zone	+10
			More than 6 km from the seismic fault zone	+5
		Soil liquefaction potential	The soil in the area is seriously liquefied	+15
			The soil in the area is moderately liquefied	+10
			The soil in the area is slightly liquefied	+5
		Safety	Buildings with non-fire proof construction or insufficient spacing between adjacent buildings	+5
			Decayed or ruined buildings with poor alignment or narrow road	+10
		Public Health	Poor drainage facilities in the area	+10
			Poor sewage facilities in the area	+5
		Building condition and living function	Average building age in the area $\geqq$ 50 years	+15
			40years $\leqq$ Average building age in the area $<$ 50 years	+10
			30 years $\leqq$ Average building age in the area $<$ 40 years	+5
			Sea sand buildings or radiant buildings in the area	+10
		Consist with major policy goals	Distance between the area and government major construction $\leqq$ 100m	+15
			100 m<Distance between the area and government major construction $\leqq$ 300m	+10
			300m< Distance between the area and government major construction $\leqq$ 400m	+5
Land Characte	Subject 2	Scale of area	Project area $<$ 30,000m^2	-10
			30,000m^2 $\leqq$ Project area $<$ 50,000m^2	-5

ristic index			50,000m^2≦Project area＜80,000m^2	0
			80,000m^2≦Project area＜100,000m^2	+5
			Project area≧100,000m^2	+10
	Subject 3	The proportion of government owed land area	Proportion of government owed land area ＜1/16	-10
			The proportion of government owed land area＜1/8	-5
			The proportion of government owed land area＜1/4	0
			The proportion of government owed land area＜1/2	+5
			The proportion of government owed land area≧1/2	+10
	Subject 4	The wiliness of management authority	The management authority is willing to lead the urban renewal project	+10
			The management authority is unwilling to lead the urban renewal project	0
Score level			Suggestion	
Total score	□Total score<20		Not suitable for government-led urban renewal area	
	□20≦Total score<40		Listed as a government-led urban renewal planning area	
	□Total score≧40		Priority as a government-led urban renewal project	

4.2.2 The legal system and mechanism of urban renewal implementation in Taipei City

Urban Renewal Act

The Urban Renewal Act and related eight sub-regulations, which were issued by the central government between 1998 and 1999, defined the principles of urban renewal. As the Urban Renewal Act only defined the principles of urban renewal, the Taipei City Urban Renewal Autonomous Regulations were issued by the Taipei City Government (TCG) in 2001 in order to give more detailed guidance on implementation. According

to the Urban renewal Act, the implementation procedure of urban renewal can be separated into three stages: designation of urban renewal area; establishing urban renewal business plan and implementation (Figure6). There are two approaches to demarcate urban renewal areas: government demarcation and application by private landowner[3], the two approaches have different criteria (Table3). According to Taipei City Urban Redevelopment Office (TCRUO), until 2018, there are 1239 areas (units) have been demarcated as urban renewal area of which 152 areas (709 hectares) were demarcated by government and 1087 units (267 hectares) by private owner application. The total demarcated urban renewal area accounts for about 6.8% of the developed area of Taipei City(TCURO, 2019)The landowners of designated urban renewal areas (units) can apply urban renewal business plan for approval to implement urban renewal projects with incentives, including maximum of 1.5 times of the statutory volume of the floor area and tax reductions.

To adapt to environment transition and solve the problem of private land coordination, the act has been modified several times. The latest one was in January 2019, which indicated that the authority could designate strategic urban renewal area and offer higher floor area incentives for the need of urban disaster prevention enforcement; also, the disaster prevention scheme should be specified in the urban renewal plan (Urban Renewal Act of 2019).

[3] Land and legal building owners may present proposals for demarcation of renewal areas to the municipality, once approved, the area becomes legal “urban renewal unit” which is the basic unit to implement urban renewal. An “urban renewal area” may include several urban renewal units.

