



# Disaster-Resistant Community: An examination of developmental differences

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## Abstract

Flood disaster-resistant community projects, which are viewed as a non-infrastructure disaster management strategy, have been implemented to encourage residents to participate in community-based disaster management programs in Taiwan. Although this strategy provides many benefits in principle, there is no agreement on what it develops, and its practice varies. In this paper, first, the concept of a disaster-resistant community is refined, building two definitional dimensions: resources and consensus-based emergency management. Based on these dimensions, the current development of a disaster-resistant community is introduced and distinguished from other categories: passive dependency, resource utilization, proactive preparedness, and comprehensive integrated plan. The main characteristics of each category are provided. The model of a disaster-resistant community enables community practitioners and public managers to assess their relative perspectives to bottom-up emergency management approaches, and the model provides considerable information to stakeholders. The disaster-resistant community matrix can notify ongoing theory building and practical experimentation to fill the current literature gap, refine the indicators of emergency management practice, and provide suggestions for voluntary participation in the community-based emergency management process.

**Keywords** Collaboration · Community resilience · Citizen participation · Coproduction

## 1 Introduction

In recent decades, voluntary manpower and organizations have notably tended to participate in the emergency management process, and community-based approaches have been emphasized in emergency management (Geis 2000; Karanci and Askit 2000; Ray 2017). There is a growing popular agreement that bottom-up participation in emergency management is generally more efficient and responsive than government participation, and the government should guide or at least support bottom-up participation (Maskrey 2011;

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Maghelal et al. 2017); in addition, citizens and neighborhood groups should actively commit to disaster-resistant community projects (McEntire and Myers 2004; Flint and Luloff 2005).

Because they supplement or complement the limitation of the organizational capacity of local governments, voluntary groups are believed to be crucial partners in emergency management tasks directed by governments. Neighborhood voluntary groups play crucial roles and functions in emergency management; the effectiveness of regional emergency management is enhanced given that these group members have local knowledge, regional network building, and resources (Miyaguchi et al. 2009; Tag-Eldeen 2017).

In addition to developing community-based emergency management strategies, local governments have made efforts to make communities more resilient (Kusumasari and Alam 2012). Disaster-resistant community projects have emerged as a steadily popular non-infrastructure disaster management strategy, especially at the community level (Patterson et al. 2010). In a disaster-resistant community, residents are encouraged to voluntarily participate in community-based disaster risk management programs and events (Geis 2000; Maskrey 2011).

A disaster-resistant community has many potential advantages, and some studies have explored the roles and functions of voluntary neighborhood groups and associations involved in emergency management (Allen 2006; Brudney and Gazley 2009; Chen and Graddy 2010). In addition, different types of communities adopt various approaches for effective emergency management. However, in the literature, no description of the typology and main characteristics of disaster-resistant communities has been provided (McEntire and Myers 2004; Chen et al. 2006; Chou and Wu 2014). Exploring the typology and characteristics of these communities is important because emergency managers should be aware of differences among and advantages of all communities to provide support and enhance community resilience strategically. In this paper, the following two questions will be answered:

- (1) What is the progress of voluntary community groups in emergency management after implementing the disaster-resistant community program in Taiwan?
- (2) What are the main characteristics of and differences in these types of disaster-resistant communities?

To answer these two questions in this study, the community emergency management practice was examined. Specifically, the various types of disaster-resistant communities were examined, and the outcomes of current community practices were further evaluated.

## 2 Literature

Participation of voluntary groups and manpower in the emergency management process is viewed as an intermediate outcome that can assist in disaster relief, enhance emergency response capacity, and build community resilience when the input of community participation is in accordance with the expectations of public officials (Brudney and Gazley 2009; Wu and Chang 2018). Some studies have asserted that voluntary participation is viewed as a critical input to effective emergency management because communities would gain resources and assistance to supplement and complement their disadvantages (Patterson et al. 2010).

Active voluntary groups and manpower in the emergency management process are helpful in building the bottom-up model of a disaster-resistant community, which can in turn strengthen community values, reduce uncertainty during a disaster, offer more flexible emergency response approaches to local public managers, and stimulate organized citizen groups in the emergency response process (Miyaguchi et al. 2009; Wu et al. 2015). Because community-based participation would assist in the delivery of public services, and these participants would share their expertise and resources with other participants of disaster events (Geis 2000; Jang and Wang 2009), emergency plans and initiatives with active voluntary participation can not only reduce disaster losses and the probability of potential risks but also provide coproduction service delivery to the required people (Stevens et al. 2010; Ray 2017).

