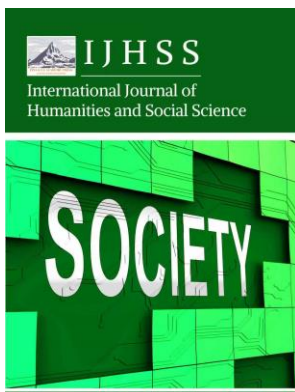*Article*

From Awareness to Action: A Conceptual Framework for Participatory Resilience in the Chinese Context

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Abstract: As climate risks grow increasingly complex and governance systems undergo institutional change, fostering individual-level public engagement has become a critical challenge in risk research. Existing studies often focus on macro-level institutions and community practices, with limited attention to the behavioral mechanisms at the individual level. This study proposes a theoretical framework of participatory resilience that expands the micro-analytic dimension of social resilience theory through the lens of individual behavior change. Drawing on the Social Cognitive Theory and the Theory of Planned Behavior, the paper introduces a five-stage behavioral pathway model comprising cognitive activation, emotional resonance, evaluative judgment, motivational development, and behavioral transformation. By integrating international experiences with bibliometric analysis of both Chinese and English literature, the study identifies gaps in current research-particularly the insufficient attention to individual behavioral transformation and the lack of clearly defined institutional embedding mechanisms in state-led governance environments. The findings contribute to resilience theory by offering a micro-level analytical perspective that links individual cognition and motivation to broader systemic resilience-building efforts.

Keywords: participatory resilience; behavioral transformation; social resilience; bibliometric analyses; five-stages behavioral pathway

1. Introduction

The intensification of extreme climate events in recent years has placed unprecedented stress on social systems and revealed critical gaps in conventional risk governance frameworks. As floods, typhoons, heatwaves, and droughts occur with increasing frequency and severity, early warning information has not been converted into timely action responses, and the general public is slow to act and lacks knowledge when facing risks, it reveals that the traditional risk governance model that relies on the unilateral power of the government can no longer effectively cope with the complex and diverse risk landscape [1]. In China, events such as the Zhengzhou "7·20" torrential rain, the 2023 Fujian typhoon landfall, and urban drainage crises across major cities in Guangdong province have not only caused significant human and economic losses but also exposed the structural vulnerabilities within existing emergency management systems. These crises have highlighted it should accelerate the transition to a model that maintains the continuous operation of the system and adapts flexibly to environmental changes under the coordinated efforts of multiple forces, especially incorporate public engagement as an essential dimension of resilience governance.

The rise of resilience theory has provided a new theoretical perspective for disaster risk governance. "Resilience" first appeared in physics, originally referring to the ability of an object to self-repair when subjected to external forces. While the resilience paradigm has gained global traction across disciplines such as environmental science and engineering, much of the prevailing literature has concentrated on system structures or infrastructure capacity [2,3]. In the 21st century, it was introduced into the field of "governance" by public management scholars, and resilience governance has become one of the research hotspots. This theory often emphasizes the ability of system to withstand, recover and adapt to shocks, and advocates the overall improvement of the response mechanism through multi-subject collaboration, with the goal of improving the adaptability of governance subjects and their urban and community systems to complex disaster risk shocks. However, existing resilience governance is still largely based on a top-down control method, which means that information about disasters must first be collected, then aggregated to support government decision-making, and then passed down for execution until the disaster or disaster damage is controlled. On the one hand, when faced with complex, cross-system, and long-term disaster risks, this approach is often limited by the response speed of the hierarchical organizational structure. From problem discovery to instruction transmission, it is necessary to go through multiple levels of reporting and decision-making processes. Although it ensures procedural rationality, it is easy to miss the best response opportunity due to decision-making delays or execution delays. Therefore, the behavioral pathways through which individuals perceive, interpret, and respond to risk is necessary yet remain insufficiently addressed in current models [4-6]. Although public participation is frequently cited as a normative goal in disaster policy documents, the mechanisms by which individuals develop the capacity and motivation to engage meaningfully in risk mitigation remain underexplored, particularly in non-Western contexts [7].