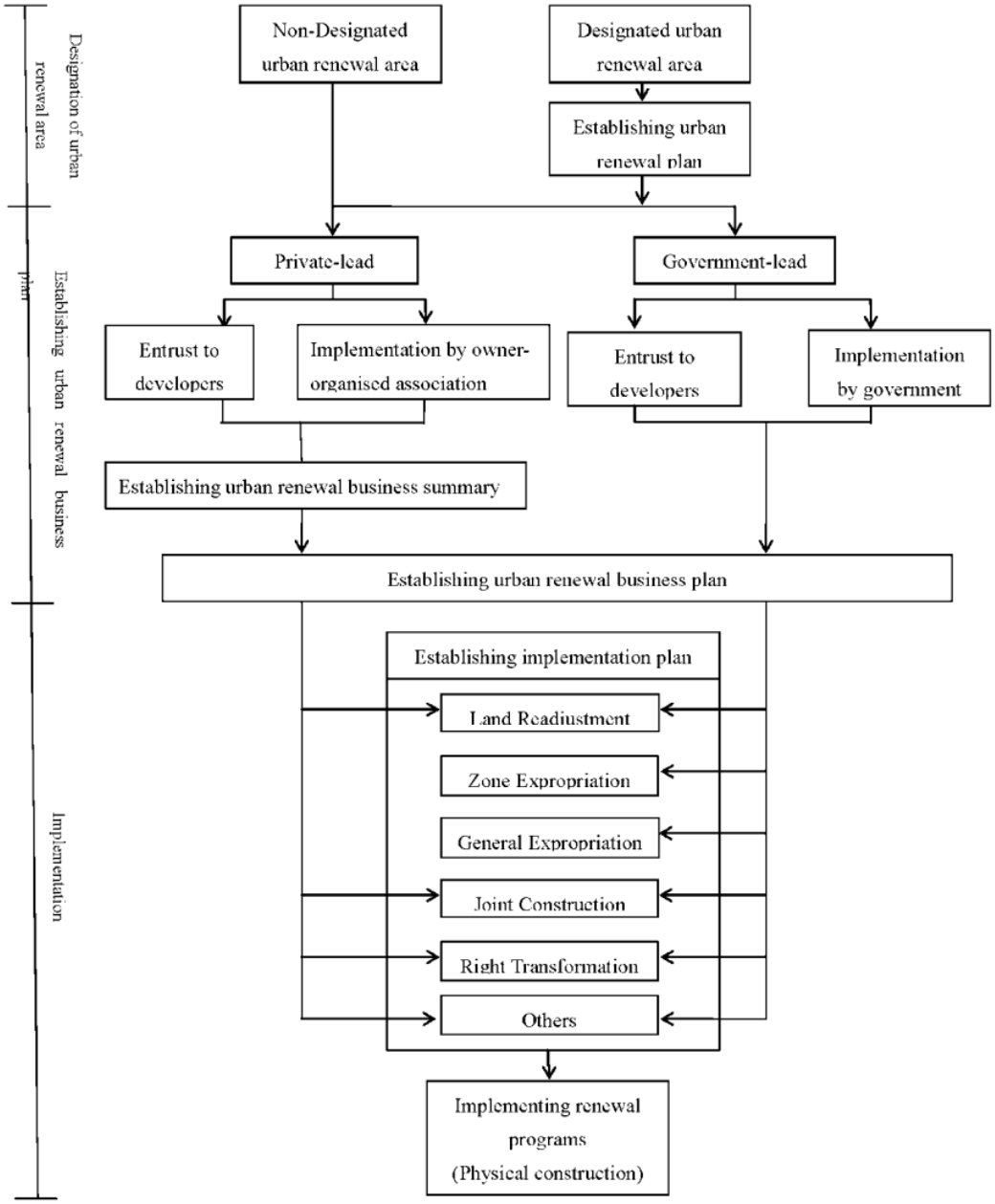

Figure 6: Urban renewal implementation procedure. Source: TCURO, 2019

Table 3. Approaches and criteria of designing urban renewal areas in Taipei City.

Source: (CPAMI, 2013)

Demarcation Approach	Demarcation Form	Criteria
Government Demarcation	Immediate Demarcation	1. Destruction or damage due to war, earthquake, fire, flood, storm or other major incidents. 2. To prevent a major disaster occurred.
	Priority Demarcation	1. Buildings that are deteriorated and not having a fireproof structure or the space between neighbouring buildings is insufficient, and the building is hazardous to public safety. 2. Buildings those are in a dilapidated, dangerous condition that have been badly built or roads that are curved and narrow or in any way hazardous to public safety. 3. Buildings that do not meet the urban function. 4. Buildings those are not coordinated with important development projects. 5. Buildings that have historical, cultural, artistic, or other memorable value that urgently requires preserving and maintaining, or it is incongruous with the buildings in the surroundings. 6. Buildings which have a bad living environment as to constitute a hazard to public health or peace and order in society. 7. There are buildings inspected and confirmed as having been contaminated by radioactivity. 8. There are special industry facilities likely to cause harm to public safety.
	Strategic Demarcation	1. The area is situated within a certain distance from a train station, MRT station or an airport. 2. The area is situated near the waterfront of a metropolis or a harbour and high-level redevelopment is an appropriate choice. 3. An overall urban renewal business is needed for urban disaster prevention.

		4. Urban renewal is needed to accommodate an important public construction project.
Application By Private Land Owner		The area must be a complete block or above 2,000 square meters. And 1. The proportion of non-fireproof construction building within the area is more than one-half. 2. The proportion of total road length with a width less than 6 meters within the area is more than one-half. 3. The proportion of the buildings with seismic resistance capacity below D level within the area is more than one-half. 4. The proportion of the buildings with foundation sag, damaged or deformed columns, walls and floors within the area is more than one-half. 5. The area is located within 200 meters of the train station and the city's major construction or international attraction. 6. The proportion of the buildings without public sewage within the area is more than one-half. 7. The proportion of the buildings which above four floors have no elevator equipment and sufficient parking spaces is more than one-half. 8. The average floor area of housing within the area is lower than the average of Taipei City.

Demarcation of the Taipei City Renewal Area and Urban Renewal Plan 2018

Considering the existing urban renewal areas which have been demarcated by municipality have no redevelopment strategies to follow, also, the urban renewal areas are fragmentary and inconsistent with master plan; TCG examined all the existing urban renewal areas and launched the “Demarcation of the Taipei City Renewal Area and Urban Renewal Plan” in 2018 (Hereinafter referred to as Urban renewal Plan). There are five major goals of this plan: stimulating international industrial development; restructuring urban into mass transit-oriented development; readjusting and building the adaptive public infrastructure; improving the living environment and enhancing

urban resilience to natural disasters(TCG, 2018). To achieve the goals, the plan reviewed the urban renewal areas by adopting map overlay analysis with eight evaluation indicators including building safety; location safety (soil liquefaction potential areas, flooding potential areas and narrow lanes); transit-oriented development; consistency with the major infrastructure; public land redevelopment; obtain public facilities land, vulnerable group assistance and environmentally sensitive area. The plan also established the redevelopment strategies of each urban renewal area which mainly focus on five aspects: land use, public transportation, public facility, disaster prevention and disaster response space. The final part is the incentive, to encourage private investment in urban renewal projects, which gives an additional 10% of building bulk rewards to the projects that apply within one year the plan lunched.

4.3 The disaster management mechanism in Taipei City

The disaster prevention and response framework in Taiwan is broken down into three hierarchies, the central government; municipal government and township offices. The disaster prevention and response system in Taipei City was formed according to the Disaster Prevention and Rescue Act, Taipei City Disaster Prevention and Rescue Guidelines and the Local Government Act. To better reduce the effect, prepare for, respond to disasters and carry out recovery operations, the Taipei City Disaster Management Office was organized in 2011, which directed by vice-mayor and operated by Taipei City Fire Department. There are three divisions of Taipei City Disaster Management Office: disaster prevention and planning; response and mobilize; recovery and investigate. Also, when disasters occur, the Taipei City Emergency Operations Centre is responsible for the report, communication, mobilization, dispatch, coordination and integration when disasters strike.