Many studies on voluntary participation in emergency management have mainly focused on the roles of community organizations in the emergency management process and have examined factors affecting the mobilization of resources in the emergency management process as well as the setting up of a predisaster plan for potential risks (Simo and Bies 2007; Brudney and Gazley 2009; Patterson et al. 2010; Wu et al. 2016). Some studies have paid more attention to the functions of community organizations in emergency service delivery (Tambo et al. 2017) as well as the capacity building of collaboration emergency management (Kapucu 2008). The literature provides insights into the main function of voluntary community associations or neighborhood groups in the emergency management process: enhancement of the effectiveness of emergency management of governments (Stevens et al. 2010; Ray 2017).

Studies have asserted that to achieve effective community organization involvement, emergency planners from local governments should attempt to not only integrate citizens in disaster management plans and community development but also create strategies to motivate citizens' involvement in disaster preparedness (Simo and Bies 2007; McLennan 2018). Communities actively participate in disaster response tasks and protect themselves from potential risks because of the built-in methods of citizen participation in the emergency management process and the participation of energetic local community organizations (Pearce 2003; Perry and Lindell 2003; Stevens et al. 2010).

Unprepared communities may have limited response capacity for emergency events because they lack comprehensive and cohesive management approaches to emergency situations. In this sense, many researchers have stressed on conducting voluntary and proactive community preparedness projects to enhance the effectiveness of emergency management (McEntire and Myer 2004; Kaltenbrunner and Reichel 2018). Case studies have examined the experiences and development of disaster-resistant communities after adopting related community-based disaster risk management projects (Chou and Wu 2014; McLennan 2018). However, although there is a consensus on the advantage of voluntary participation in disaster-resistant communities, there is little agreement on differences among various disaster-resistant community models and their main characteristics.

### 3 Background of Taiwan disaster-resistant community development

A disaster-resistant community can help build “strong regional resilience” through the development of social capital and effective emergency preparedness (Witt 1997; Tadele and Manyena 2009). Community organizations with resources for emergency events can supplement and complement emergency management performed by public

organizations by sharing resources that public organizations do not have (Kusumasari and Alam 2012). Development of this “capacity,” in turn, lays a platform for local collaborative actions for hazards or disaster events (Patterson et al. 2010; Nohrstedt 2016).

Although scholars have emphasized the concept of community-based emergency management, its significance grew most rapidly in Taiwan since the occurrence of the 921 earthquake in 1999 when some professional organizations and public managers started to expend tremendous effort to encourage its adoption in villages. These efforts have yielded significant success, and any public officials and village residents are currently aware of this concept (Chen et al. 2006).

Because Taiwan is located in a high-frequency disaster area, local governments have gradually developed their own procedures of responding to unpredictable threats or disasters. After the 921 earthquake, which was a severe catastrophic event, the central government of Taiwan enacted disaster programs and regulations for ensuring national and regional enhancements in emergency management. This ambitious effort has not been limited to disaster events or environmental sustainable development. Therefore, community-based emergency programs have been launched at all levels of governments since the 2000s, with the fundamental assumption that if villages and community development associations become actively involved in the emergency management process, then disaster governance at the regional level would be more effective (Chou and Wu 2014; Wu et al. 2016).

Community development associations and village offices in Taiwan play a vital role in connecting governments with citizens. In addition to the coproduction of public services and service delivery, they are responsible for convening residents to discuss and solve community problems. It is dangerous when a community encounters a problem and residents communicate nothing. If residents do not “butt in” public affairs, community development associations and village offices would have to develop strategies to involve more citizens in the public governance process (Wu et al. 2015). The preparedness process of Taiwan Disaster-Resistant Community program includes the following main key steps:

- (1) Assessing hazards, vulnerability, and risks. Identifying the hazard, which can be natural, technological, civil, or biological or an affected area, and then evaluating the main characteristics of the hazard are important for residents and neighborhood associations because they can learn from the assessment of previous hazards to predict the future and make plans in advance.
- (2) Creating an emergency operation plan. An emergency operation plan guides the community in responding to disasters strategically and identifying the responsibility of each collaborative partner.
- (3) Developing a warning communication mechanism. The warning not only informs citizens about an impending disaster but also delivers key information on the impact of the disaster on the area they live in.
- (4) Identifying and acquiring resources and grants. Resources and grants are the main factors of organizational capacity, and community development associations and village offices should know what resources and budget they have and then mobilize them when responding to disasters.
- (5) Instituting mutual support agreements, which assist organizations from adjacent regions and regional voluntary groups to collaborate formally and legally.

