Reseach On The Construction Of Resilient Community Disaster Prevention System

Yanan Zhang1, Huiying Gao1
1 Department of civil engineering, Ocean University of China, Qingdao, Shandong, 266000, China
*Corresponding author’s e-mail: fqmghy@sina.com

Abstract. The current city is facing the threat of various natural and man-made disasters. The theory of resilient city provides a new thought for urban planning and disaster prevention and reduction. The community is the typical representative of the most practical significance of in the inner space of the city. The resilient community is also the basic unit of urban disaster prevention and mitigation and maintenance of public safety. However, resilient city construction has just begun in China, and the construction of community resilience has not been paid enough attention. This paper first puts forward the development of resilience. On this basis, it summarizes the connotation of community resilience and draws on the experience of international representative resilient construction. Combined with the current situation of resilient construction in China, the resilient community system in line with the national conditions is constructed, aiming at accelerating the pace of localization community resilience.

1. Introduction
Resilient city is a new concept of urban development proposed by the international community to cope with various natural disasters and social crises. It coincides with the requirement of green development advocated by new-type urbanization in China. The theory of resilient city provides a new thought for guiding the construction of sustainable development in China, especially urban planning.

2. The development of resilience
The concept of “resilience” originated from the ecological field in the 1960s. Canadian ecologist Holling et al. discussed ecological resilience and stability[1]. By the 1990s, the concept of resilience has been introduced into the field of urban planning and management represented by disaster prevention. On November 1, 2016, the “New Urban Agenda” adopted by the Third United Nations Conference on Housing and Urban Sustainable Development highlighted environmental sustainability and resilient urban development and proposed to build resilient cities and human settlements.

The international community has recognized the development of resilience into three morphological evolution: engineering resilience, ecological resilience, and evolution (social-ecological) resilience[2]. At present, the mainstream research direction is evolutionary resilience, that is, social-ecological resilience. It focuses on social action rather than uncertain external factors, emphasizing public participation and self-regulation of sustainable development.

3. The connotation of resilient community
The resilient community emphasizes the ability to absorb the adverse effects when disasters occur without external assistance, or to quickly implement countermeasures after disasters, to restore the
original state or another balance through re-learning and self-organization, in order to maintain the normal functioning of the community. Fang Dongping of Tsinghua University believes that resilience consists of resistance, recovery and adaptation, and is procedural [3]. After summary about relevant theoretical research on foreign resilience communities, Peng Yu believes that community resilience is a collection of a series of capabilities, such as stability, resilience and adaptability[4]. It is both a growth process and a community development goal. Wu Xiaolin believes that the resilient community contains the “resistance” of physical level, the “resilience” of social and ecological level, and the “autonomy” of community members[5]. It is an active and dynamic community based on common actions which can link internal and external resources, effectively resist disasters and risks, recover from harmful effects, and maintain community of sustainable development.

Scholars in academic circles have reached a consensus on resilient community. This paper puts forward the connotation of community resilience. As the basic unit of urban public security, community resilience mainly reflects the connotation from three aspects, including a series of capabilities, a dynamic development process, and the goal of disaster prevention and mitigation.

3.1. A series of capabilities
It primarily refers to the ability to respond to sudden security threats or disasters, including stability/resistance, resilience, and adaptation/autonomy. The specific explanations are: the degree of stability of the structure, function and process of the ecosystem to external interference; the ability to restore balance after being destroyed; the co-evolution with the external environment and the self-regulating self-organization ability.

3.2. The dynamic development process
It can be divided into three stages: resistance, recovery and adaptation. Resistance is to absorb the negative effects of disturbances when disturbances occur, and core functions are not completely destroyed. Recovery means that the damaged part can be quickly restored to the desired state after the disturbance occurs. Finally, adaptation, the whole system changes its structure through active or passive learning to cope with future uncertainties.

3.3. The goal of disaster prevention and mitigation
The ultimate goal of resilience is to reduce the adverse effects of disasters, ensuring the safety of life and property of residents in the community, maintaining normal production and life. Finally, the goal is achieved after obtaining the “capacity” and experiencing “process”.

4. Resilient construction and practice of international representation
There have been many successful cases of resilient urban planning and construction in the world. In this paper, several typical cases of resilience construction are selected for discussion.