The absence of a comprehensive understanding of individual behavior transformation has created a conceptual blind spot in both resilience theory and practice. For example, review study pointed out that there is a serious gap between the definition of resilience at the policy level and the daily vulnerability perception of urban residents. Although public participation is promoted in form, individual experience is not effectively absorbed in reality, and self-organized practices at the grassroots level have long been outside of institutional support [8]. In addition, evidence has shown that even when early warning systems are functional and accessible, individuals may fail to act on risk information due to cognitive biases or socio-structural constraints [9-11]. This suggests that truly transformative resilience building requires not only a focus on adaptive reforms at the institutional level but also a deep integration of value reshaping and capacity-building at the individual level to avoid the phenomenon of "knowing but not doing" [12,13]. This gap is especially salient in the Chinese context, where formal disaster governance remains largely centralized and where individual autonomy in emergency response is frequently constrained by the extent of policy extension, institutional opacity, and uneven access to risk communication channels [14].

Against this backdrop, this study argues that building effective risk governance systems requires a deeper engagement with the psychological, emotional, and social mechanisms that underpin individual action, rather than a pre-determined state or technical indicator. Specifically, individual resilience participation should not be viewed simply as a procedural step in policy implementation, but rather the process through which individuals develop and exercise agency in disaster risk reduction through iterative interactions with risk information, emotional stimuli, institutional norms, and collective practices [15,16].

To operationalize this perspective, the study develops a five-stage behavioral pathway model-cognitive activation, emotional resonance, evaluative judgment, motivational development, and behavioral transformation-that articulates how individuals move from passive risk awareness to active engagement. This model

synthesizes insights from Social Cognitive Model and the Theory of Planned Behavior (ToPB), while also drawing upon practical case studies and empirical findings from both Chinese and international settings through a bibliometric analysis [17-20]. Therefore, the comparative insights are used to highlight contextual specificities in China's disaster governance landscape, thereby offering a more nuanced account of resilience capacity-building at the individual level.

2. Literature Background

2.1. Search for the Literature

We reviewed the literature to synthesize the concept of participatory resilience, and found that is embedded in the broader tradition of participatory research. When Sherry Arnstein proposed her famous "Ladder of Citizen Participation" model in 1969, the depth of participation has become a core dimension for assessing the substantive nature of public participation [21]. Arnstein argued that participation only becomes meaningful when the public has real influence over decision-making process. This insight has important implications for shaping the idea of participatory resilience. At present, much public participation in disaster management remains at the stage of information transmission or symbolic mobilization, rather than being integrated into the core mechanisms that support building resilience [22-24]. Consequently, there is a lack of interaction between public behavior and institutional structures. Although resilience building have increasingly focus on community level, the role of the individual remains significantly under-theorized in much of the academic and policy literature [25,26]. Therefore, the participatory resilience perspective urgently needs to respond to the question of how to leap from collaborative participation to co-construction and co-governance, that is, how to achieve institutional embedding of individuals at key nodes such as risk identification, resource allocation, and response actions design.

In addition to the deep concern about participation, "who are the participants", "who has the ability to participate" and "who is excluded" are also long-term concerns of participation theory [27,28]. In Healey's collaborative planning framework, urban planning is regarded as a social learning process, emphasizing the construction of negotiation space between heterogeneous knowledge systems, so that local knowledge can supplement the technical hegemony of expert systems [29]. Empirical works in sub-Saharan Africa and Southeast Asia have shown that adaptation strategies often fail when local knowledge, values, and perceptions are ignored in the design of top-down resilience interventions [30,31]. In the disaster governance scenario, these findings underscore the need for view the public not merely as recipient of information, but as the active co-creators of resilience capacity. Their daily experience, historical memory and emotional perception are often the indispensable cognitive basis for formulating effective governance strategies [32]. This view also coincides with the recent research on "place-based resilience", which emphasizes the path of building risk perception and collective action based on sense of place, cultural identity and historical experience [33]. Grounded upon these frontiers theories, it can conclude that participatory resilience is not only an instrumental policy means, but should also be understood as an institutional mechanism to promote the redistribution of the public's knowledge construction rights and action interpretation rights.

