How to establish a disaster-resilient ageing community based on local eld Institutions in Taiwan?

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Abstract

While ageing population in Taiwan surged to 11.5% in 2014, ageing in place emerging concept in public health policy, which proposes a community-based ca increasing ageing population. Among all the issues regarding population ageing, from natural disasters would be the most challenging. Meanwhile, local elderly w with relatively sufficient storage, professional nursing/medical care services be able to sustain better self-support status during and after disaster. Ac experience in Taiwan, rescue force usually could not reach most rural area very occurring due to the disconnected communication and destructed routes. Local el could act as shelters for community residents. In recent years, there have been given to capability of disaster resilience for elderly welfare institutions disaster management. Discussion regarding how institution resilient capacity co in the community is still lacking.

The aim of this paper is to explore how well communities could respond to disas integrating the existing elderly welfare institutions. This paper would divide first part is the analysis of the spatial distribution of elderly welfare in disaster potential area in Taiwan. And the second part will define the role of about institution for community, and identify the disaster-resistant level for di institutions. Finally, it would feedback to overall institutions in community f policy at local level. The framework is expected to propose a community-level and enhance disaster carrying capacity.

1.! Introduction

1.1.! Research background

1.1.1.! Long-term care challenges for the ageing in Taiwan

In Taiwan, the population above 65 years of age reached the standard of an ageir and the proportion was over 11.5% in 2014, which surpassed the benchmark of an which is 7%. It is estimated that the proportion will go up to 14% in 2017 an society. After one-decade, Taiwan will become a super-aged society. Meanwhile make younger population decrease and dependency ratio surge. The demographic ch not only in the age structure but also in the size of households. Only half of long-term care live with their children, yet the size of households continues to shrir elderly by families has declined due to the lack of caregivers among family mer care, however, is not affordable for most families. ("White paper of population

Compared to the complete network available for evacuation and disaster reductio people in rural areas face more threats and difficulties regarding the disaster process. Since young people leave their hometowns, this also increases both t

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elderly living alone and their vulnerability to a disaster. So, the establishme
is necessary at the local level.

1.1.2. Ageing in place

A common issue of ageing is the lack of adequate and affordable health care in t
people live, as they are no longer able to live in their own homes. World Healt
guide for global age-friendly cities, based on the concept of active ageing. I
friendly city should adjust the structure of urban spaces to make services
environment more available for the elderly to meet their needs.

One of the principles of an age-friendly city is to offer community-based su
services, which are important for maintaining the health and independence of old pe
community. On the other hand, the community should be responsible for emerger
including older people s needs and capacities in preparing for and responding to

Shih (1999) proposed that long-term care should transform from care in the com
by the community , and finally to care with the community. Wu and Chuang
mentioned that the goal for a long-term care policy in 21st Century Taiwan shou
local services that connect resources in the community to establish a long-term
on the community. This kind of long-term care follows the ageing in place
enhances the cost-effectiveness of the service. At the same time, the key role
gradually transfers from the home to the community.

1.1.3.! Long-term care model in Taiwan

The long-term care model in Taiwan can be divided into three parts, and each
provide different kinds of services to meet the needs of the elderly. It shoul
based services, community-based services, and home-based services. Home-based
incompetent elders get continuing care, and caregivers will provide services at
Community-based services are aimed at enhancing the willingness of family car
advance the independence of the elders in the community, which provides services
the elderly. These kinds of services help the elderly to stay in their familia
accept different professional services at the same time. Finally, institution-
care for the elderly in daily life and with whole-day medical assistance.

In recent years, the local government tried to promote community care services.
term Governance, from 2013 to 2016, there were subsidies for nutritious catering
services, and various other welfare activities for the elderly.

In the Senior Citizens Welfare Act, Article 19 clearly states that institution-
integrate with family-based and community-based services, and give support to i
community-based services. It shows that long-term care in Taiwan has been dev
community-based care to fulfill the spirits of aging in place, so elderly wel
addition to the original work of these institutions, should take up the crucial
for the elders of a community.

