Exploring and Enhancing Community Disaster Resilience: Perspectives from Different Types of Communities

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Abstract

This study aimed to explore the differences in various aspects of community disaster resilience and how to enhance disaster resilience tailored to different community types. The evaluation re-sults were validated using the flood event that occurred in Zhengzhou on July 20, 2021 (hereinafter referred to as the "7.20" rainstorm disaster). The main results of the analysis showed that the respondents' overall evaluation of their community's resilience to the “7.20” disaster was relatively high, commercial housing communities performed the best, followed by urban village communities, employee family housing communities performed the worst. Specifically, commer-cial housing communities scored highest in three dimensions: human capital, physical infrastruc-ture, and adaptation. Urban village communities scored highest in the three dimensions of social capital, institutional capital, and community competence, while employee family housing com-munity consistently ranked the lowest in each dimension. The most significant disparities were found in human capital, followed by community competence and social capital, adaptation, and, lastly, institutional capital and physical infrastructure. Targeted improvement strategies and measures are suggested for each type of community, offering valuable recommendations for rele-vant government agencies aiming to enhance community disaster resilience and disaster risk re-duction.

Key words: flood disaster; community disaster resilience; climate emergency; disaster risk reduction

I. Introduction

In the last few years, resilience has gained attention in the political sphere, the field of crisis management, a nd the news media, drawing the attention of scholars and policymakers from various disciplines and sectors. R esilience is an innovative way of thinking about disaster governance and is a rather modern concept in the co ntext of disaster management [1,2]. Communities are increasingly recognizing the importance of identifying res ources and formulating strategies for their utilization in the event of a disaster, thereby enhancing their readine ss for emergencies. These proactive measures serve to mitigate the adverse impacts of disasters and bolster the resilience of the affect-ed populations [3]. In particular, one of today's most significant global challenges is cli mate change, posing numerous ecological, environmental, social, and economic threats to human survival and development. Extreme weather and climate events are on the rise, exceeding the capacity of both natural and human systems to adapt and re-sulting in irreversible consequences [4].

Communities play a pivotal role in disaster resilience, whether it involves combat-ing a pandemic like COVI D-19 or addressing natural disasters such as floods and heavy rainfall due to sudden climate changes. Commu nity resilience and the effective-ness of disaster recovery efforts have a direct impact on reducing disaster reco very time, making community-level responses indispensable in disaster loss reduction and disas-ter managemen

t. Concurrently, community resilience and its role in responding to dis-asters have gained significance as integr al components of disaster prevention and miti-gation efforts. The concept of disaster resilience has evolved to i ntroduce novel perspec-tives in disaster management, particularly in the context of comprehensive multi-hazard prevention. Rather than regarding society's obligation as merely adapting to the failures that precipitate local-le vel disasters, resilience is viewed as the capability to diminish the risk and repercussions of crises and disaster s at the grassroots level. This entails more than just grasping the adaptive potential of social systems. Despite the in-volvement of higher tiers of government, emergency management frequently places a greater responsibili ty for service delivery on local authorities [5]. When local, state, and federal governments are aligned in their understanding of their respective roles and responsibilities, the whole system functions more effectively. Howev er, discrepancies in these perceptions can lead to confusion, conflict, or in severe cases, a complete break-dow n in disaster response. Therefore, it is crucial for officials at each level of govern-ment to have a clear underst anding of their specific responsibilities to manage disasters effectively. Nonetheless, achieving such alignment is challenging. Problems may arise when other involved parties hold unrealistic or inappropriate expectations reg arding government actions in disaster scenarios [6].

Particularly for those societies whose regions rely on resources sensitive to climate change, the vulnerability of societies to risks related to climate change may exacerbate ongoing social and fiscal challenges. Therefore, understanding the local context of vul-nerability is essential for effective adaptation. This is related to the need to strengthen communities' adaptive, absorptive, and resilient capacities, which has emerged as a key concept i n modern urban planning, emergency response, and disaster manage-ment [7–9], and in particular "community resilience" [10–12]. The internal resilience of a community and its driving factors are spatially variable, which means that the com-munity's performance in the face of disasters is also different due to various factors in its components [13]. Therefore, it's crucial to research and assess "community disaster resil-ience" in the context o f climate emergencies, considering a range of community types.