At the same time, from the perspective of collaborative governance, participatory resilience can also be understood as a redesign of the governance structure. The four key conditions of collaborative governance theory are: starting conditions, institutional design, leadership, and collaborative process. Among them, the matching of institutional design and starting conditions is considered to be the key to achieving effective collaboration. Under the path of participatory resilience, the public's behavior transformation mechanism must match institutional resources. Only by building a positive feedback loop

between cognitive mobilization, effectiveness evaluation, and willingness to act can the public truly transform from passive responders to institutional collaborators.

2.2. The Emerge of Participatory Resilience

To address this gap, a growing body of literature has begun to explore the micro-foundations of resilience by focusing on individual-level factors such as risk perception, protective motivation, and decision-making [34-36]. These studies offer valuable insights into the cognitive and emotional processes that shape behavioral responses to risk. Emerging from this line of inquiry, the concept of participatory resilience has gained traction as a theoretical extension of existing resilience frameworks.

Grounded in traditions of participatory planning and collaborative governance, participatory resilience places individuals at the center of risk governance [37]. It emphasizes their active role in co-producing knowledge, engaging in social learning, and participating in networked action. Crucially, participatory resilience goes beyond simply involving the public in decision-making. It reflects a model of governance in which individuals are empowered to perceive, evaluate, and respond to risks in ways that are both locally meaningful and institutionally supported [38,39].

However, it is essential to conceptualize behavior within the broader social, cultural, and institutional context in which it occurs. While Western scholarship on civic engagement and grassroots adaptation has advanced our understanding of participation as a critical enabler of resilience, the Chinese context introduces a distinct set of challenges and opportunities. In China, public participation is often mediated by centralized institutions, shaped by official narratives, and constrained by disparities in access to resources and digital technologies [40,41]. Therefore, theorizing participatory resilience in the Chinese context requires an integrated perspective-one that accounts not only for individual behavioral dynamics but also for the institutional structures and governance mechanisms that shape participation.

It is worth noting that although resilience theory originated in the Western society, its introduction and development in China have followed a distinctive path of conceptual adaptation and localization. As urban governance and risk management practices in China have evolved in recent two decades, scholars have increasingly sought to integrate the concept of resilience with the country's unique social structures and governance frameworks, and exploring resilience-building paths suitable for the Chinese context [42-44]. At the same time, public participation, as an important practical approach to promoting resilience building, has also gained increasing attention in China's disaster prevention and mitigation system. To better understand how the analytical lens of participatory resilience has been localized, this study conducts a systematic review and bibliometric analysis of relevant literature from both Chinese and international databases. This approach aims to trace research trends, identify conceptual developments, and assess how participatory resilience has been theorized within China's academic discourse.

3. Methodology

Along with the core elements discussed above, this study intend to construct a behavioral model of participatory resilience by integrating bibliometric analysis, theoretical synthesis, and contextual adaptation [44]. Rather than following a conventional empirical design, this approach aims to identify theoretical gaps, map the structure of existing knowledge, and construct a model rooted in interdisciplinary literature. Special attention is given to the intersection of risk, individual behavior, and governance systems, allowing for a more comprehensive understanding of how participatory resilience can be conceptualized within both global and localized contexts.

3.1. Bibliometric Analysis of Participatory Resilience Literature

In order to more clearly sort out the knowledge map of participatory resilience, a cluster-based bibliometric analysis was conducted using the Web of Science Core Collection. The dataset includes peer-reviewed articles published between the year 2000 and 2024, filtered by the terms: "participatory resilience" OR "community resilience" OR "risk governance" OR "citizen participation" OR "resilience engagement". Citespace 6.2.R2 was used to present the changing foci in literature and the definition scope trending by conducting keyword co-occurrence and its network clustering analysis [45].