5 Findings and Discussion

5.1 How urban renewal affect the physical capacity of Taipei City

5.1.1 Built environment

Building codes and standards

After the 921 earthquake struck on 1999, the Building Act of Taiwan was urgently revised, in order to comprehensively improve the seismic-resistant capacity, the law classifies whole Taiwan into two earthquake zone, zone one includes the east and central area, which has higher potential risk of earthquake; zone two includes the north and south area, such as Taipei City. The buildings in each zone are required to meet the certain minimum seismic-resistant standard which can normally withstand earthquakes of magnitude 5-6. Therefore, it is believed that urban renewal can improve the seismic-resistance of buildings. As the senior policy advisor of central government maintained:

"Considering that the earthquake is the riskiest and threatening disaster in Taiwan, we encourage the communities and residents of the old building to conduct reconstruction through urban renewal. Since the reconstructed buildings are built under the new building specifications, the earthquake resistance will definitely increase."

On the other hand, the government provides additional bulk rewards as incentives for implementation of urban renewal (Table4), each type of floor area incentive has its legislative background and the policy objectives to be achieved. In this case, the types of bulk reward such as building structural safety; aseismic design; qualified green buildings and conducting runoff retention facility target to improve the adaptive capacity to earthquake and flooding. While since it is not compulsory to conduct adaptive facilities, most of the developers tend to apply the type of bulk reward which

has the lowest costs and highest profits. As the interviewed developer maintained:

"In the process of assessing whether to conduct development, disaster prevention factors will not be taken into consideration at all, unless the government provides additional incentives. Take green buildings, for example, there is silver, gold and diamond level, the general urban renewal case will only apply for the silver level, unless the location is particularly good because the selling price is high after reconstruction, developers are willing to invest more for bulk rewards."

Table 4. Different types of additional bulk reward for urban renewal projects.

Sources	Types	Maximum addition bulk
Regulations of Bulk Reward for Urban Renewal (Launched by central government)	Building structural safety do not meet the minimum level	10%
	Qualified intelligent building	10%
	Barrier-free environment design	5%
	Aseismic design	10%
	Implementing with Joint Construction Agreement Method	10%
	Existing building bulk higher than legal building bulk	10%
	Provision of public facilities	30%
	Helping construction of public infrastructure	15%
	Preservation of culture heritage	1.5*Floor area of heritage
	Applications within a certain time	10%
	Qualified green buildings	10%
	Project area above a certain scale	35%
	Clearing and settling illegal building households	20%
Taipei City Regulations of	Provision of open spaces	2%
	Conducting runoff retention facility	1%

Bulk Reward for Urban Renewal[4] (Launched by TCG)	Provision of sidewalks	6%
	Provision of Electric vehicle charging facility	1%
The maximum building bulk after reward equal to 1.5 times of the statutory building bulk, or 0.3 times of the statutory building bulk together with the existing building bulk.		

Application of zoning, building codes and standards

Not until Taipei City Urban Planning Autonomous Regulations published in 1976, except for the restricted development areas, the permissible use of different zones is relatively vague, and building management is loose, therefore, most of the buildings constructed before that period are not consistent with the present standard, however, to protect the rights of land and building owners, those buildings are allowed to keep the original use until reconstruction, in this situation, urban renewal provides an opportunity to rebuild those" illegal buildings". As all urban renewal projects have to establish urban renewal business plan and all the plans should be examined by the urban renewal review committee and approved by TCG, the development plan of urban renewal projects will be detail re

plan for authority's approval. In addition, the construction should improve the permeable and water retention capacity to ensure the outflow after development stays the same (MOEA, 2019). As a consequence, the urban renewal project with an area above a certain level will be regulated which could help to improve the physical resilience to flooding

On the other hand, as mentioned previously, the central government has encouraged municipalities to utilized disaster prevention-oriented urban renewal projects to mitigate the risk of disaster potential area such as soil liquefaction area. With adaptive protective infrastructures such as soil improvement and drainage facilities, the buildings can be rebuilt equipped with higher disaster capacity through urban renewal approach. However, this path is more applicable for large-scale renewal, as the policy advisor of central government maintained when asked about the effect of urban renewal to physical adaptive capacity:

"Besides the seismic capacity, if you are doing a large-scale regional urban renewal project, you will definitely consider the public facilities, such as regional drainage system, but that is a relatively large-scale based approach, small–scale individual sites may not have the same effect."

Furthermore, even though encouraged by the central government, the local authority seems to have difficulties in implementation, as the senior planner of the local planning department stated:

"I think that it is even more difficult to promote large-scale urban renewal projects in densely populated urban areas such as Taipei City because it involves a large number of people relocating with authority's power. Therefore, in terms of disaster prevention, TCG still put more focus on promoting private-led small-scale urban renewal projects, which can also improve building resilience gradually. In this

case, TCG may have different views with the central government."

Therefore, in spite of the promotion by the central government, the implementation of large-scale disaster prevention-oriented urban renewal seems too ambitious from the municipality's view. Thus, the overall effect of urban renewal to improve infrastructure capacity could be limited.

5.1.2 Natural environment

☐ **Integration of green infrastructure into city policy and projects and Extent of ecosystem types**

According to the procedure of implementing urban renewal (Figurre7), the authority should propose urban renewal plan of demarcated urban renewal area, which presents the redevelopment strategies for implementers to follow and guide the urban renewal business plan. The Urban Renewal Plan published by TCG has identified the green infrastructure system around the demarcated urban renewal areas and prioritized the undeveloped facilities such as parks and open spaces. Thus, the implementers of urban renewal projects can choose to help to construct the green facilities for applying maximum 15% additional bulk reward of "Helping construction of public infrastructure" (Table4). The redevelopment strategies not only assure the urban renewal projects are developed complied with the green facilities system, but also ensure the provision of adequate green spaces when the area has been reconstructed.