Hence, this study wants to address the following questions: Are there substantial variations in the resilience l evels among diverse urban communities? How do distinct measurement dimensions accurately portray the resili ence levels within these different community types? What are the most effective approaches to develop tailore d strategies for each community type, thereby fostering the creation of resilient communities and enhancing the ir disaster resilience levels?

II. Theoretical Discussions

1. Community

It's vital to first define the term "community" before discussing community disaster resilience. Despite numer ous attempts to define it in various ways, the literature lacks a universally accepted definition [14]. The acade mic literature has employed a variety of definitions of the community up to this point, but no single term has garnered wide-spread agreement [15].

The term "community" traces its roots to ancient Rome and holds multiple inter-pretations from diverse disci plinary perspectives [16]. Community is a term that can encompasses a broad spectrum of meanings, most of which are relevant in the context of emergency management. A community is essentially a group sharing seve ral com-mon elements. While it is often defined by geographical location, it can also encompass shared experi ences or functions. This broad definition implies that the concept of com-munity can be applied to a diverse a rray of groups that may require interaction with emergency management systems [17]. Geographic locations ca n vary in scale, ranging from something as small as a neighborhood to something as extensive as a major me t-ropolitan area. Similarly, shared experiences might be rooted in aspects such as ethnic identity, professional in terests, or recreational hobbies [18].

It is crucial to acknowledge that the geographical context significantly influences the experience of social ca pital in the study of disasters and resilience. Geographically, locations often serve as settings for social interacti ons [19]. Communities can be estab-lished through networks and relationships among individuals who share co mmon identities or interests. Geographic communities are groups of people delineated by spe-cific geographical boundaries united by shared bonds [20].

Thus, in the realm of disaster management science research, a community is re-garded as a distinct entity, s eparate from individuals and society, functioning as a col-lective unit. Typically, a community comprises built, natural, social, and economic el-ements that interact, possessing well-defined boundaries, a shared destiny [21], and share common interests is an often-used definition of a community [22,23]. Social net-works can influence the collective behavior of a community, impacting its resilience to disasters. Large-scale events like disasters a ffect every member of a community, often prompting them to come together in response to crises or tragedies [24]. Large-scale disaster response necessitates collaboration across multiple organizations, intergovern-mental ag encies, and various sectors. Both preparedness and recovery rely on social networks where authority is distribut ed, responsibilities are widespread, and resources are extensively shared.

The disaster-affected community encompasses anyone connected to those impacted by a disaster through vari ous social networks. In times of crisis, community members share a common fate, or at the very least, a shar ed reality [19]. Some argue that com-munities should be defined on a case-by-case basis, allowing for multiple scales (from community to county) to serve as appropriate analytical units for resilience assessment [13,25,2 6].

In this study, a community is defined as a social group consisting of individuals who are closely related to one another, live in a shared residence, and are socially inte-grated. Communities are dynamic systems composed of individuals and groups that are interconnected.

2. Community Disaster Resilience

In the broader context of resilience, the field of community resilience continues to evolve. Despite the frequ ent use of the term "community resilience" in discussions re-lated to sustainability and disaster risk reduction, a universally accepted definition for either term remains elusive. The precise definition of community disaster r esilience remains a subject of ongoing debate among academics. When applied to social systems, resilience oft

en places a greater emphasis on governance, environmental factors, and the organizational aspects of social co mmunities linked to disaster mitigation and pre-paredness, as opposed to natural systems. In practice, society is increasingly focused on developing strategies to enhance and strive towards enhancing the overall resilience of communities in the face of various formidable disasters [27]. A new catastrophe-handling culture has emerged as a result of the term "resilience" being used in disaster discourse [28].

This study explores the concept of community resilience, e, particularly in the con-text of disasters, which is often defined as a community's capacity to effectively manage natural catastrophes, endure their impact, and s ubsequently recover [29–34]. The abil-ity of a community system, or part of a system, to absorb and recover from disaster events, it's important to note that “resistance” is distinct from the concept of "resilience”. Moreov er, it's worth mentioning that resistance is not in opposition to resilience; rather, resilience encompasses resistan ce. So, focusing exclusively on either resilience or re-sistance can result in inadequacies. In essence, a commu nity's resources should be suffi-cient not only to withstand disruptions but also to prevent interruptions that can weak-en community functioning without the need for adaptation [35,36].