Using co-word analysis and clustering techniques, this study identified 19 distinct thematic clusters, each representing a sub-domain of participatory resilience research. These clusters include contributions from "disaster studies", "public health", "indigenous knowledge systems", "urban planning", "ecosystem services", and "mental health interventions". Table 1 below presents an excerpt of these clusters, highlighting their dominant themes, high-frequency keywords, and representative articles [46-58].

Table 1 An excerpt of co-word analysis and clusters of WOS database (Check the Appendix for the full Table)

Cluster ID	Thematic Focus	High-Frequency Keywords	Key Contributions	Source
0	Literature Reviews & Frameworks	Participatory methods (169); disaster reduction (94); politics (74)	Conceptualizing health in socio-ecological systems	[46]
1	COVID-19 Crisis	Health (175); risk (132); gender (63)	Photovoice and community kitchen as participatory crisis responses for fighting against the COVID-19	[47], [48]
2	Indigenous Knowledge	Community (168); protection (104); local knowledge (81)	Role of indigenous participation in climate literacy	[49]
3	Southeast Asia & Youth	Resilience (950); climate change (577); adaptation (290)	Youth-led participatory practices for climate resilience	[50]
4	Urban Resilience	Vulnerability (226); participatory action research (164); city resilience (53)	Participatory strategies across urban-rural scales	[32], [51]
5	Sustainable Management	Local participation (354); system management (143); policy (132)	Participatory modeling in agroecological resilience	[52], [53]
6	Community Health	Community resilience (153); post-disaster recovery (83); public health (48)	Resilience in participatory public health planning	[54]
11	Mental Health and Youth	Mental health; adolescents	Community-based mental health as resilience pathways	[55]
14	Disability and Resilience	Social inclusion (73); participation (73); care service (47)	Investigated participatory resilience-building in marginalized groups, especially focusing on children and people with disabilities	[56]

15	Nature-based Solutions	Urban planning (45); climate resilience (30); indicator (31)	Showcased the role of participatory urban planning in building resilience through nature-based solutions, focusing on green infrastructure	[57]
18	Resource-dependent Community	Participatory mapping (42); stakeholder engagement (38); decision-making (37)	Studied the impact of participatory mapping and local collaboration on resource-dependent communities in decision-making processes	[58]

Across clusters, several commonalities emerged. The correlation between clustered keywords and highly cited literature indicates that the knowledge landscape of participatory resilience reflects a developmental trend characterized by interdisciplinary integration, local knowledge incorporation, and practice-oriented evolution. Its theoretical foundation and practical application are closely related to key concepts such as "collective intelligence", "citizen science", and "risk communication". These frameworks have become well-established within disaster governance and risk management research, particularly in Western contexts, where they provide the cognitive and analytical underpinnings for understanding participatory resilience. This observation aligns with the findings of Mahajan et al, who similarly reviewed the participatory resilience theory and practice. Despite the richness of the literature, the analysis revealed conceptual gaps regarding 'how' individual behavior is structured over time. While "engagement" is often referenced, few models disaggregate the motivational and emotional stages that mediate action.

To reflect the theoretical evolution in China, a parallel bibliometric analysis was conducted on the CNKI database, focusing on CSSCI articles from 2010 to 2024. The search terms included combinations of "participatory resilience" OR "resilience engagement" OR "public participation" OR "risk governance". Due the limited quantities, only the clusters are identified by LSI model, presenting in Table 2. Preliminary findings suggest that the Chinese literature heavily emphasizes on "Collective mobilization" and "emergency response coordination", as well as "Digital tools for participation", e.g., Health Code, WeChat public services.

Table 2. LSI Cluster Keywords of CNKI database.