- (6) Training. Training not only focuses on the training of key regional participants but also on the application of specific system usage of local governments to empower citizens in the emergency management process.
- (7) Exercising and educating the public. Exercising can strengthen the effectiveness of a network during the emergency process; the first aid response of participants should be examined, and citizens should be educated about how to prepare for and respond to disasters.

## 4 Framework

In this study, various approaches were adopted to determine the dimension of typology and the main characteristics of each type of disaster-resistant community. First, the literature was reviewed to find main dimensions for developing a disaster-resistant community framework. Practical experience and the literature were combined to assert that the two dimensions are prominent for defining a disaster-resistant community. Resource richness captures the rationale for organizing events and manpower, and its maintenance is the basis of community events (Paton and Johnston 2001; McEntire and Myers 2004), and consensus-based emergency management encompasses the value of collaborative principles (McGuire 2006; Kapucu 2008; Robinson and Gaddis 2012).

An expert meeting was conducted, and three emergency management scholars were involved for developing the dimensions and framework of typology. Then, two senior emergency officers of local governments who are in charge of disaster-resistant community projects provided suggestions and confirmed the final dimensions and framework of a disaster-resistant community model. Table 1 combines these dimensions to define disaster-resistant community types.

### 4.1 Resource

Collective action is designed to respond to complicated and risky environments in terms of organizational resources (Flint and Luloff 2005). A collaborative relationship is formed when organizations require critical and beneficial resources to solve problems (Chen and Graddy 2010). A single organization has limited capacity to solve problems or accomplish their objective; thus, organizations interact with other organizations to obtain external resources (Child and Rodrigues 2011). To solve problems and deliver services and goods, which require diverse resources and expertise, external assistance and resources from emergency expert groups that have different skills, expertise, and resources, are required. For example, when organizations solve problems or deliver services and goods, critical

**Table 1** Disaster-resistant community types

|          | Consensus-based emergency management |                               |
|----------|--------------------------------------|-------------------------------|
|          | Low                                  | High                          |
| Resource |                                      |                               |
| Low      | Passive dependency                   | Proactive preparedness        |
| High     | Resource utilization                 | Comprehensive integrated plan |

resources are required, such as expertise in a particular area, knowledge of local needs, access to service receivers, and cultural understanding (Tschirhart et al. 2009).

## 4.2 Consensus-based emergency management

From the integration perspective, a consensus among organizational members is clear and manifested as types of mutually consistent interpretation, and building an organization-wide consensus through shared values of organizational members would reduce the possibility of some conflicts (Robinson and Gaddis 2012). In addition, organizational members would have strong belongingness and high willingness to engage in collective actions. However, from the integration perspective, a dominant and wide consensus does not necessarily mean total unanimity throughout the organization. It may be understood that such a consensus is broadly shared by organizational members and those having a negative sentiment regarding the consensus do not form a strong group or force within the organization.

## 5 Data collection

On the basis of the framework developed in this study for disaster-resistant community types, nine public officials who are in charge of disaster-resistant community projects from nine local governments were interviewed to determine the main characteristics and operation of the four disaster-resistant community types, namely passive dependency, resource utilization, proactive preparedness, and comprehensive integrated planning.

We investigated 36 disaster-resistant community cases in Kaohsiung City, which is the most significant city when discussing disaster-resistant community issues. As the second largest metropolitan area with a high population and industrial density, technological hazards and severe environmental pollution are frequently encountered in Kaohsiung City. Disaster events such as floods, typhoons, and heavy rain increase disaster risks in Kaohsiung (Chen et al. 2006; Wu et al. 2016).

A total of 36 villages participated in a disaster-resistant community project, and we interviewed the main facilitators of the disaster-resistant community project, which included 36 village chiefs and 14 chairmen of the community development association, to describe the development and main characteristics of each disaster-resistant community. After examining the content of these interviews, we adopted the dimensions of resources and consensus-based emergency management to categorize these 36 cases into disaster-resistant community types. We found that 18, 6, 6, and 6 cases belonged to passive dependency, resource utilization, proactive preparedness, and comprehensive integrated planning types of disaster-resistant community, respectively.

## 6 Main types of disaster-resistant community

We developed four models of a disaster-resistant community based on the dimensions of resources and consensus-based emergency management. To examine the main characteristics and development status of each disaster-resistant community model, we performed a secondary analysis of interviews conducted with the community development association heads and village chiefs in all 36 cases of the disaster-resistant community project in Kaohsiung City. Then, using interview data, we organized these data and identified five main

indicators to describe the main characteristics of each model: resource source and use, emergency preparedness activities, voluntary participation, collaboration development, and main problems and challenges.