Sharifi and Yamagata’s analysis [15] define community resilience as the capacity of a community to adapt more successfully to unfavorable events and restore equilibrium. In addition to outcome-based metrics like spee d of recovery and loss estimation, the definition also emphasizes the use of participatory approaches and proce ss-based met-rics Norris et al. [21] highlight the challenges in defining CR, the idea of "community resilience" is challenged by the evolving definition of community as an organization with geographic borders and a shar ed purpose, consisting of constructed nature, and natural resources.

Consequently, research on community resilience has branched into two primary strands: one primarily focuse s on community resilience as a means to shield residents from suffering physical or mental health issues in th e aftermath of disasters. The other approach discusses good organizational behavior and catastrophe manageme nt, which is significantly more focused on community resilience. To put it another way, he says that building a resilient community is "the act of tying a collection of adaptive capaci-ties to positive functional and adaptiv e trajectories" [21].

Building and achieving community resilience relies heavily on effectively control-ling risks using various risk reduction strategies. However, the transformative effects of natural disasters on the physical, social, and psych ological facets of our lives can make this task challenging. After a disaster, as well as during the recovery an d reconstruc-tion phases, communities are faced with a new reality that often differs significantly from their pr e-disaster norms. As a result, people must adjust to the changed reality (ei-ther the disaster itself or the social response to it) [37]. According to Collins et al. [38], defining resilience follows Paton's opinion that it is a co nsequence rather than a process. Second, the situation determines the proper meaning of resilience. Learning fr om natu-ral disasters is subtler. No single disaster typically prompts major change on its own. Instead, signific ant changes, such as the enactment of disaster management legislation like the Stafford Act, often occur after several major disasters have taken place [39].

The ability of a community to deal with calamities while lessening its susceptibil-ity and utilizing its locatio

n and people is referred to as community resilience. Com-munities that are disaster-resistant are more robust a nd able to deal with disasters, making them less exposed to them [40]. The capacity of a community or its el ements to recover from the negative impacts of a tragedy is known as community resilience. Communities are able to adapt and respond to emergencies in a catastrophe or risk set-ting through the use of this adaptable, c hangeable, and recoverable capacity, all while maintaining crucial systems and preserving the distinctiveness of the community [41]. According to Buckle [42], who examined the idea of community resilience, "a "commu-n ity" is defined as a big social group." The operations, readiness, and resilience of ho-tels might face enormous obstacles from impending and perhaps catastrophic disasters. Communities and organizations are intertwined [4 3]. As a result, "passive and active aspects" that integrate adversity rehabilitation (pre-element) and environmen tal altera-tion to mitigate future disasters (post-element) are necessary for community resilience [44]. This inclu des the capacity for adversity recovery before a disaster strikes and the ability to modify the environment to r educe the impact of future disasters.

Therefore, the concept of community resilience is not only about the ability to re-cover quickly from the direct consequences of a disaster but also about learning from, responding to, and adapting to disasters. Resilience draws attention to the community's ability for adaptation and aligns emergency management's conceptualization with the adaptation discourse, paving the way for advancement in the practice of disaster and emergency management.

III. Materials and Methods

1. Study Area

Henan Province is located in central China and is one of the most populous prov-inces in China. The topography of the province is high in the east and low in the west, consisting mainly of the Yellow River Basin and the mountains in the south [45]. Zhengzhou City, located in the center of Henan Province, is the capital and largest city of the province (Figure 1). Due to its geographical location, it is subject to monsoons and rainfall all year round and often suffers from heavy rainfall and flooding [46]. In July 2021, Henan Province in China endured an exceptionally powerful rainstorm that lasted from July 17th to July 23rd, triggering severe flooding [47]. As documented in the "Investigation Report of the '7 20' Extraordinary Rainstorm Disaster in Zhengzhou, Henan Province," this rainstorm was a natural disaster responsible for extensive prop-erty damage, casualties, and widespread flooding in both urban areas and rivers. Ad-ditionally, it led to various other calamities, including building collapses, landslides, and subway accidents, as reported by the Disaster Investigation Team of the State Council in 2022. Verified sources have indicated that this disaster affected a total of 14,786,000 individuals, resulting in direct economic losses of 120.6 billion RMB as of September 30th. Tragically, 398 individuals lost their lives or went missing as a conse-quence of this tragic event [48].