Cluster ID	Thematic Focus	LSI Cluster Keywords
0	Urban Resilience	Resilience; NetLogo software; stable strategies; outdoor sports; multi-agent modeling
1	Organizational Resilience	Organizational resilience; institutional resilience; technology; institutions; technological resilience
2	Urban Empowerment and Risk	Urban resilience; empowerment; community resilience; risk
3	Rural Revitalization	Rural revitalization; community participation; international experience; smart cities; risk
4	Community Governance	Community governance; influencing factors; resident participation; "five-fold linkage"; risk society
5	Community Resilience	Social governance; community resilience; people-centered politics; Chinese modernization; farmers' cooperation
6	Public Participation	Public participation; urban resilience; sustainability; e-governance; plant configuration

Cluster ID	Thematic Focus	LSI Cluster Keywords
7	Emergency Mechanisms	Rural governance; emergency mechanisms; governance; Xiong'an New Area; resilience assessment

The outcome reveals a strong focus on optimizing governance structures and enhancing community self-organizing capacity. Yet research directly using "participatory resilience" as a keyword is relatively limited. Instead, research focuses on topics such as "community participation," "public participation," and "social mobilization," exploring pathways for the public to play an active role in resilience systems. Overall, current research on participatory resilience is mainly concentrated in the field of "urban community resilience" construction, which shows that in the localization process, participatory resilience is regarded as a mechanism to mobilize public participation through policy guidance and social norms, rather than relying solely on individual spontaneous actions.

At the same time, existing research focuses more on short-term mobilization in emergency management scenarios, and pays less attention to how to embed participatory resilience into daily community governance and cultural construction to cultivate endogenous resilience capabilities [59]. From the perspective of a risk society, participatory resilience should be a dynamic process that runs through the entire cycle of risk governance and reshapes social collaboration and trust networks, rather than being limited to the disaster response stage [60-62]. Empirical evidence demonstrates that technological tools such as smart city platforms and risk perception tools, can significantly promote residents' participation in urban resilience planning. These tools help raise disaster awareness, strengthen social equity consciousness, and facilitate the transformation of knowledge into action [63,64]. However, existing approaches often conceptualize participation as a static outcome rather than a dynamic process. This highlights the need for a more nuanced behavioral model-one that views participation as a multi-stage journey influenced by institutional structures, emotional engagement, and iterative learning The five-stage behavioral model of participatory resilience proposed in this study aims to fill this critical gap.

3.2. Theoretical Model Construction

Building on insights from the bibliometric analyses, this study proceeded to develop a conceptual framework grounded in interdisciplinary theory. Its central contribution is the formulation of a behavioral transformation model of participatory resilience, which synthesizes and extends established behavior theories while drawing from the fields of participatory governance, collaborative planning, and disaster psychology. A key reference point is the model by, which outlines a sequential pathway from hazard awareness to action-encompassing risk perception, cost-benefit analysis, intention formation, and behavioral execution-under the influence of personal, social and environmental factors. While their model offered provides important insights into individual disaster preparedness, it serves here as a foundation for rethinking participatory resilience through a behavioral lens, particularly in contexts shaped by evolving institutional and sociocultural dynamics.

The five-stage behavioral pathway model of participatory resilience adapted from Tekeli-Yes il [64].

However, to adapt this model for the sociocultural and institutional context of China, a number of refinements are necessary. Specifically, Chinese disaster governance is shaped by a unique combination of collectivist cultural norms, strong state-led governance, and the centrality of relational ethics [65-67]. Within this environment, individual behavior is not solely driven by rational calculation but is deeply influenced by emotional and normative cues. Participation is often not a solitary or autonomous act, but one rooted in moral obligation, social signaling, and communal cohesion [68]. For

instance, patriotic narratives in social media and emotional storytelling on platforms like Weibo can rapidly galvanize collective action [69-71]. Accordingly, this revised model embeds emotional and motivational mechanisms not as secondary, but as central components of participatory resilience. The stage details are as follows.

Cognitive Activation. This initial stage refers to the process through which individuals encounter and internalize risk-related information. This stage plays a key role in shaping how people understand their place in resilience efforts and whether they are likely to participate. Two basic steps are involved: first, whether people can access information about the risk; and second, whether they can understand and use it. These steps are closely tied to ideas from social cognitive theory of observational learning, which highlights how people learn from their environment, and self-efficacy, which refers to their confidence in taking action [72].