## 6.1 Passive dependency model

A total of 18 cases were categorized into the passive dependency model type. The passive dependency model has the characteristics of a high degree of social vulnerability, and its development is stimulated by the enforcement of laws, regulations, rules, and public programs. Some cases of this model type experienced a large-scale flood and since have improved environmental hazards by investing in public infrastructure projects, such as building a drainage system and detention pond. Because of these improvements, roads would not be severely flooded during torrential rain, and only some places may have small puddles. Because of the implementation of public infrastructure projects, the issue of puddle formation was solved soon, and most residents have benefited greatly from the hazard improvement through public infrastructure investment projects.

### 6.1.1 Resource source and use

Governments support these cases in disaster prevention education and training, and these cases have passively received disaster prevention support and resources from governments. Individuals and groups mainly have soft resources, such as community emergency response training and knowledge on emergency measures. However, residents and groups would like to have more hard resources, such as an enlarged embankment, a water system, and a detention basin project.

### 6.1.2 Emergency preparedness activities

Emergency preparedness activities are not held frequently and heavily rely upon support from the local government and teams led by scholars. Residents and neighborhood organizations are not active in organizing disaster plans. Emergency preparedness activities are not common in this model because citizen participation in the emergency management process is not active. Most of the time, the village chief or community development association head patrols the perimeter of the neighborhood when heavy rainfall is forecast or when typhoons are approaching. The standard operating procedure to prepare for and respond to disasters has not been developed, and residents are not familiar with evacuation methods and require additional resources and help.

### 6.1.3 Voluntary participation

Most individuals and groups do not care much about emergency preparedness and take little personal responsibility for participating in emergency training programs, helping their neighborhood, or improving community emergency preparedness. Residents are not willing to engage in the emergency management process because they have a low degree of risk awareness and less interest in emergency preparedness. In this model, more elderly people participate in regular neighborhood activities, and many residents believe that government's mission is to protect people from hazards and disasters by

solving possible problems that can cause risks and hazards. Residents' risk awareness and environmental proactive behaviors is significantly low.

#### 6.1.4 Collaboration development

Awareness of emergency management among residents and neighborhood groups is not high, and there is a significant gap in emergency management that limits collaboration development. The internal and external networks of a village are not active and strong. The lack of an emergency management plan impairs the collaborative possibility of community neighborhood associations. In addition, the disagreement of intro-organization affects the external connection negatively and limits the possibility of external collaboration. As a result, internal and external collaborations may have not occurred in this model.

#### 6.1.5 Main problems and challenges

Residents' disaster self-rescue ability and risk awareness are limited, which in turn result in a high degree of disaster social vulnerability. Application of government mandates and accomplishment of governmental goals are the priority of this model. This model implies formal institutional arrangements, which facilitate individuals' participation in community affairs. However, the participation status has a limited outcome because of limitations of resources and long-term participative willingness. In addition, community discretion is very limited, and bargaining and negotiation are not common in this model. The model is commonly used in those areas with high vulnerability and low resilience and heavily relies on support from district office. The interest of an individual community may be ignored, and some top-down emergency plans and programs do not fit the needs of community emergency practice. Significantly, some participants have restricted capacity to use their information, skills, strategies, and expertise as well as fail to benefit from other village residents.

### 6.2 Resource utilization model

Six cases among the 36 disaster-resistant community cases were categorized into this model type. Most of the cases in this model have not experienced large-scale floods, but they may have experienced middle- and small-scale floods as well as regional puddles after the occurrence of heavy rains. Resource application and use are the priority of this model. The model implies formal institutional arrangement for community resource support, mainly including financial aid, equipment, and infrastructure. Institutional arrangement provides organizations with more resources for emergency management. Institutional arrangement induces neighborhood groups and individuals to engage in the activities of disaster-resistant community programs because these organizations are qualified to gain financial support and resources from governments and businesses. Resource use induces organizations to reduce the transaction cost and uncertainty for annual event planning. Hence, for financial support, most organizations plan various annual events using these legal rules and norms.



### 6.2.1 Resource source and use

The legal requirement mandates opportunities to community groups for annual financial support and resource richness. Residents and community groups may be interested in a larger budget to increase organizational capacity and prestige or to have adequate resources to accomplish current organization's goals and conduct annual events. Some government agencies have gone as far as providing resources in the form of monetary assistance to encourage attendance from underprivileged community members. However, mandates for financial aid reduce fiscal issues among residents and community groups. To support community affairs and events, local governments and regional businesses offer land, equipment, budget, and training and other forms of technical assistance.