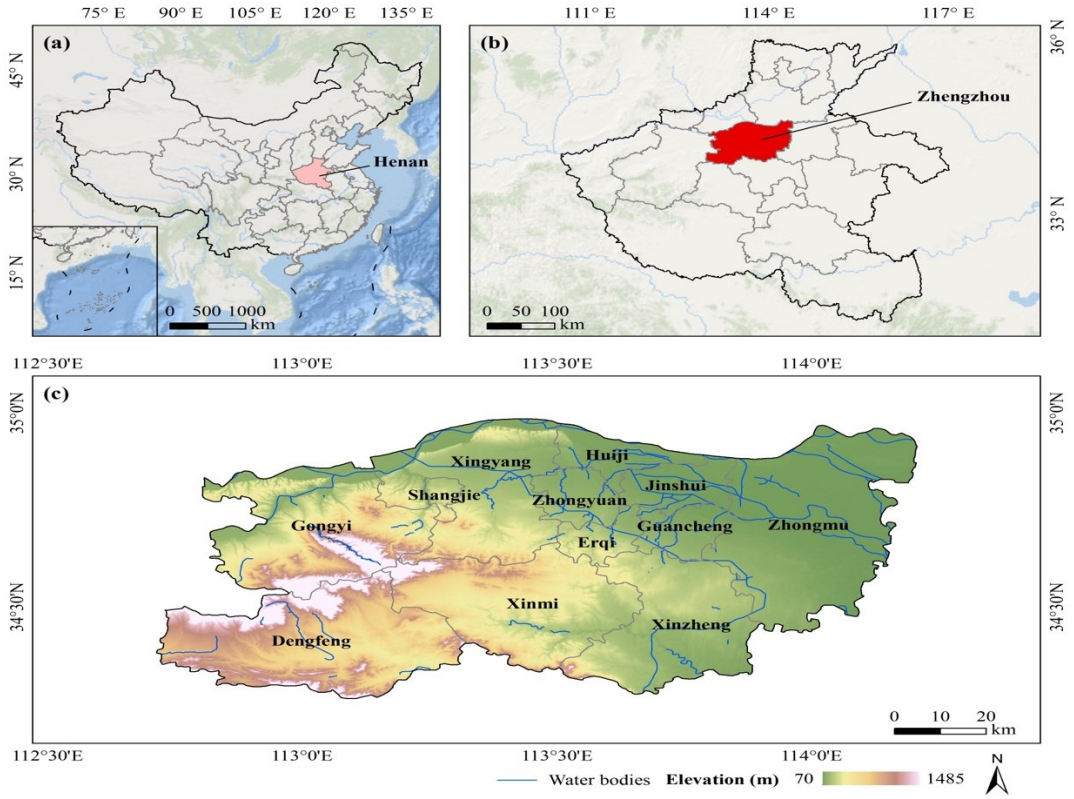

Figure 1. Location of Zhengzhou, Henan.

2. Data Source

This study used a questionnaire survey to collect data, the comprehensive resili-ence index values of differen t types of communities will be compared to reveal the dif-ferences in community resilience levels, and to com pare the differences in the resilience of various types of communities in different dimensions such as human, s ocial, physical infrastructure, institutional capital, community competence, and adaptation, and ex-plore the reas ons for them. The questionnaire questions were designed in three parts, the first part was demographic charact eristics related questions, which mainly included basic information of respondents, including gender, age, occup ation, income level, house ownership, type of community of residence, etc. The second part is a section on pe rsonal perceptions, knowledges, and experiences of disasters. The third part is main-ly for scoring the 6 dimen sions of community disaster resilience and the total evalua-tion index, with questions set for each dimension. The questionnaire was designed us-ing the Likert five-point scale (1-5 scale). Questionnaires were randomly di stributed to community residents in Zhengzhou City, especially those who had experienced the event. The ques tionnaire survey in this study was commissioned to the questionnaire company in China (Wenjuan Xing) to di stribute through online route, which was dis-tributed from April 21 to May 1, 2023, and 396 questionnaires w ere collected, and after excluding 18 invalid data, the final valid questionnaires were 378. In this study, Cronb

ach's alpha was used to test the internal consistency. Based on the results, the re-liability coefficient of human capital was 0.746, the overall reliability coefficient of social capital was 0.832, the overall reliability coefficient of physical infrastructure was 0.857, the overall reliability coefficient of institutional capital was 0.884, 0.837 for community competence, and 0.849 for adaptation. The reliability coefficients range from 0 to 1, and the cl oser to 1, the higher the reliability.