Table1. Comparison of institution-base services, community-base services, and ho

Category	Institution-based	Community-based serv	Home-based ser
Attrib	To provide al services to the eld the instit	To provide serv specific place in the community	To provide services
Content	1. Residence servi 2. Medical service.	1. Health care servi 2. Medical service.	1. Medical service. 2. Recovery service.

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	3. Recovery service. 4. Livelihood service. 5. Food service. 6. Emergency care service. 7. Social life service. 8. Parent education service. 9. Day-care service.	3. Recovery service. 4. Aids service. 5. Psychological consultation service. 6. Day-care service. 7. Food service. 8. Family support service. 9. Education service. 10. Legal service. 11. Transportation service. 12. Retirement preparation service. 13. Recreation service. 14. Information supply and transfer service.	3. Body care. 4. Housekeeping service. 5. Visit-care service. 6. Phone-care service. 7. Food service. 8. Emergency care service. 9. Household cleaning service.

1.1.4.! The need for community-oriented long term care facilities

The focus of long-term care for elderly people has gradually shifted from instit
communities, and the institutions have become part of the professional caregive
based services. At the same time, institutions can make use of resources in
provide informal assistance to residents inside institutions, so community-bas
people is regarded as a concept of self and mutual assistance (Chen, 2009). Lai
an institution as more than just a place separated from the outside with a hi
should integrate with the community actively and remain in a good relationship
of the community. On the other hand, community-based care is a welfare provic
from nation to community, so he defined the community-based cares of an i
localization, decentralization, and service based.

Localization is to provide long-term care, varied according to local characteris
that long-term care is not a fixed and inflexible mechanism to apply everywher
long-term care providers shifting from central government to local governmer
decentralization. Deinstitutionalization aims to support elderly people receivi
the community where they live, so all the cares correspond to a miniaturizati
community.

While institution-based services tend to integrate with community-base care, the
welfare institutions has been given more attention. Chuang (2008) mentioned tha
offer a variety of community-based care, such as home-based care and day care; c
residents in a community take advantage of the facilities in institutions to ac
functions. Furthermore, institutions could act as emergency shelters because
living facilities. For instance, there is safety management in kitchens and bat
medical care providers. In addition to providing care to the elderly, elderly
have become shelters for the elderly and residents in the community when d
Institutions can supply their storage of food and water, and they are a compa
sleep (Dosa et al., 2008). Disaster mitigation gradually is incorporated into o
community-based services that elderly welfare institutions offer. Laditka et al.
preparedness of elderly welfare institutions after the Katrina Hurricane, and i
plans for disaster prevention and protection at the community level excluded
Likewise, institutions were not aware of existing health care resources, so vul
the face of a disaster.

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Above all, the role of elderly welfare institutions, which provide services onl
institutions, transformed into an important core of the community elderly care
outreaching professional medical and multiple care such as emergency care and disaster
prevention services to community, the network of long-term care becomes more access
available to the elderly.

1.1.5.! Ageing society & disaster vulnerability

With the ageing population quickly growing, there is more attention given to t
people belonging to a high vulnerability group (Cohen & Ahearn, 1980; Tierney &
Fernandez et al. (2002) stated that the vulnerability of the elderly includes
mobility of the elderly decreases due to the degeneration of physical function o
of health. Compared to healthy people, the speed of the elderly to respond to
slower. Another aspect focused on the alertness of the elderly to escape a di
sensory functions of the elderly decline, they are not able to respond to disast
elderly people the loss of social capital, social networks, and socio-economic s
capability to recover.

FEMA (2012) pointed out the evacuation capability of elderly people is much low
population, and mental traumas make them take longer time to recovery when di
Therefore, the elderly suffer higher vulnerabilities from different physical
conditions. In the case of an increased proportion of elderly in a populatio
resilience to disasters and reducing their losses from a disaster have become
Corresponding to the specific needs of disaster response, The Disaster Preventio
Plan (2013) regards the elderly as a disadvantaged group, so they are a prio
assistance after a disaster. The Ministry of Interior, the Ministry of Health a
governments should promote preparedness for disadvantaged groups, offering hos
social welfare institutions, and other places to shelter the elderly.