In practice, many people face barriers in both areas. Disaster information often comes from centralized authorities or mainstream media, which may overlook people with language barriers, limited education, or restricted digital access [73]. Furthermore, the content is often filled with technical jargon, lacking everyday relevance or localized examples. This makes it especially difficult for older adults and marginalized groups to interpret the information meaningfully [74]. Another challenge is that most disaster knowledge is framed from a science or engineering perspective, with little connection to daily life experiences. As a result, individuals may recognize a risk in theory but struggle to see its relevance or know how to respond. This disconnects between information and personal action will limit early awareness and delay motivation.

Emotional Resonance. Emotional engagement plays a crucial role in helping individuals move from abstract awareness of risk to a genuine sense of personal relevance and shared concern. It contributes to the development of emotional capital and fosters a sense of collective identity. After individuals acquire basic risk knowledge, a critical shift must occur-they need to emotionally recognize that the risk is real and meaningful to their own lives. However, current risk communication often struggles to trigger this emotional response. A major reason is the dominance of technical rationality in early warning systems. For example, during the Zhengzhou "7.20" rainstorm in 2021, although multiple government departments issued timely warnings, the official messages were overly formal, lacked actionable guidance, and failed to provide emotional reassurance [75]. As a result, many people did not respond effectively to the warnings. Another challenge is the overuse of general disaster narratives, which can lead to information fatigue and reduce public engagement [76-79]. Repeated exposure to emotionally flat or repetitive warnings may cause people to become numb or dismissive. In contrast, studies show that personal stories and emotional expression are far more effective at capturing public attention. For example, it was founded that during earthquakes, Weibo posts featuring direct emotional expressions and personal experiences not only drew higher public engagement but also provided valuable feedback to help guide government decisions [80].

Evaluative Judgment. Once individuals have developed an emotional connection to risk, they begin to assess whether taking action is worthwhile. This stage involves evaluating the effectiveness of possible actions, their own ability to carry them out, and the potential costs or obstacles. The three components, response efficacy, self-efficacy, and response cost will influence whether someone is willing to invest time, effort, or resources in disaster preparedness [81]. Research by Han Ziqiang has shown that many Chinese people hesitate to take preventive measures due to reasons like limited knowledge, unclear steps, and the perceived high cost of action. These doubts are especially common among low-income individuals, those without stable employment, and marginalized communities, who often feel that disaster preparedness is either not their responsibility or beyond their capability [82]. This gap between awareness and action suggests that, even when people understand the risk, they may not take steps to prepare unless they clearly see the value and feasibility of doing so.

Motivational Development. At this stage, individuals begin to form a clear intention to act, but this intention is shaped not just by personal thinking, but also by social norms and shared meaning. In the context of disaster preparedness, motivation grows when people feel that their actions are valued by their community and when they see themselves as part of a collective effort. This sense of identity and belonging plays a crucial role in turning intention into action [83]. However, current risk communication often does not go far enough. While many campaigns successfully provide information and trigger emotional reactions, they frequently lack strategies to strengthen personal responsibility or foster long-term engagement. Another issue is the lack of role models. People rarely see examples of others around them actively participating in disaster prevention. Without seeing "others doing it", it becomes hard for individuals to believe that their own participation matters.

Behavioral Transformation. This final stage represents the point at which individuals turn their awareness, emotions, and motivation into concrete risk-reducing actions. In the context of participatory resilience, this is the most visible sign of personal resilience and the point where individual behavior feeds back into the broader system. A common challenge lies in institutional and infrastructural limitations [84]. Studies show that people often hesitate after receiving early warnings-not because they lack awareness, but because there are no clear evacuation instructions, no accessible supply channels, or no nearby emergency shelters [85]. These gaps often caused by weak infrastructure or unclear policies. Another major issue is the absence of feedback and social reinforcement. When people take action but don't receive support, recognition, or even acknowledgment, their motivation tends to decline. For behavioral change to last, it must be supported by ongoing communication, visible impact, and social validation. This ensures that individuals not only act once but remain engaged in building and sustaining resilience within their communities [86].