In order to solve the devastating losses caused by climate change, New York and London, as explorers of resilient city construction, have provided us with useful experience [6]. In 2012, based on the lessons learned from typhoon in Sandy, New York introduced the “New York Adaptation Plan”. In 2013, it released continuous planning such as “A Stronger, More Resilient New York”. The good wishes for the construction of the city are translated into policy practice.

Resilience city theory planning practice is also relatively early in Japan, and the “National Land Resilience Plan” is one of planning practices for the theory of resilient cities [7]. The goal is to build a strong and resilient land and economic society. In addition, since the birth of “Community Building” in the 1960s, it has changed the way of public participation, converting “citizen participation” into “citizen's main body”, and presenting characteristics to cope with different social issues in different stages of development of the city [8].

The overall goal of the development of resilient cities in the world is to minimize the adverse impacts of disasters and risks on residents as much as possible, maintain the normal production and life of society, and maintain or improve residents' sense of security, belonging and happiness.
5. Opportunities and challenges for resilient cities in China

Nowadays, the concept of resilient city has gradually integrated into the field of disaster management in China, which coincides with the emerging cities concept such as “elastic city”, “sponge city”, “double repair city” and “low carbon city”. In 2016, Tongzhou first proposed the concept of building a flexible city, which is also a way to promote the localization of resilient cities. The country has issued a series of policies to actively promote the construction of sponge cities, and the government has also carried out pilot projects for the construction of sponge cities in more than 30 cities.

Since 2014, more than ten cities have participated in the international cooperation plan for the construction of resilient cities. The “Global Resilience 100 City Plan” advocated by the Rockefeller Foundation [9] of the United States currently has four cities such as Huangshi, Deyang, Haiyan and Yiwu. However, it seems that resilience community construction has not got rid of the traditional engineering planning ideas in China. Cities still emphasize infrastructure construction and urban governance, ignoring the diversified management mechanisms.

The comprehensive disaster reduction demonstration community also follows the traditional governance path and pays insufficient attention to the self-organization and capacity of the community. In the future, we must focus on promoting the localization of the concept of resilient communities, laying a solid foundation for urban security and sustainable development.

6. Research on the construction of resilient community disaster prevention system

At present, there are many deficiencies in the construction of resilient cities in China. The construction of resilient communities is still in the stage of primary hardware construction. The long-term top-down disaster management model has led to the loss of autonomy in the community. The country also lacks the policy of strategic resilience urban construction, and cannot effectively guide the formation of the resilient construction concepts and systems of society and communities. Therefore, the construction of resilient community disaster prevention system is carried out from the following aspects shown in figure 1.

![Figure 1. Community Resilience Disaster Prevention System with Diversified Participation](image)

**6.1. Community resilience with diversified participation**

In China, disaster relief and mitigation models generally adopt the government-led, social group assistance, affected community people waiting for rescue mode. This situation is highly likely to lose the golden time of post-disaster relief, therefore, we need to shift the autonomy of disaster relief down to the community. Community residents will be the mainstay of community disaster relief, and strengthen the awareness and ability of community forces to participate in governance independently. We need to clearly define the division of labor and functions of the government, society and community in the construction of community resilience, but it should be noted that community self-rescue cannot replace responsive and responsible government regulation.
6.2. Emphasize the dominant position of community capital in the community resilience disaster relief system

Community capital can be divided into two basic levels. From the internal perspective, it is divided into individual level and organizational level. It builds self-reinforcing system within the community, so that various resources generate positive circulation in community self-organizing behavior to enhance the sustainability of community resilience. From the external point of view, it is divided into the social level and the government level. By integrating urban resources, the resources are circulated inside and outside the community. The policies, funds and technologies needed to build a resilient community are supported.

The key to a resilient community includes high levels of community capital and the necessary resources to overcome the adverse effects of disasters and actively adapt to changes in the environment. The most important thing to improve the level of community capital is to improve the self-help level of community residents. China has some shortcomings in disaster education, and residents have insufficient knowledge of disaster prevention and mitigation, especially after the disaster. Community residents can regularly organize and disseminate disaster prevention knowledge, keeping in mind the community disaster prevention routes and the use of disaster relief equipment.