On the other hand, the additional bulk rewards of providing open spaces and sidewalks also offer an incentive for implementers to consider designing more open space within urban renewal projects, which will both increase the environmental quality and housing price. According to the statistical data, the bulk reward of a provision of open spaces and sidewalks was adopted by most of the implementers

(Figure7). Therefore, through the guide of redevelopment strategies and additional bulk incentives, the green infrastructure could be integrated into urban renewal projects and those projects also provide more open spaces and green spaces.

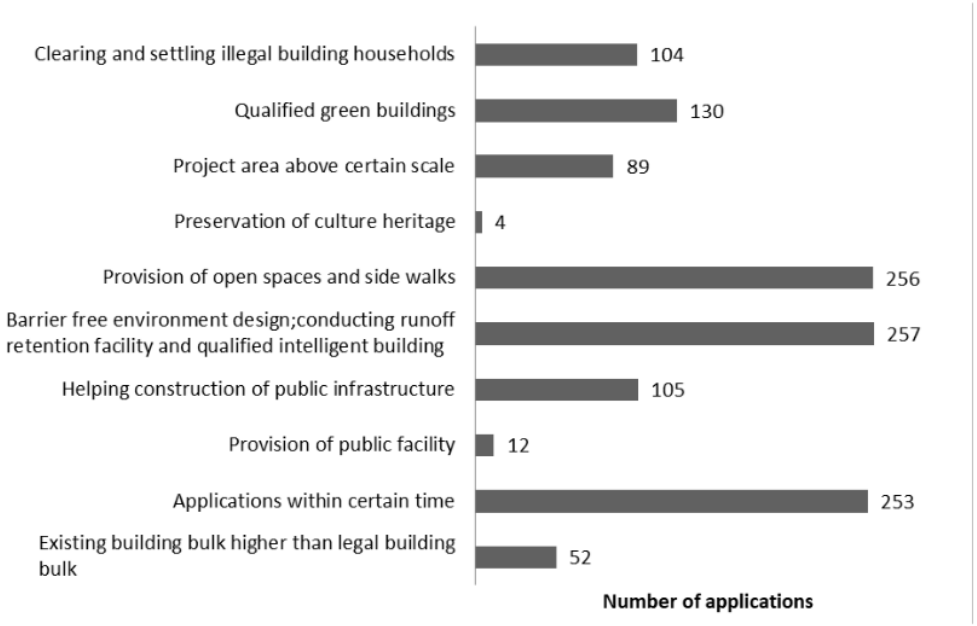

Figure 7. The applications numbers of different types of urban renewal bulk rewords in Taipei City 2006-2016. Source: Wang, 2017

In summary, in terms of the physical capacity to disaster, it is suggested that the urban renewal programme could improve the physical resilience of Taipei City, both in the built environment and natural environment. Through reconstructions of the decaying buildings which do not meet the seismic-resistance standards, buildings could become more earthquake-resistant. Also, the environmental vulnerable informal housing or squatter areas may have opportunities to redevelop. The various types of floor area incentives also reveal the government's ambition to increase urban adaptive capacity through urban renewal approach, such as qualified green building, aseismic design, conducting runoff retention facility and provision of open space.

5.2 How urban renewal affect the social capacity of Taipei City

5.2.1 Institution and governance

- **Plan making and appropriate land use**

Originating from Urban Planning Act, Urban renewal Act is regarded as the "special law" under the urban planning law, which should have been included in the overall urban planning making process, however, since Urban Renewal Act has launched, the necessary links of urban renewal and urban planning have been neglected. There are two approaches to demarcate urban renewal areas/unit: government demarcation or application by a private landowner, each approach has different criteria as previously mentioned (Table3). Therefore, even though the TCG has lunched the Urban Renewal Plan to identify the demarcated urban renewal areas, the sites outside those areas can still apply for designing as urban renewal unit to implement urban renewal projects, which suggests that the location and the order of implementing urban renewal are decided by developers. While, since there are other factors influence the preference of developers, the demarcated urban renewal areas, which are supposed to be the prioritized areas for urban renewal in government's plan, may not be the first area to redevelop. As one developer maintained when being asked about whether they prefer demarcated areas when choosing the site:

"We prefer the sites within demarcated urban renewal areas because it can save the procedure and time for demarcation, but factors such as location, the difficulty of integration, the complexity of property rights, and whether the government provides special incentives for the area are still more important to us."

On the other hand, in order to improve the capacity to disaster, either approach of demarcating urban renewal areas involve criteria relates to disaster prevention or recovery such as destruction or damage due to war, earthquake, fire, flood, storm or

other major incidents; to prevent a major disaster occurred; the proportion of the buildings with seismic resistance capacity below D level within the area is more than one-half (see Table3). The Urban Renewal Plan further indicates enhancing urban resilience to natural disasters as one of the main objectives and adopts disaster risk as an indicator in evaluation. However, besides disaster mitigation related factors, there are several other criteria such as a location near to waterfront or train station; floor area of housing lower than average. Similar with the building bulk rewards, because besides increasing the capacity for disaster prevention, there are other objectives the authority wants to achieve, therefore, the criteria of demarcating urban renewal areas is like a shopping list covers a wide range of conditions. Consequently, the implementation of urban renewal is disordered, and the goal of increasing urban capacity to natural hazards may not be achieved effectively.