Taking into consideration the different health conditions of elderly people, the st
change according to differing levels of vulnerability. The National Disaster Pre
Center (NCDR) (2008) categorized the elderly into four groups according to di
conditions.

(1) The elderly rely on institution-based care:
Because people in this group live in elderly welfare institutions, the preparedn
disaster focuses on the safety of the physical environment of an institution, th
protection and prevention, plans for disaster management, the delivery of ev
support among regional institutions, and disaster insurance.

(2) Incompetent elderly receiving community-based care:
People in this group need assistance regardless of mitigation, preparedness, and
disaster. Consequently, it is necessary to plan shelters with professional car
aids, and to provide relative medical facilities for the elderly of specific dem

(3) The elderly capable of looking after themselves receiving community-based ca
The strategy focuses on education about disasters, so people in this group
knowledge of self-protection in the face of a disaster, and strengthen their ab
who live alone or are incapable of movement by themselves in a disaster.

(4) Others:
Offer recovery planning about economics and housing reconstruction assistance to

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1.2.! Research Objectives

The vulnerability of elderly people in the face of a disaster differs accordin
and need for caregivers, and the differences are worthy of more discussion, specific
enhancement of resiliency to a disaster.

Hence, our research scope covers the review of different types of elderly welf
the situation that extends from the services of elderly welfare institutions to
identifying the role of existing elderly welfare institutions in response to d
provide some suggestions to the entire institution-based service system.

Objective 1: Enhancement of the function of elderly welfare institutions: Disaster response
! Objective 2: Identification of elderly welfare institutions in disaster pron
! Objective 3:Suggestions about disaster management to various kinds of elderl institutions

2.! Conceptual framework

2.1.! The role of elderly welfare institutions based on ageing in place

According to the population projection of WHO World Health Organization , th
incompetent elders will grow four times from 2000 by 2050. And The average
elderly people in Taiwan will become 30% then. There will be plenty of demand
care, including home-based care, community-based care, and medical institution
"Global Age-friendly Cities: A Guide", it was mentioned that health and suppor
community are a very important part of maintaining active ageing. Through sup
available and multiple services, a long-term care network based on community can

AARP (American Association of Retired Persons) echoed the concept of ageing in
and they advocated for the establishment of a liveable community. The community
the spirit of active ageing. The principles of a liveable community includ
connectivity between community and health facilities, supporting home-based or c
related services, and relative health-based resources to improve the health of
community.

Ageing is a continuous process, and the concept of active ageing can only slow
ageing. When ageing reaches a certain level, elderly people still have to rely
services, which can provide 24-hour medical care and professional nursing. In
Welfare Act Article 19 mentions The institution-base service shall be formed as a combin
home-based and community-based services, and shall support home-based or comm
service, which expect elderly welfare institutions can be the main providers o
and home-based services and contribute to elderly people s active ageing in th
from this act amended from 2014 to now, elderly welfare institutions are not af
the community-based care (Shih, 2013) and there is still a long way to develop
from elderly welfare institutions in the network of long-term care in Taiwan.

2.2.! Strengthening the relief role of elderly welfare institution by red of at-risk communities

According to Establishment Standards of Senior Citizens Welfare Institutions,
service can be divided into domiciliary care institutions and long-term care ins
Domiciliary care institutions provide seniors who can take care of themselves fo
life but without any relative with legal support obligation living. The average

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residents in domiciliary care institutions are better than those in other types medical device is relatively simple. On the other hand, long-term care instit characteristics of residents and can be classified into three categories:

! Nursing: services for incompetent elderly people who are unable to take care elderly people in need of nursing services such as a nasogastric tube or cathe

! Long-term care: services to elderly people with long-term chronic diseases w nursing services 24 hours a day.

! Caring for senior citizens with dementia: services to senior citizens who ar middle degree dementia, are capable of moving by themselves, but are in need services.