This five-stage model of participatory resilience builds upon existing behavioral frameworks by placing greater emphasis on emotional engagement, identifying motivational development as a distinct and necessary phase, and incorporating feedback loops to reflect the dynamic and recursive nature of resilience. It illustrates how individual cognitive and emotional responses unfold within specific institutional, social, and communicative environments [87]. Grounded in the Chinese governance context, the model captures how participation is both facilitated and shaped by state-led structures, collective norms, and public discourse. While tailored to China, the framework offers broader relevance for understanding how individuals develop and sustain resilience across diverse disaster settings [88].

3.3. Comparative and Contextual Insights

Understanding how individuals move from awareness to action requires careful attention to the design of governance systems, specifically, how they support, shape, or constrain behavior at each stage. Drawing on the five-stage behavioral pathway model proposed in this study, this section offers a comparative perspective, examining how various international practices engage with each phase of the process. The analysis highlights key contextual differences and provides insights for enhancing participatory resilience through more responsive and adaptive governance strategies.

International resilience frameworks now increasingly emphasize localized and user-friendly communication strategies to improve public engagement in disaster preparedness. For example, the FEMA "Ready" campaign in U.S. offers checklists and neighborhood-specific hazard scenarios to enhance risk information communication [89]. These messages are simplified, visual, and framed around local realities, that make people feel the risk information more relevant and accessible. Several studies point out that China's risk communication tends to relay on a more standardized, technocratic approach [90]. Although such systems ensure broad coverage, interviews following Zhengzhou

"7·20" torrential rain revealed that many residents experienced difficulty interpreting warning levels and connecting alerts to actionable behavior [91]. These differences underscore the importance of bridging the gap between information delivery and public understanding through improved contextual framing and cognitive modeling [92].

The second stage focus on helping people internalize risks as something real and urgent. In Japan, disaster education in schools goes beyond drills. It includes storytelling, survivor interviews, and community memorials activities, which help students form emotional connections to past events [93]. These engagements create a long-term emotional connection to historical disasters, cultivating both empathy and preparedness. In China, emotional response mechanisms have also played a visible role, particularly during the COVID-19 pandemic, when public behavior was significantly influenced by social media use [94]. This highlights the role of emotional resonance as a critical catalyst for influencing individual behavior change within the Chinese context.

The third stage refers to how individuals assess the feasibility and utility of participating in risk reduction. Globally, participatory models increasingly support such evaluations by involving citizens in planning processes. In several European cities under Horizon 2020's nature-based solution programs, residents participated in co-designing flood mitigation infrastructure, which enabled them to weigh alternatives and understand trade-offs [95]. These participatory efforts also strengthened individuals perceived self-efficacy and trust in institutions. In China, although programs like "Sponge Cities" also applied advanced infrastructure to manage floods, yet decisions are mainly led by experts [96]. Thus, strengthening the connection between public input and decision-making outcomes in depth could enhance individuals' sense of contribution and encourage more sustained participation over time.

The fourth stage, motivational development, requires the conversion of evaluation into intention, supported by internal belief and social norms. This stage is often strengthened through identity-based engagement. For instance, youth climate networks in Southeast Asia, youth climate groups have built strong peer networks, using social media to promote environmental action as a shared identity [97]. Such motivation is not solely cognitive but deeply rooted in belonging and meaning. In China, moments of crisis have demonstrated the potential for civic motivation-particularly when citizens spontaneously organize through platforms such as TikTok or WeChat. These bottom-up mobilizations show the public's willingness to act, especially under urgent conditions. To build on this momentum, further efforts could focus on integrating such civic initiatives into formal emergency frameworks and reinforcing them through recognition, feedback, and sustained engagement. Doing so would help transition short-term action into lasting participatory behavior.