Based on the analysis results presented in Table 1, within the sample of 264 com-mercial housing communit y residents: Gender distribution was nearly equal, with men and women constituting 41.3% and 58.7% of the sample, respectively. The age structure primarily consisted of young and middle-aged individuals. Specifically, 45.8% fell within the age range of 31 to 40, and 34.5% were aged between 21 and 30. The majori-ty of the interviewed families, 188 individuals, held university degrees, accounting for 71.2% of the sample. In terms of occupations, the predominant occupation among com-mercial community residents was employment in compani es, making up 62.1% of the sample. Regarding income, the most common monthly earnings fell within the ra nge of 5,000 RMB (694 USD) to 8,000 RMB (1111 USD), with 91 individuals (34.5%) falling into this categ ory. The next most common income bracket was 8,000 RMB (1111 USD) to 12,000 RMB (1667 USD), whic h accounted for 27.3% of the sample and included 72 in-dividuals.

The distribution of monthly household income showed the following patterns with-in the surveyed household s: The majority of households (47.3%) reported monthly in-comes ranging from 10,000 RMB (1389 USD) to 20,000 RMB (2778 USD). The next most common income bracket was 20,000 RMB (2778 USD) to 30,000 RMB (4167 USD), ac-counting for 25.8% of households. Households with monthly incomes below 10,000 R MB (1389 USD) constituted 16.7% of the total. Households with monthly incomes ex-ceeding 30,000 RMB w ere the least common, making up only 1.9% of all households. A total of 46 individuals earned less than 5,00 0 RMB (694 USD), representing 17.4% of the households.

Regarding homeownership: The majority of residents (88.3%) owned their houses independently. A smaller percentage (8%) resided in rented houses. Some residents (2.7%) lived in staff dormitories. A few individuals (1.1%) temporarily borrowed ac-commodations from relatives or friends. Concerning the length of residence: Over 60% of residents had lived in their current homes for more than 5 years. Approximately 34.8% of residents had a residence duration between 1 to 5 years.

Table 1. Characteristics of Commercial Housing Community Residents (N=264).

Characteristics		Frequency	Percent	Characteristics		Frequency	Percent
Gender	Male	109	41.3	Monthly income	<5000RMB	46	17.4
	Female	155	58.7		5000-8000RMB	91	34.5
Age	20	8	3.0		8000-12,000RMB	72	27.3
	21-30	91	34.5		＞12,000RMB	55	20.8
	31-40	121	45.8		< 10,000RMB	44	16.7

	41-50	16	6.1	Monthly family income	10,000-20,000 RMB	125	47.3
	51-60	18	6.8		20,000-30,000 RMB	68	25.8
	60	10	3.8		＞30,000 RMB	27	10.2
Education	Less than high school	6	2.3	Homeownership	Own house	233	88.3
	High school	16	6.1		Rented house	21	8.0
	College	32	12.1		Temporary stay with relatives or friends	3	1.1
	Four-year university	188	71.2		Staff dormitory	7	2.7
	Graduate school	22	8.3	Length of residence	< 1 year	6	2.3
Occupation	Student	24	9.1		1-5 years	92	34.8
	Government and public institution staff	35	13.3		5-10 years	83	31.4
	Company employee	164	62.1		> 10 years	83	31.4
	Company owner or self-employed	27	10.2				
	Freelancer	11	4.2				
	Other	3	1.1				

Accoring to the analysis results shown in Table 2, within the sample of 53 employ-ee family housing com munity residents: Gender distribution showed a relatively even split, with men comprising 54.7% and women r epresenting 45.3% of the sample. The age structure primarily centered around the 21-30 age group, accounting for over 50% of the respondents. The majority of individuals held bachelor's degrees as their highest educatio n level, with 33 individuals accounting for 62.3% in this category. In terms of occupation, employee family h ousing community residents were predominantly em-ployed by companies, making up 39.6% of the sample.

Regarding personal monthly income: The most common range was between 5,000 RMB (694 USD) and 8, 000 RMB (1111 USD), accounting for 41.5% of respondents. The next most prevalent income bracket was bel ow 5,000 RMB (694 USD), constituting 24.5% of respondents. Conversely, individuals with incomes exceedin g 12,000 RMB (1667 USD) were the least common, making up 11.3% of the sample.