Organization, coordination and participation

The works of disaster prevention and rescue and urban plan are operated with different frameworks, institutional arrangements, funding, assessments and information bases in TCG. Also, the mitigation of different disasters is responsible for different agencies. For example, the Fire Department is in charge of windstorm, fire and explosion, while flood, earthquake are managed by Public Work Department. Adopting the" all-hazard" approach, Taipei City Disaster Management Office was established in order to better response various of disaster, mitigate risk and integrate all resources. The office is also responsible for organizing the overall Taipei City Disaster Prevention and Protection Plan, which should include related affairs of disaster prevention, emergency response and reconstruction after disaster and aims “to establish a liveable and resilient city with resistance to disasters through continuously promoting and strengthening disaster risk management “(TCG, 2017) However, even though shared

with the similar object, the linkage between disaster prevention plan and urban renewal is weak, the few parts mention about urban renewal indicate that to increase the capacity to disaster, "The disaster prevention and evacuation plan should be reviewed in the urban renewal **b**usiness plan, such as the fire truck parking space and the evacuation route during fire. The poor connection has been reflected on the urban renewal business plans, although disaster prevention plan is a necessary chapter in a business plan, the only disaster has been examined and considered is fire, which is obviously insufficient to achieve the goal of enhancing urban resilience to natural disasters specified in Urban Renewal Plan.

☐ **Public education and awareness and Training delivery**

To strengthen the disaster prevention capability at local (city, town, and district) level, Executive Yuan has promoted series of disaster prevention and protection projects since 2009, the first session of project includes: review the disaster prevention and operation mechanism of municipalities, counties (cities) and townships, establish township disaster risk map, revise standard operating procedures to disaster and establish resources reserve mechanism and sign contracts with private manufacturers for the provision necessary supplies during the disaster(NFA, 2017). While from 2017, they turned the focus on encouraging the participation of civil organizations and community in disaster prevention and rescue works, such as the demonstration disaster prevention community project in Taipei City. The project intends to raise awareness of disaster prevention among the community and organize local assistance team through training courses covering community-related disaster risk and resilience issue. However, when asked if they prioritised the communities with higher vulnerability for training, the officer of local disaster prevention planning office maintained:

"We wanted to, but there are many practical considerations when selecting a

suitable community. For example, we originally targeted a community with higher disaster risk in the mountain area of Shilin, but the local residences were against to the project strongly because they thought the housing price would fall if being identified as a high-risk community."

As a result, most of the selected communities were those with more resources and wiliness rather than high vulnerability. On the other hand, even though the governments try to enhance the disaster prevention capacity through urban renewal, the disaster risk-related information and education are lacking in the urban renewal implementation process. Both residence and developer interviewed suggested they did not receive any information or training about disaster prevention from the government during or after urban renewal.

Integration

As the disaster mitigation and urban planning are in charge of separated departments and operating under different frameworks, the disaster management office was established to integrate and coordinate the cross-sector works. Also, the Disaster Prevention and Protection Plan was supposed to be a comprehensive disaster prevention and protection guide for every sector to achieve the goal of becoming a disaster resilience city. However, as stated above, the connection between disaster prevention plan and the urban renewal plan is weak. Since the disaster management office is operated by the Fire Department, the officers may not equip with the knowledge of urban planning or urban renewal, as the officer of disaster prevention planning office stated:

"We are from the fire department after all, and under the current division, the fire department is only responsible for fire rescue, we do not have enough knowledge and ability to examine the urban disaster prevention part of the urban plan or urban

renewal plan. Furthermore, for some senior officials, the fire department is only responsible for the rescue of people during the disaster, which is the stage of disaster response. Other parts of disaster prevention are not the scope of work of the fire department"

Therefore, although targeting in the same objective, the two plans seem to work respectively, the disaster prevention concept has not been reflected nor integrated into the urban renewal programme.

5.2.2 Community and economy

Community organizations, networks and training

Not until the Apartment Building Regulations were lunched in 1995, the building or community commit are not compulsory when apartments or communities are constructed, thus, most of the four or five floor apartments, which is the most common housing type in Taipei City, do not equip with a legal representative or organisation to operate community's affairs. While according to the present regulations, the constructor of a new building should organise residents meetings and establish a management committee when more than half of the apartments are occupied. Therefore, the implementation of urban renewal could encourage the foundation of community organisations or apartment committees, which may increase the organisational power of a community for participation in pre-event planning and post-event response. On the other hand, the planner from urban redevelopment office also agreed that urban renewal process could have a positive effect to stimulate community organisations, who maintained:

"The residents must reach a consensus on the process of urban renewal, which provides a chance for them to communicate and discuss face to face, in addition, if the urban renewal project is implemented by owner-organised association, it may become

an opportunity for the community to coordinate together."

Active citizen engagement and techniques

Smartphones are widely used in Taiwan, according to the report of eMarketer, Taiwan is the most mobile country in the world, which has 73.4% of the population use smartphones(Dustin, 2016). Also, more than 98% of smartphone users social media and instant message software such as "Facebook" "iMessenger" and" Line"(NDC, 2018) Therefore, it has become a common approach for residences to exchange information and communicate during the urban renewal implementation process. In other words, urban renewal presents an opportunity for the community to form one or several groups for information transformation, which can be utilised as a platform for disaster prevention knowledge delivery or early warning when a hazard occurs. On the other hand, the website set up by developers, which are normally used to disclose project-related information and update the urban renewal status, can also provide the function of education. However, since there is no cross-sector mechanism, disaster prevention training and education have not been integrated into the approach.

Value of property and insurance

It is widely considered that urban renewal will increase the price of real estate, according to the statistical data, in Taipei City, the average housing price after urban renewal (with reconstruction approach) increase about 40% compared to the price before reconstruction. Furthermore, the spillover effect of urban renewal also adds the value of neighbourhood housing (Lee et al., 2017). In the terms of insurance, according to the statistics of the Insurance Bureau, the earthquake insurance coverage rate for housing in Taipei City was only 38%(Insurance Bureau, 2019), indicating that many buildings are still not insured. However, during the urban renewal process, when implementers or residences apply for mortgages, the earthquake insurance is often

required by banks, therefore, the insurance cover rate can be increased gradually through the implementation of urban renewal.