Long-term care institutions and nursing institutions should possess the foll support 24 hour care: dormitories, bathing and hygiene facilities, and kitch heating, storing and freezing. In comparison to domiciliary care institutions, l care institutions lack capabilities and the average health condition is worse. nursing records, pharmaceuticals, storage of medical equipment, and adequate emergency rescue, long-term care institutions possess nursing stations equipped room, service stand, and treatment trolley. These medical facilities meet each demands. In the face of disaster, long-term care facilities have more complete consequently, this type of institution-based service has the potential to provid the elderly in a community.

Similarly, the arrangement of caregiver corresponds to different types of instit below presents the comparison. Due to better health, the elderly in domicilia need fewer caregivers than the elderly in long-term care institutions. The dens of personnel between the three categories of long-term care institutions from respectively, from caring for dementia senior citizens with dementia, long-term nursing. In other words, the order of dependency on care giving is that caring with dementia is the highest one, and long-term care is higher than nursing. Th based services in Taiwan will be sorted by the arrangement of personnel and med this paper: institutions for senior citizens with dementia are on the highest l followed by long-term care institutions, nursing institutions, and finally institutions.

Table 2. Comparison of caregiver ratio (caregiver to residents) and medical

		Domiciliary care institutions	Long-term care institutions		
			Nursing	Long-term care	Caring dementia senior citizens
The arrangement of personnel	Nursing personnel	At least 1 staff 1/20		1/15	1/20
	Social worker	1 /80	1 /100	1 /100	1 /100
	Caregivers	Day care:1 Night care:1/3	Day care: Night care:1/	Day care: Night care:/1	Day care: Night care:1/15
Medical faci		A. Nursing records B. Storage of medical	A. Nursing records B. Storage of medical equipment and pharmaceuti C. Adequate equipments for emergency rescue D. Nursing equipments preparatory room, service		

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	equipment pharmaceutical C. Adequate equipments for emergency rescue	stand and treatme		
Level of medicaf	Lowes	Lowe	Higher	Highest

2.3.! The role of disaster prevention according to the type of the instit

According to the abilities of taking care of oneself in daily life and the strength institutions provide, the capabilities of disaster protection for institution- divided into 4 levels. From high to low, the level of disaster protection is citizens with dementia, long-term care, nursing care, and domiciliary care. When institution are more incompetent, the institution should possess more medica example, regarding self-relief, long-term care institutions that provide care t dementia are much more vulnerable in the face of disaster due to the health elderly people in the institution. When disaster strikes, elderly people in th cannot rely on their own strength to escape, so the density of caregivers shoul limits for selection of the location of the institution should be stricter. On the othe care institutions providing care to senior citizens with dementia should be at disaster protection due to high resiliency and coexistence with disaster.

Table 3. The analysis of disaster protection in types of institutions

	Domiciliary institutions	Long-term care institutions		
		Nursir	Long-term c	Caring dementia senior citizens
Medica Resources	Lowes	Lowe	Highe	Highes
Caregivers	Lowes	Lowe	Higher	Highest
Level of dir protection	Lowes	Lowe	Higher	Highest

2.4.! Challenges elderly welfare institution faced when provide relief se disaster prevention

The relevant norms about the establishment of elderly welfare institutions foc conditions of the building, including the differences among the health conditio the arrangement of caregivers and medical facility. However, these norms stil regarding the influence of disaster prevention. In addition, the Establishment Citizens Welfare Institutions only refers to the requirements of facilities re residents inside the institution, but not to regulations corresponding to disast

Regarding local disaster prevention, the Disaster Prevention and Protection A Regional Plan of Disaster Prevention and Protection should be conducted by the c and township (town, city) level. Furthermore, township authority is responsib community disaster prevention and protection affairs. In addition, for disadvantaged government should provide the necessary assistance at the stage of prevention, protection at the stage of response.