Finally, behavioral transformation entails not only the implementation of risk-reducing behavior but also the feedback mechanisms that support habit formation and learning. In the U.S., programs like the Community Emergency Response Team (CERT) offers a model of ongoing public engagement through simulation exercises, certification, and role assignment. Participants develop a sustained identity as preparedness actors and often become civic multipliers within their networks. In China, promising efforts are emerging through pilot projects in cities such as Tianjin and Wuhan, which have explored community-based approaches to resilience planning. To strengthen these initiatives, future programs might focus on expanding their reach, enhancing peer-to-peer learning, and building structured feedback loops. Recognizing and tracking individual contributions alongside providing institutional support could help turn sporadic participation into long-term behavioral commitment, thereby building social resilience.

In summary, the comparative analysis reinforces the relevance of the proposed five-stage behavioral framework and highlights key areas for strengthening participatory resilience in the Chinese context. Bridging the gap between awareness and action will require more than just improved access to information-it also calls for thoughtful emotional engagement, supportive motivational structures, and adaptable institutional

mechanisms. Participation should be understood not simply as a reaction to risk, but as a continuous process of identity formation, trust-building, and behavior reinforcement. This analytical lens on participatory resilience offers a meaningful extension of micro-level social resilience theory, deepening our understanding of how individuals, communities, and institutions interact to build adaptive and responsive governance in the face of disaster.

4. Discussion

This study proposed a five-stage behavioral pathway model of participatory resilience to better understand how individuals transition from risk awareness to action within the Chinese governance context. Through a combination of bibliometric analysis, theoretical synthesis, and contextual adaptation, the research identified emotional resonance and motivational development as critical yet underexplored stages in existing frameworks. The model emphasizes that individual behavior is not merely shaped by cognitive factors, but also deeply influenced by emotional engagement, social norms, and institutional environments. Comparative insights revealed that while international frameworks increasingly integrate these elements, Chinese disaster governance systems tend to prioritize technical communication, often overlooking the psychological and social processes that sustain long-term participation. The proposed model, therefore, offers both a conceptual refinement and a practical roadmap for enhancing public engagement in risk governance.

The framework draws on established behavior models such as PMT and the ToPB, but adapts them to account for context-specific drivers, particularly in non-Western governance settings like China. In this study, emotional resonance is identified as a central turning point between awareness and action-an aspect often overlooked as ICT-focused research has become mainstream with the rise of social media. Our review of Chinese and international practices shows that while many systems have robust technical infrastructures for early warning and information dissemination, they often fail to translate this awareness into sustained behavior. The five-stage model identifies specific gap such as the lack of participatory narratives, weak motivational support, and absent feedback loops, that hinder the long-term development of civic resilience. These findings align with global insights on the importance of integrating psychological, social, and cultural factors into disaster governance.

Importantly, this conceptual model contributes to the micro-level of social resilience theory by highlighting how individuals, as situated agents, construct resilience not only through knowledge and action, but also through emotion, belonging, and institutional interaction. Similar to how citation theory has evolved from normative to multi-dimensional models incorporating social, rhetorical, and strategic motives, our model suggests that participatory resilience must also be understood as a layered construct, where each stage carries distinct values.

Additionally, the conceptual framework proposed here provides a structured foundation for future empirical research. Much like how community resilience studies began with the infrastructure redesign into cultural cultivation, studies on participatory resilience should move beyond measuring participation rates and instead examine how and why individuals move through each behavioral stage. Questions worth exploring include: What kinds of emotional content are most effective in triggering action in different cultural settings? How do institutional structures support or suppress motivation? What role does peer behavior or community leadership play in reinforcing individuals resilience behavior?

In summary, this study provides a theoretically grounded, context-sensitive model of participatory resilience that links individual behavior to broader systems of governance. The model serves both as a diagnostic tool to identify behavioral bottlenecks and as a design tool to craft targeted interventions. Future research, ideally drawing on qualitative

and behavioral data, can test, refine, and extend the model across different risk settings and sociopolitical environments.

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