### 6.2.2 Emergency preparedness activities

The ambiguous goal in emergency management exists because feedback fund can be used for various events, and most of these goals are not related to emergency preparedness activities. Social capital is high in this model because residents and community groups can share information on neighborhood affairs in the network of social clubs or voluntary organizations. Individual actors still have sufficient discretion, resources, and autonomy to implement their plans within the mandates or guidelines from the donor. However, they are less willing to use them in disaster-resistant events.

### 6.2.3 Voluntary participation

Participation in social clubs or voluntary organizations enables residents to be concerned about their neighborhood affairs but not disaster issues, because emergency management may not be the priority of residents and local voluntary groups. Elderly people usually have free time to be involved in community events that are supported by current resource input. With a hectic lifestyle, many working people have little time to interact outside of work. Rarely, most residents have the time or energy to participate in community events, disaster preparedness workshops, or related disaster plans. Conducting more community activities without increasing residents' burden can reduce cynicism about the local government, thus providing some understanding of community development and the perceived value of this practice.

### 6.2.4 Collaboration development

Participation in voluntary organizations or social clubs allows people to interact with neighbors, which increases social capital in the community area. Activities attract volunteers' participation, but most activities are not held for emergency preparedness. However, scattered and unprepared voluntary organizations lack cohesiveness with emergency plans of government and find it difficult to suddenly form networks and gain resources in the emergency management process.

### 6.2.5 Main problems and challenges

Community development association heads and village chiefs are best prepared to address issues related to establishing an efficient pattern of resource allocation. Issues with these ideas arise; however, village chiefs can contest the idea that the financial aid is beneficial to them and the resources provide the village with important support to help the village chief's efforts in advertising, credit claiming, and position taking. Uneven interest group pressures and political favoritism may exist because narrow interest groups outnumber all other types of groups. Community development association heads or village chiefs are best equipped to address matters of unfairness related to the equitable distribution of financial aid and the maintenance of high participation with stable social capital. Significantly, resources used in disaster prevention are fewer, and non-scheduled drills affect resident's risk awareness and disaster prevention participation.

One of the common funding sources through which the government transmits funds to local groups is grants. Typically, grants are associated with government regulations or standards that the receiving community development associations or villages must meet. However, the increase in the dependency of a community on government funding is an issue of much contention. In addition, funding issues almost always create problems related to the equitable distribution of resources. Therefore, it is common to see groups lobbying village chiefs for special funding or elected officials helping each other secure funding for their respective districts.

### 6.3 Proactive preparedness model

A total of 6 cases were categorized into the proactive preparedness model type. A strong risk awareness influences residents' self-regulation of emergency management. Because of mutual interaction and the value of community safety, residents encourage each other to engage in community disaster programs and monitor each other's and their emergency preparedness. Disaster avoidance and relief are enhanced because residents and their neighbors have their "eyes on street's safety and risks." Residents take personal responsibility for the common problems of the community. They use the self-help approach as the first resort in case of a disaster and take care of themselves, neighborhoods, and community affairs. They conduct disaster drill events by themselves, and other people's motivation to engage in these disaster drill events is high.

#### 6.3.1 Resource source and use

This model indicates that a single community finds it difficult to have broad knowledge and resources and reduce uncertainty for handling problems and providing services and goods. If an organization is required to engage in disaster-resistant activities under limited resources, it will experience difficulties in meeting residents' demands. In many cases, to address problems and deliver services and goods that need diverse resources and expertise, seeking external assistance and resources from emergency expert groups that have different skills, expertise, and resources is required; this encourages the organization to plan resource allocation more effectively to serve the public.

Many organizations have developed strategies to seek resources and funds to maintain operation, and village chiefs are required to hold fund-raising campaigns for disaster activities.

### 6.3.2 Emergency preparedness activities

Emergency preparedness activities are prioritized and may include only one event that a village chief prefers to use the limited resources for. The numbers of community events that take place within villages may exert strain. For example, the event process may cost resources in terms of money and human resources. Although the issue of limited resources exists, voluntary disaster groups are organized by people who are willing to take collective action in their community disaster activities, such as solving community problems and delivering public goods and services to their community residents. There are different types of contributions from residents and neighborhood groups. Depending on the resources and capability of residents and groups, each of them contributes to disaster programs and activities or to valuable projects in some way.

### 6.3.3 Voluntary participation

As opposed to mere voting, resident participation in community emergency activities represents citizenship. Residents share information and resources about their neighborhood, which facilitates residents' participation in neighborhood issues. People form networks through relationships, and a set of shared assumptions guide action in organizations by defining appropriate behaviors for various situations. Voluntary network connection and risk awareness increase voluntary participation in emergency preparedness activities.