Family monthly income: The concentration was primarily in the range of 10,000 RMB (1389 USD) to 20,0 00 RMB (2778 USD), with 56.6% of families falling into this cat-egory. Families with incomes below 10,000 RMB (1389 USD) constituted 24.5% of the to-tal, followed by families with monthly incomes exceeding 30,0 00 RMB (4167 USD) at 13.2%.

In terms of homeownership: The majority of residents (75.5%) owned their houses independently. A smaller percentage (15.1%) resided in rented houses. Some residents (9.4%) lived in employee dormitories. No individ

uals reported temporarily borrowing accommodations from relatives or friends, which aligns with the characteri stics of the employee family housing community.

Concerning the length of residence: 37.7% of the residents had lived in their cur-rent homes for 1-5 years. 30.2% had a residence duration ranging from 5 to 10 years. 24.5% had resided in their homes for over 10 years.

Table 2. Characteristics of Employee Family Housing Community Residents(N=53).

Characteristics		Frequency	Percent	Characteristics		Frequency	Percent
Gender	Male	29	54.7	Monthly income	<5000RMB	13	24.5
	Female	24	45.3		5000-8000RMB	22	41.5
Age	≤20	3	5.7		8000-12,000RMB	12	22.6
	21-30	27	50.9		＞12,000RMB	6	11.3
	31-40	14	26.4	Monthly family income	< 10,000RMB	13	24.5
	41-50	3	5.7		10,000-20,000 RMB	30	56.6
	51-60	2	3.8		20,000-30,000 RMB	3	5.7
	≥61	4	7.5		＞30,000 RMB	7	13.2
Education	Less than high school	0	0.0	Homeownership	Own house	40	75.5
	High school	4	7.5		Rented house	8	15.1
	College	9	17.0		Temporary stay with relatives or friends	0	0.0
	Four-year university	33	62.3		Staff dormitory	5	9.4
	Graduate school	7	13.2	Length of residence	< 1 year	4	7.5
Occupation	Student	13	24.5		1-5 years	20	37.7
	Government and public institution staff	13	24.5		5-10 years	16	30.2
	Company employee	21	39.6		> 10 years	13	24.5
	Company owner or self-employed	3	5.7				
	Freelancer	2	3.8				
	Other	1	1.9				

According to the analysis results (Table 3), from a survey of 61 urban village community residents: Gender distribution showed that females were the majority, accounting for 60.7%, while males made up 39.3% of the sample. The age distribution was primarily concentrated in the 21-30 and 31-40 age groups, together accounting for over 60% of respondents. In terms of education, the majority of residents had achieved university and bachelor's degrees, representing

a total of 75.4% Regarding occupation, A significant portion of urban village community residents were employed by companies, making up 49.2% of the sample.

Monthly individual income was most commonly found in the range of 5,000 RMB (694 USD) to 8,000 RMB (1111 USD), constituting 44.3% of respondents. The next most prevalent income bracket was below 5,000 RMB (694 USD), accounting for 31.1%. Conversely, individuals with incomes exceeding 12,000 RMB (1667 USD) were the least common, making up 4.9% of the sample.

For monthly household income, the majority of households fell within the range of less than 10,000 RMB (1389 USD), accounting for 45.9%. The next most common income bracket was 10,000 RMB (1389 USD) -20,000 RMB (2778 USD), constituting 37.7% of the total. A smaller proportion (11.5%) reported monthly incomes higher than 30,000 RMB (4167 USD).

Regarding homeownership: Most residents (67.2%) owned their houses independently. A smaller percentage (21.3%) resided in rental housing.

Concerning the length of residence: 36.1% of the residents had lived in their current homes for 1-5 years. 34.4% had a residence duration exceeding 10 years. 21.3% had resided in their homes for 5-10 years.

Table 3. Characteristics of Urban Village Community Residents(N=61).