Promoting the planning of the team group in the community is necessary, because there are many super high-rises and high-rise residential buildings in city, the original spatial planning of the group led to the existence of a large community group, the number of residents is large, which is not conducive to the emotional exchange between the groups. It is not conducive to enhancing the relationship between residents, which will reduce the degree of trust between residents and the sense of community belonging.

6.3. Community resilience relief at the social community level

Seeking the support of the social community can also improve the self-help level of community residents. For example, it can establish stable cooperation mechanisms with universities, technical departments, and welfare institutions around the community, to learn the excellent disaster prevention experience of other communities, and get interaction opportunities and space for communication. Relevant experts also can be invited to hold emergency lectures after the disaster to further improve the level of community capital.

6.4. Strong and resilient infrastructure to ensure the normal operation of the community

The construction of resilient communities requires that when disasters come, the infrastructure of the community can resist the damaging effects of disasters, and it can guarantee the safety of life and property of community residents and form effective protective barriers. The government also needs to maintain investment in maintaining and upgrading critical infrastructure, especially lifeline systems, to enhance stability and risk resistance, ensuring that facilities are functioning properly.

6.5. The guiding role of government policies in the construction of resilient communities

Government departments should change the traditional urban planning ideas, compile a resilient urban planning implementation system, play an advanced thinking in urban planning, and establish resilient urban planning rules from top to bottom, as an important guide to the construction of resilient communities. It emphasizes the transformation from policy control to policy guidance, from government leading to diversified participation, from environmental strengthening to resilient communities.

6.6. Intelligent and three-dimensional information sharing platform

Constructing an intelligent and three-dimensional information sharing platform, with disaster data collection and realizing information sharing between the government, the community and the society in a short period of time, can effectively and consistently carry out post-disaster emergency and
treatment on the same platform, and more importantly, can achieve effective connection between different entities and different departments for three-dimensional collaborative management.

7. Conclusion
The study of resilience communities started late in China. At present, the construction of resilient community is still in the stage of theoretical exploration and practical exploration. Although some communities have achieved some mitigation effects through strengthening resilience, there is still no successful practice guided by the theoretical system of resilience community construction. In the grim situation of urban disaster prevention and mitigation, the resilience community provides a new perspective to solve the problem. It should be extended to the national strategic level and develop a resilience community construction agenda at the national level. On the basis of learning from foreign experience and continuous practice revision, we will take the road of development of localized resilience community in China.

References
[1] Xu, Y Y. Li, G. Cui, S H. Xu, Y P. Pan, J B. Tong, N J. Xu, J R. Zhu, Y G. (2018) Review and prospect of resilience science: from ecological theory to urban practice. ActaEcologicaSinica, 38(15).
[2] Liao, M L. Su, Y. li, F F.(2018) Urban community construction under the framework of resilience system. China administration, (04):57-62.
[3] Zhai, G F. Zou, L. Ma, D H. Tang, F H. Liu, F Y. Zhao, Z Q. Huang, F M.Wang, P M.(2018) Urban resilience. Urban planning, 42(02):42-46+77.
[4] Peng, C. Guo, Z Y. Peng, Z G. (2017) Research Progress on the Theory and Practice of Foreign Community Resilience. International urban planning, 32(04):60-66.
[5] Wu, X L. Xie, Y Y.(2018) Study on resilient community based on urban public security. Tianjin social science, (03):87-92.
[6] Zhou, L M.(2016)Resilient cities: risk management and indicator construction -- on international cases. Journal of Beijing institute of administration, (02):13-20.
[7] Teng, W X. , Luo, X .Wan, B L. Mao,Y Y.(2018) Urban security and comprehensive disaster prevention system from the perspective of resilient city -- taking pudong new area of Shanghai as an example. Urban development research, 25(03):39-46.
[8] Liang, H E.(2017) Experience and inspiration of building resilient communities in Japan -- a case study of post-disaster reconstruction in the northern area of kobelujia road station. Planner,33(08):38-43.
[9] Reiner, M.McElvaney, L. (2017)Foundational infrastructure framework for city resilience. Sustainable and Resilient Infrastructure, 2(1): 1-7.
[10] Jiang, H Y.(2017) Discussion on the application of community capital in the construction of resilient community disaster prevention system -- taking baiyunli community in Taiwan as an example.In:China urban planning annual conference.Dongguan.