Demographics

Whether the urban renewal in Taipei City will inevitably lead to gentrification and the replacement or even displacement of the disadvantaged group, there is not much local research study this issue, neither have a consist answer(Chang, 2012). But it seems that from an official point of view, urban renewal has little connection to gentrification, such as the policy advisor of central government stated:

"Theoretically, the urban renewal will not cause gentrification issue, because the original landowners will go back after the urban renewal is completed. It is just the tenant who will not be able to go back, but it is about moving, not gentrification. So we rarely consider this issue when investigating related urban renewal policies."

However, according to the data of CPAMI, there are only 54% of urban renewal projects have a removal rate less than 10%, and about 20% of cases have removal rate between 11-20%, which indicates that more than 30% of the urban renewal projects have the removal rate higher than 20%(CPAMI, 2018). Furthermore, the calculation method is based on the "ownership supremacy" concept, which means only legal owners such as landowners or building owners who cannot or do not want to participate in urban renewal are included. Other rightsholders such as owners of informal construction, leasehold rights are neglected in the calculation. Therefore, despite that the demographics after implementations of urban renewal may become less vulnerable superficially since the disadvantaged groups are displaced; it can further increase the risk of the unprivileged groups. To reflect the issue, the Urban Renewal Act amended in 2019 added the regulations about resettlement, which indicated that the urban renewal project with economically or socially underprivileged people living in the area

and end up becoming homeless after their homes are dismantled or relocated, the government shall provide them with public housing or rent subsidization before their homes are dismantled or relocated, or establish a special project to handle such matters(Urban Renewal Act of 2019). Thus, through urban renewal might result in the replacement of disadvantages, it could also help the hidden vulnerable group to be identified and received adequate assistance from the government.

Cohesive communities

Urban renewal could affect community cohesion indirectly, either through the physical or social approach. As one resident described:

"..... The open space is not well maintained and design before urban renewal, so it seems to be dirty and messy, usually no one will stay there. After the urban renewal, since the open spaces are redesigned, residents of the community are more willing to stay there and make small talk. So it does provide a place for the community to interact."

On the other hand, the complex rights exchange and distribution process during urban renewal implementation may cause internal conflicts and tensions within the community(Chang, 2012), as the other resident explained:

"In my case, urban renewal has destroyed the original community consensus and connections. When developers started to integrate owners, some residents did not want to participate because they did not trust the developer, so they choose to move with the compensation. Also, some residents start to suspect each other whether they got the benefits from the developer."

While some studies suggested that it is not urban renewal cause the disintegration of the community, instead, it is the responsibility of lacking community empowerment(Ding, 2010). The reason for the failure integration is that the community

do not process with cohesion and consensus in the first place rather than the urban renewal breaks the community cohesion.

Incentives

To encourage private to invest in implementing urban renewal, the government offers several incentives as previously mentioned. While the additional bulk rewards may be the most attractive to developers, the effect to improve the resilience to disaster is questionable. Firstly, there is no difference between the incentives of government demarcated urban renewal areas and non-demarcated areas. The sites outside urban renewal areas can still apply for bulk rewards as long as they are qualified for implementing urban renewal. The undifferentiated incentives have no function to guide the order of redevelopment, thus, even though the areas with high vulnerability have been designed as urban renewal area, they are not necessarily the prioritized to be reconstructed. Secondly, the government try to utilise different types of bulk rewards to achieve various policy objectives, while it can also diversify the effect on each goal. Also, the developers often apply for the type of reward with the highest profits and lowest cost, which may not be the most essential to the area. Moreover, the bulk rewards allowed the extra floor area which was not considered in the urban plan and the supply of public facilities. Thus, the additional bulk rewards to promote disaster prevention facilities may increase the vulnerability to other disasters.

To sum up, in terms of social capacity, it is suggested that the concept of disaster resilience has not been involved in the urban renewal mechanism in the first place, either on policy or plan-making process. Even though shared with the same target, the connection between disaster mitigation system and urban planning system is poor; also, the urban plan does not play the role of guiding the urban renewal plan. On the other hand, although urban renewal can increase the value of the real estate, it may also cause

the displacement of the vulnerable groups, which requires the government's intervention and assistance. Furthermore, instead of improving resilience, the bulk rewards offered to encourage private-led urban renewal may cause the opposite effect due to the uncontrolled building volume.

6 Conclusion and suggestions

The study aims to research how urban renewal programme affect the natural disaster resilience of Taipei City. To conclude, urban renewal programme may increase the physical resilience to disaster through improving build environment and natural environment capacity, however, in terms of improving the social adaptive capacity, the effect of urban renewal programme is quite limited. Since the concept of disaster resilience, especially social resilience, have not been involved in the policy and plan-making process in the first place, the linkage between urban renewal and building disaster-resilient city is fragmentary. Furthermore, despite similar ambition, the different departments in the municipality have worked in parallel with different frameworks and institutional arrangements, which results in the poor integration of urban renewal and disaster prevention policies. In the same time, the investigation of social and economic conditions are lacking when demarcating urban renewal areas, neither the community cohesion or grassroots organizations have been considered. Finally, the incentives do not achieve the function of guiding the development order, which leads to urban renewal become disorderly reconstruction of individual base buildings.

Considering the limitations, here are some suggestions for improving the disaster resilience through urban renewal programme:

1.Building a cross-sector mechanism to integrate the policies of different department

Systemically reviewing and combining the works and policies of different sectors can more effectively integrate efforts to build resilience, for example, the public education and training can be delivered during urban renewal implementation process, such as sending the local relevant disaster prevention knowledge to the social media group of the communities to raise the public awareness, disclose on the websites and

combined with urban renewal seminars.