Characteristics		Frequency	Percent	Characteristics		Frequency	Percent
Gender	Male	24	39.3	Monthly income	<5000RMB	19	31.1
	Female	37	60.7		5000-8000RMB	27	44.3
Age	≤20	5	8.2		8000-12,000RMB	12	19.7
	21-30	25	41.0		＞12000RMB	3	4.9
	31-40	17	27.9	Monthly family income	< 10,000RMB	28	45.9
	41-50	4	6.6		10,000-20,000 RMB	23	37.7
	51-60	7	11.5		20,000-30,000 RMB	3	4.9
	≥61	3	4.9		＞30,000 RMB	7	11.5
Education	Less than high school	8	13.1	Homeownership	Own house	41	67.2
	High school	6	9.8		Rented house	13	21.3
	College	18	29.5		Temporary stay with relatives or friends	1	1.6
	Four-year university	28	45.9		Staff dormitory	6	9.8
	Graduate school	1	1.6	Length of residence	< 1 year	5	8.2
Occupation	Student	13	21.3		1-5 years	22	36.1

	Government and public institution staff	1	1.6		5-10 years	13	21.3
	Company employee	30	49.2		> 10 years	21	34.4
	Company owner or self-employed	11	18.0				
	Freelancer	3	4.9				
	Other	3	4.9				

3. Variables and Measurements

The establishment of the comprehensive evaluation indicators in this study was based on a synthesis of related literatures. It aggregated all the indicators from the in-cluded literature, considered the actual situation and characteristics of the case urban community, screened for duplicate or similar indicators, and validated, improved, and refined the measurement tools. The six variables, namely human capital, social capital, physical infrastructure, institutional capital, community competence, and adaptation, complement each other and constitute the resilience of communities to natural disasters. A system was developed to measure and assess the resilience of communities.

The six variables of community disaster resilience were refined and decomposed, and then divided into the specific measurements. The precise measuring techniques are based on the body of research, and data accessibility and measurability are also considered.

In the study, human capital described people's educational background [11,22,49–52], income level [21,25,52], disaster risk perception [33], physical health [50], psycho-logical well-being [53]. The social capital dimension mainly included social network re-lationships [10,54], trust in the community [54,55], community recognition [19,50], and community cohesion [19,33]. The physical infrastructure dimension mainly included disaster communication service [22], disaster transportation support [49,56], shelters availability [52], health and medical system [52,57], living environment of community [58,59]. The institutional capital dimension mainly included disaster responsibility or-ganization structure [41], mitigation and evacuation plan [8,22,60], disaster prepared-ness [33,41], disaster response and recovery [22,33,61], and institutional collaboration and coordination [22,62,63]. The community competence dimensions mainly included leadership [64,65], disaster education, training, and drills [34,37], information and communication [50,66], and collective efficacy [27,53]. This study measured and as-sessed adaptation through four secondary variables: innovative disaster management strategies [50,67], learning [33,53,68], critical reflection [50,69], flexibility and creativity [50,70].

IV. Conclusions

This research was conducted to examine the significance of differences in resilience among various types of c ommunities during the Zhengzhou 7.20 rainstorm and to identify ways to enhance disaster resilience for each

community type. The major find-ings, based on the analysis of collected questionnaire responses, are summariz ed as fol-lows:

(1) The overall evaluation of disaster resilience in different types of communities ranged from 3 to 4, with a mean value of about 3.72. The result showed that the respondents' overall evaluation of their communit y's resilience to the “7.20” rainstorm disaster was relatively high.

(2) In general, the highest score was for commercial housing communities at 3.7609, followed by urban village communities at 3.7269, and employee fami-ly home communities scored the lowest at 3.6959. In term s of community resil-ience to respond to sudden rainstorm disasters, commercial housing communi-ties perform ed the best, followed by urban village communities. Employee family housing communities performed the wor st.

(3) Specifically, commercial housing communities scored highest in the three di-mensions of human capi tal, physical infrastructure capital, and adaptation. Urban village communities scored highest in the three dimen sions of social capital, institutional capital, and community competence, and employee fami-ly housing commu nity scored the lowest in each dimension.

(4) There are some differences among the three types of communities in each di-mension. The three ty pes of communities differed the most in human capital, followed by community competence and social capital, adaptation, and finally institutional capital and physical infrastructure.

These insights offer valuable guidance for local authorities on tailoring flood disas-ter prevention and enhancing community disaster resilience to fit the specific needs of different community types and dimensions.

Note: This study has been published in the journal《Water》of MDPI. For the full text of the study, please go to the journal's official website to check the full article. https://doi.org/10.3390/w16060881

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