### 6.3.4 Collaboration development

This model has significant organizational culture and a high potential of collaboration development in the emergency management process. Organizational culture in emergency management is strong and shapes the basic patterns of assumptions that guide and influence the behaviors and decisions of residents and neighborhood groups. In this process, residents in a relationship can be encouraged to share their information and resources because of learning reciprocity and can achieve mutual benefits. The relational network shares particular norms and culture in terms of action or behavior, and residents and neighborhood groups are familiar with a particular behavioral pattern through repetitive interaction. Organizational culture in emergency management can facilitate collaboration among more neighboring groups in emergency preparedness activities.

### 6.3.5 Main problems and challenges

Because of limited resources for implementing a disaster-resistant community, village chiefs and community development association heads make considerable efforts for self-financing because funds are not gained annually; they play a critical role in coping with changes in diverse "subcultures" that clarify the specific goals of subgroups, including formal and informal types. Because each village consists of diverse groups with a distinct task that other groups cannot substitute for, village chiefs and community development association heads may accept the notion that subculture captures the specific pattern of each

group to interpret residents' behavior. In addition, limited disaster prevention equipment and resources affect community resilience and development.

## 6.4 Comprehensive integrated plan model

A total of six cases in the study were categorized into the comprehensive integrated plan model type. This is a bottom-up model of a disaster-resistant community with complementary relationships, shared values, planning, resources, training, and education. Voluntary individuals and organizations with committed altruists, high sense of societal meaningfulness, and societal commitment, make more in disaster preparedness and response. Voluntary individuals and organizations are helpful for public service delivery and coproduction in some disaster preparedness activities because they play a significant partner role as public service providers. Voluntary participants are included in a network that encourages or restricts collective action for public service delivery and for accomplishing the common goals of emergency management. The leadership of village chiefs is important for the social capital of communities, because these chiefs build and maintain trust within networks, participatory platforms, and communications, which in turn influences local residents to participate in community emergency plans and activities.

### 6.4.1 Resource source and use

This model includes well-organized emergency planning activities, including education, training, and resource management, which are necessary factors. In this model, there are multiple methods of receiving subsidies and resources, mainly including self-raising funds and top-down subsidies. Emergency planning is one of the core preparedness processes because it is a comprehensive and fundamental framework that includes the types of resources required and the processes that should be applied during emergency. Emergency planning includes resources needed to support and facilitate emergency management and training and education to prepare voluntary organizations to respond to emergency situations. Education and training help the public in recognizing how and what to do in an actual emergency situation, and resources allow actors to manage emergency effectively. In many cases, they do not need to hold fund-raising campaigns for disaster activities. Instead, governments can directly support community emergency activities through financial support and coproduction.

### 6.4.2 Emergency preparedness activities

Emergency preparedness and community social activities are integrated and maintained because they continuously emphasize the "critical consciousness" of residents regarding their responsibility to solve the common problems of communities. When voluntary citizens and groups acquire the knowledge required to conduct collective activities, for instance, that is the emergency management strategies of voluntary citizens and groups through experiences of the artefacts of the organizational culture that as a part of its daily work and each emergency activities. At the organization level, preparedness enhances the internal coordination of public agencies and increases the possibility of collaboration with nonprofits, adjacent governments, and citizens. In addition, mutual communication among various parties can be effective. The main goal of emergency preparedness activities is to reduce the problems of disaster response operation. In some cases, to generate

an atmosphere of risk awareness, village chiefs have built distinctive flags or pillars with slogans. Various stakeholders know who will participate in the emergency response process and understand their own responsibility during the emergency response stage. Neighborhood groups can identify their own resources to mobilize them during the emergency management process.

### 6.4.3 Voluntary participation

A sense of community, risk awareness, collective activities, and young volunteer participation are high. Voluntary organizations with training, education, and resources for emergency management enhance the development of the bottom-up model of a disaster-resistant community. In disaster-resistant programs, citizens come together as a “coproducer” or “partner” in emergency management to contribute their knowledge, skills, and energy toward the enhancement of disaster resilience and to develop a lasting risk awareness belief. The willingness of citizens to participate in emergency joint planning can build a community network toward collaborative emergency management. Because of they are familiar with the areas they live in, local residents can provide information and assistance to public officials and voluntary neighborhood organizations.