2.Examining the effect of urban renewal incentives, especially additional bulk rewards.

In the process of researching relevant incentives, the government considers the functions and benefits of a single objective, ignoring negative externalities that may arise during implementation and the contradictions between different types of additional bulk incentives. Therefore, it is essential to evaluate the overall effect of the incentives. Furthermore, incentives should be used as a tool to guide the private-led urban renewal projects, different incentives could be offered according to authorities 'strategies and local requirements.

3.Enhancing community engagement before and after the urban renewal implementation.

The community participation and cohesion is not only the key for successful urban renewal, but also the critical factor to improve social adaptive capacity. Therefore, promoting public-private partnership strategies could be an approach for the government to encourage community engagement and manages community collaboration. It may be more important after the implementation of urban renewal since the composition of the community has been restructured.

Urban renewal has been considered a critical approach to achieve sustainable development and improve climate change adaptation. Building disaster-resilient environment both physically and socially is essential to achieve the goal. This study provides a framework to examine the effect of urban renewal programme on disaster resilience, this framework could be utilized to evaluate other policies or plans. Also, it presents a reference for local authorities when investigating relevant policies and projects.

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Appendix A

RISK ASSESSMENT FORM
FIELD / LOCATION WORK

The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form
http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf

DEPARTMENT/SECTION BARTLETT SCHOOL OF PLANNING

EQUIPMENT	**Is equipment used?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	the departmental written Arrangement for equipment is followed
☐	participants have been provided with any necessary equipment appropriate for the work
☐	all equipment has been inspected, before issue, by a competent person
☐	all users have been advised of correct use
☐	special equipment is only issued to persons trained in its use by a competent person
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	**Is lone working a possibility?**	**NO**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. alone or in isolation lone interviews.	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**
☐	the departmental written Arrangement for lone/out of hours working for field work is followed
☐	lone or isolated working is not allowed
☐	location, route and expected time of return of lone workers is logged daily before work commences
☐	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
☐	all workers are fully familiar with emergency procedures
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

ILL HEALTH	**The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.**
e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low?

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ an appropriate number of trained first-aiders and first aid kits are present on the field trip
- ☐ all participants have had the necessary inoculations/ carry appropriate prophylactics
- ☐ participants have been advised of the physical demands of the trip and are deemed to be physically suited
- ☐ participants have been adequate advice on harmful plants, animals and substances they may encounter
- ☐ participants who require medication have advised the leader of this and carry sufficient medication for their needs
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT	**Will transport be required**	**NO** ■ **Move to next hazard**
		YES ☐ **Use space below to identify and assess any risks**
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low?	

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ only public transport will be used
- ☐ the vehicle will be hired from a reputable supplier
- ☐ transport must be properly maintained in compliance with relevant national regulations
- ☐ drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
- ☐ drivers have been trained and hold the appropriate licence
- ☐ there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
- ☐ sufficient spare parts carried to meet foreseeable emergencies
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	**Will people be dealing with public**	**YES**	**If 'No' move to next hazard** **If 'Yes' use space below to identify and assess any risks**
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? Risk of personal attack/abuse due to misunderstanding of nature of work. While the risk is very low		

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ■ all participants are trained in interviewing techniques
- ☐ interviews are contracted out to a third party
- ☐ advice and support from local groups has been sought
- ■ participants do not wear clothes that might cause offence or attract unwanted attention
- ■ interviews are conducted at neutral locations or where neither party could be at risk
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

WORKING ON OR NEAR WATER	Will people work on or near water?	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ lone working on or near water will not be allowed
- ☐ coastguard information is understood; all work takes place outside those times when tides could prove a threat
- ☐ all participants are competent swimmers
- ☐ participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
- ☐ boat is operated by a competent person
- ☐ all boats are equipped with an alternative means of propulsion e.g. oars
- ☐ participants have received any appropriate inoculations
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	Do MH activities take place?	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		

CONTROL MEASURES **Indicate which procedures are in place to control the identified risk**

- ☐ the departmental written Arrangement for MH is followed
- ☐ the supervisor has attended a MH risk assessment course
- ☐ all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
- ☐ all persons performing MH tasks are adequately trained
- ☐ equipment components will be assembled on site
- ☐ any MH task outside the competence of staff will be done by contractors
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

SUBSTANCES	Will participants work with substances	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		

CONTROL MEASURES — **Indicate which procedures are in place to control the identified risk**

- ☐ the departmental written Arrangements for dealing with hazardous substances and waste are followed
- ☐ all participants are given information, training and protective equipment for hazardous substances they may encounter
- ☐ participants who have allergies have advised the leader of this and carry sufficient medication for their needs
- ☐ waste is disposed of in a responsible manner
- ☐ suitable containers are provided for hazardous waste
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	Have you identified any other hazards?	NO	If 'No' move to next section If 'Yes' use space below to identify and assess any risks
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		

CONTROL MEASURES — **Give details of control measures in place to control the identified risks**

Have you identified any risks that are not adequately controlled?		
NO	■	Move to Declaration
YES	☐	Use space below to identify the risk and what action was taken

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research? NO

If yes, please state your Project ID Number

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

DECLARATION — The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

- ■ I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
- ■ I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

NAME OF SUPERVISOR

** **SUPERVISOR APPROVAL TO BE CONFIRMED VIA E-MAIL** **

Appendix B

研究參與說明

Participant Information Sheet

敬愛的　　先生/小姐您好：

我就職於臺北市都市發展局都市規劃科，目前於英國倫敦大學學院研讀碩士學位，論文題目探討都市更新對於都市防災的影響。希望能邀請您協助分享相關的知識及經驗。

◆ **研究題目**(Title of Study):

都市更新對於地震、颱風及洪水之城市韌性之影響：以臺北市為例

How the urban renewal programmes have affect Taipei City's resilience to earthquake, typhoon and flooding

◆ **學校系所名稱**(Department)：

英國倫敦大學學院巴雷特規劃學院

Bartlett Faculty of the Planning, University College London

◆ **訪談者姓名及聯絡方式**(Name and Contact Details of the Researcher):

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1. 敬邀您參與本項研究，在您決定是否參與前請花些許時間詳讀以下資訊，若有任何問題或不清楚的地方歡迎隨時提出，感謝您的閱讀：

'You are being invited to take part in a research project. Before you decided it is important for you to understand why the research us being done and what participation will involve. Please take time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.'

2. 研究背景及目的**(What is the project's purpose?):**

地震，颱風和洪水是臺灣最重要的三大自然災害。隨著全球氣候變遷，自然災害的威脅也隨之增強，也使台灣處於更高風險的處境。面對這一嚴峻挑戰，台北市需要一種有效的方法來提高自然災害恢復能力，並減少城市的脆弱性。「都市更新條例」於 1998 年實施，該條例的主要立法目的是刺激城市經濟發展，以及促進有計劃的重建和土地再利用。然而，從 2003 年開始，政府開始推行防災型都更，希望透過都市更新提高城市的防災韌性。因此，都市更新對於台北市的抗災能力之影響，實需加以探討。本研究之研究問題如下：

I. 現行的都市更新和相關機制是否建立實質建成環境韌性而提高台北市的災害容受力？

II. 現行的都市更新和相關機制是否建立社會環境韌性而提高台北市的災害容受力？

III. 現行都市更新制度有何限制？如何突破這些限制，提高台北市的災害容受力？

As global climate change continues, the threats of the natural disaster are getting bigger and bigger. With climate becomes more extreme, it is estimated that precipitation will increase and be more intensive. Also, hurricanes and other storms are likely to become stronger, which puts Taiwan into an even higher risky situation. To face the critical challenge, Taipei City needs an effective approach to enhance natural disaster resilience as well as reduce the vulnerability of the city. As Urban Renewal Act was implemented in 1998, the main propose of the legislation is to stimulate urban economic development as well as promote planned redevelopment and reutilization of land. While from 2003, the authority started to promote urban renewal programme as a disaster preventing approach. Therefore, there is a need for a better understanding of the effect of urban renewal programme to Taipei's disaster resilience, especially to earthquake, typhoon and flooding. More specifically, the following research questions need to be addressed:

I.Has the urban renewal programme and relevant operational mechanisms improve the Taipei's disaster resilience by building physical adaptive capacity?
II.Has the urban renewal programme and relevant operational mechanisms improve the Taipei's disaster resilience by building social adaptive capacity?
III.What are the constraints of the existing urban renewal system? How to resolve the constraints and improve the disaster resilience of Taipei City?

3. 訪談對象(**Why have I been chosen?)**

我們邀請您參與本項研究的訪談是因為您曾經參與過都市更新(包含相關政策、法令、都市計畫之制定、審議及推動實施)或都市防災計畫之擬定及推動，希望透過您的知識及經驗分享增進對本議題之了解。

We invite you to participate in this research interview because you have participated in the process of urban renewal (including the development of relevant policies, regulations, urban plans, review and promotion) or the preparation and promotion of urban disaster prevention plans.

4. 參與訪談說明(**Do I have to take part?)**

本項研究訪談為自願性質，我們完全尊重您的意願。如果您願意參與，我們將提供本訪談說明供您留存，並將要求您簽屬訪談同意書。在訪談中您隨時可以要求退出，並決定相關訪談資料應如何處理。

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. You can withdraw at any time without giving a reason. If you decide to withdraw you will be asked what you wish to happen to the data you have provided up that point.

5. 訪談進行方式(**What will happen to me if I take part?)**

本訪談預計進行約 40-60 分鐘，為確保資訊記錄準確，除非您不同意，訪談將會全程錄音。另為感謝您的協助，訪談結束後將贈予一份小禮物做為答謝

The interview is expected to take about 40-60 minutes. To ensure the accuracy of information, the interview will be recorded unless you disagree.

6. 資料保密**(Will I be recorded and how will the recorded media be used?)**

您的個人訊息及訪談紀錄及錄音將保密且只被利用於本研究之分析，在沒有獲得您同意的情形下不會作為其他用途。

The audio recordings of your activities made during this research will be used only for analysis No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings.

7. 申訴資訊**(What if something goes wrong?)**

如果在訪談過程中您有任何疑問或不適，請立即連絡研究者張懿萱或本論文指導人 **Jo Williams** 博士，若您仍認為問題沒有被妥善處理，您可以聯繫倫敦大學學院倫理委員會**(ethics@ucl.ac.uk)**

If you have any complaints about the project in the first instance you can contact any member of the research team. If you feel your complaint has not been handled to your satisfaction you can contact the Chair of the UCL Research Ethics Committee – ethics@ucl.ac.uk

8. 資料保密限制(**Limits to confidentiality)**

除非有證據顯示潛在的犯罪或傷害風險，研究單位依法須向相關機關報告，否則您的資料將被嚴格保密。

Please note that assurances on confidentiality will be strictly adhered to unless evidence of wrongdoing or potential harm is uncovered. In such cases the University may be obliged to contact relevant statutory bodies/agencies

9. 研究結果(**What will happen to the results of the research project?)**

本研究為碩士論文並預計於 2019 年 9 月發表，您的個人資訊不會在本研究內被揭露，如果您有興趣瞭解研究成果，我們完成研究後，可提供您摘要報告

Results of the research will be published. You will not be identified in any report or publication. If you wish to be given a copy of any reports resulting from the research, please ask us to put you on our circulation list.

10. 相關聯絡資訊**(Contact for further information)**

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感謝您的閱讀並考慮參與此研究訪談

Thank you for reading this information sheet and for considering to take part in this research study.