### 6.4.4 Collaboration development

Heterogeneous members can provide diverse information from different sources. However, iterative interaction with others gives rise to commonality between them because the accumulation of interactions results in the formation of a norm in a particular manner, leading to the sharing of information among members who frequently and regularly interact. Diverse organizations can have different objectives, rules, and skills for participation in emergency management; however, sharing common missions and understanding norms, culture, and jargon in planning would enhance the development of external adaptation and internal integration in this model. From the integration perspective, community development association heads and village chiefs should play a leading role in changing organizational culture to build a dominant and representative culture that guides members to reach shared goals. This model has a well-built collaborative platform, which makes internal contacts and external networks quite stable and strong, resulting in a wide consensus of organizational members with loyalty, commitment, and obedience. In turn, these core values of community disaster prevention contribute to building a consensus on the vision.

### 6.4.5 Main problems and challenges

The influence of relevant stakeholders on the participation process is dynamic. Resource allocation and use affect the relationship between stakeholders and participants, especially the relationship between the village office and community development association. The village office and community development association conduct various events strategically to maintain and continuously motivate comprehensive public participation. However, maintaining a balanced and positive relationship between the village office and community development association is the priority of this model. Community or voluntary groups may reallocate resources to other priority areas or simply deviate from the original intent of the legislation. Hence, the cost and effectiveness and performance of the disaster-resistant community project are significant issues. Concerns expressed by residents regarding the

performance of emergency projects might have an effect similar to that of a “fire alarm,” which should then prompt governments to investigate the issues of cost and effectiveness and performance of the disaster-resistant community project development.

## 7 Discussion

This study found that various types of disaster-resistant community models emerge after the implementation of disaster-resistant community programs. Table 2 shows the main characteristics of disaster-resistant community models. In this study, 18 of 36 cases belong to the passive dependency model type, and governments should apply strategies to empower these organizations in the cases and make them actively participate in the emergency management process. Furthermore, 6 of 36 cases belong to the resource utility model type, and governments may set up some rules or incentives to encourage the organizations in the cases to allocate more resources to emergency preparedness. Moreover, 6 of 36 cases belong to the proactive preparedness model type, and governments may examine the demands of each case and provide them appropriate support to increase residents’ participation in disaster-resistant community projects. Finally, for comprehensive integrated planning among disaster-resistant communities, government should help them reach sustainable development goals.

Through the analysis of interview data, we found that incentives, participation, resource richness, disaster education planning, expert groups, and community relationships are the main factors for the sustainable development of disaster-resistant communities. First, by offering different types of incentives, the government can secure the participation of community groups and residents in disaster policies. Inducements refer to “positive” financial rewards (i.e., fiscal instruments and grant incentives) that the government provides to participating community groups and residents in exchange for the implementation of a public-supported program or policy. However, the government can also use “negative” rewards to secure the compliance of community groups and residents through the use of sanctions and other regulations.

Participation in the community emergency management process is key and fulfills several purposes. First, voluntary participation in the process can enhance community resilience. Because the public participates in the process and provided their opinions, they would be more likely to follow plan’s prescriptions. Second, voluntary participation is a source of information for public agencies and may alert them to issues not previously considered. Because emergency managers are often disjointed from practice and are affected by rules, they may be aware of the latest trends or issues. Third, voluntary participation and comments of particular public agencies determine the degree of acceptance or support that an emergency plan will receive. For example, if the opposition is high, the public agency may consider altering its proposal to reduce resistance.

Resource richness should not create dependency of voluntary groups and residents. Official government support and neighborhood grants should focus on the most effective method to achieve the goal of community emergency management. In some cases, such public project support typically causes short-term interest and does not result in the development of community disaster resilience planning or a long-term development strategy.

Disaster education planning is necessary but totally insufficient to build disaster resilience and develop long-term and stable disaster-resistant communities (Allen 2006). Successful disaster planning must be complemented by voluntary community participation by

**Table 2** Types of disaster-resistant community

| Features/type                     | Passive dependency                                                                                                                                                                                                                 | Resource utilization                                                                                                                                                                                                                                                     | Proactive risk response                                                                                                                                                                                                                                                                | Comprehensive integrated plan                                                                                                                                                                                                                                            |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resource source and use           | Passively receive support and resources (only disaster education)                                                                                                                                                                  | Obtain directly neighborhood feedback fund (more hard resources and fewer soft resources)                                                                                                                                                                                | Develop strategies to seek resources and funds to maintain operation (more hardware and less software)                                                                                                                                                                                 | Multiple ways of receiving subsidies and resources (software and hardware)                                                                                                                                                                                               |
| Emergency preparedness activities | Low frequency and only regular neighborhood activities                                                                                                                                                                             | Neighborhood activities are prioritized and some occasional preparedness events                                                                                                                                                                                          | Emergency preparedness activities are prioritized and may include only one event                                                                                                                                                                                                       | Emergency preparedness and community social activities are integrated and maintained                                                                                                                                                                                     |
| Voluntary participation           | Regular neighborhood activities with more participation of elderly people                                                                                                                                                          | Activities attract volunteers to participate in activities not related to emergency preparedness                                                                                                                                                                         | Voluntary network connection and risk awareness increase voluntary participation                                                                                                                                                                                                       | Risk awareness, risk, and young volunteer participation are high                                                                                                                                                                                                         |
| Collaboration                     | Internal and external networks are not active                                                                                                                                                                                      | Activities increase community internal relationship                                                                                                                                                                                                                      | Integrate more neighboring groups to work together                                                                                                                                                                                                                                     | Internal connections and external networks are quite stable and strong                                                                                                                                                                                                   |
| Main challenges                   | <ol style="list-style-type: none"> <li>1. High social vulnerability;</li> <li>2. Heavily rely on support from district offices;</li> <li>3. Low degree of risk awareness, willingness, and frequency of bottom-up drill</li> </ol> | <ol style="list-style-type: none"> <li>1. Resource use for disaster prevention is low;</li> <li>2. Concern about if there is a positive connection between community groups and village office;</li> <li>3. Nonscheduled drills affect resident's willingness</li> </ol> | <ol style="list-style-type: none"> <li>1. Make significant effort in self-financing, and funds are not gained annually;</li> <li>2. Limited equipment and resources affect community resilience and development;</li> <li>3. Whether village head would continue to support</li> </ol> | <ol style="list-style-type: none"> <li>1. Balance the relationship among main stakeholders</li> <li>2. How to maintain and continuously motivate participants;</li> <li>3. Cost and effectiveness and performance of disaster-resistant community development</li> </ol> |

residents and regional groups and social actions undertaken by governments in conjunction with other stakeholders, such as nonprofit organizations, local businesses, and other community partners (Melo Zurita et al. 2015). To solve these aforementioned problems, diverse expertise and resources are required. Expert groups in emergency management and disaster preparedness are main catalysts for disaster-resistant community empowerment because they play a proactive role in providing emergency training, disaster education, and resources for local residents and may join in the planning process for the development of disaster-resistant communities.

Communication, mutual interactions, compromise, and cooperation with external parties are the main approaches. Community members still have sufficient discretion, resources, and autonomy for emergency preparedness within the plan or guideline from expert groups on emergency management and disaster preparedness. However, the relationship between communities and emergency expert groups is emerging. Disaster-resistant community development is temporally relevant because it compounds over time as new programs are enacted and other groups join those communities and may adopt other new approaches to disaster emergency management. When financial support or the empowerment project ends, expert groups leave those communities that they have assisted and let them self-develop. In some cases of the passive dependency model, communities that received assistance from expert groups may lose momentum to continually self-implement disaster preparedness plans and activities.

## 8 Conclusion

The government has used different methods to increase policy announcement and voluntary participation in the emergency management process, but limitations exist for each method, such as low participation willingness, time consuming, and difficulty in performance evaluation. Some public officials suggest that the methods institutionalize disaster education and training mechanisms and seldom lead to outcomes that are direct outgrowths of community participation efforts in emergency preparedness. Theory offers many normative guidance and prescriptions to lead the practice of a disaster-resistant community. However, in practice, governments conduct policy initiatives that have led to the growth of a “polycentric” policy system in the community emergency management process. Governments and public officials struggle with the implementation of disaster-resistant community programs because they do not clearly define the disaster-resistant community framework and strategically provide support to these various development types of disaster-resistant community.

Studies have provided a vast quantity of normative prescriptions concerning voluntary manpower and groups in the emergency management process. However, public managers struggle with emergency activities and report unsatisfactory outcomes. The literature shows many development cases of disaster-resistant communities but does not reveal the whole picture of these communities. This study defined the framework of disaster-resistant communities based on the disaster management experience in Taiwan.

The development of a disaster-resistant community is cumulative (Perry and Lindell 2003; Maskrey 2011; Marshall et al. 2016). This does not mean that the disaster-resistant community is always moving toward a more perfect future, but local residents and organizations are accumulating valuable experience that can be used to address hazards and risks. However, disaster governance still has resource concern and various leaderships, whether based on socioeconomic status, resource capacity, or the power of the political machine.



In addition, different areas and building styles may use different models to develop community emergency management plans. To develop a disaster-resistant community, there is no single method and no single solution. Rather, in some cases, various approaches should be integrated to enhance communities' disaster resistance. In some cases of rural disaster communities, immediate loss of life from a disaster is growing more slowly or even declining over time, indicating the successful implementation of regional emergency management measures.

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