Although the elderly are regarded centrally in the Disaster Prevention and Prot still a lack of further discussion about the elderly with different needs in dis

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Regarding the lack of regulations about the location of an institution, ins
anywhere in a community. As such, there are increasing challenges in response t
institution. Lee (2013) discussed the problems institutions meet in the proces
event-oriented method. Many institutions located in rural areas with properties
lack medical resources because cost is the first consideration. Although rural
the formal relief network is incomplete in response to a disaster. In additio
evacuation and the facilities for disaster protection should be taken into t
disaster management of institutions. Benson (2002) generalized the factors of e
CDC s records. The factors included how long institutions spend on evacuati
institutions prepare for disaster mitigation, whether the arrangement of manp
whether the storage of water and food is enough, the complex demands for medicin
plenty of difficulties institutions will meet in the process of long-distance
prevention of disaster tends to seek for a local shelter. In this paper, the
elderly welfare institutions will develop on the basis of self-rescue, and then
assistance of residents in communities.

3.! Methodology

3.1. Scope of the study

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In order to identify the role institutions should play in disaster prevention a
this paper uses the village as a spatial unit of analysis, which corresponds to

3.2.! Secondary database collection

Because the spatial units in this paper are village administrative units, the
digital maps will be based on villages. The main sources for data are from t
information" of the Ministry of the Interior Department, in 2013, and digital m
Ministry of Transportation and Communications. These contain "Taiwan county
administrative boundaries" and "Taiwan village boundaries." "The position of slo
from 2008 to 2013 ", "inundation potential map of rainfall up to 600mm in one
"distribution of fault map" are from National Disaster Prevention and Rescue Cen

3.3.! Overlay analysis of Geographic Information System (GIS)

Through the overlay analysis of potential disaster areas and the distribution
institutions, the institutions in high-risk communities can be pointed out. Aft
roles of these institutions face in a disaster according to the type of service
can be used as basic data for the establishment of the community disaster prevention
future.

4.! Issue discussion and preliminary GIS analysis results

4.1.! Preliminary issue of identification and analysis

4.1.1.! Issues I: The distribution of medical care resources in Taiwan do
demand of the elderly population in the face of a disaster. When dis
elderly in hazard-prone communities are highly vulnerable, and they
immediate services of medical resources.

! Analysis:
The distribution of large medical institutions corresponding to the villages
that major medical resources are located unevenly and cannot assist every village.
hand, comparing the distribution of large medical institutions with are out o

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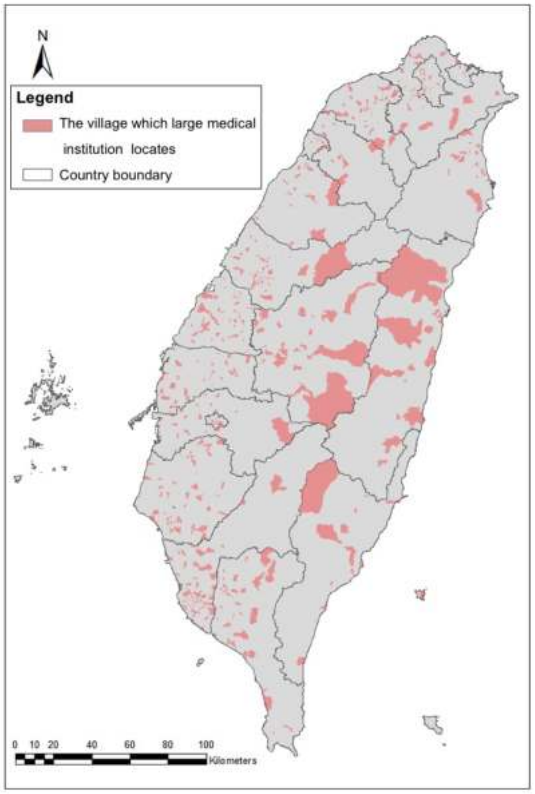
of large medical institutions. As a result, medical resources cannot handle
ageing trend, and the communities elderly people live in are unable to provi
continuous medical services. The elders are incapable of receiving med
immediately, so several problems for ageing in place emerge. In addition, whe
a hazard, those villages cannot get timely medical care.

A community with a high proportion of elderly people contains not only high v
also low accessibility to medical resources. Under this uneven distribut
institutions, communities should seek other local resources with medical and



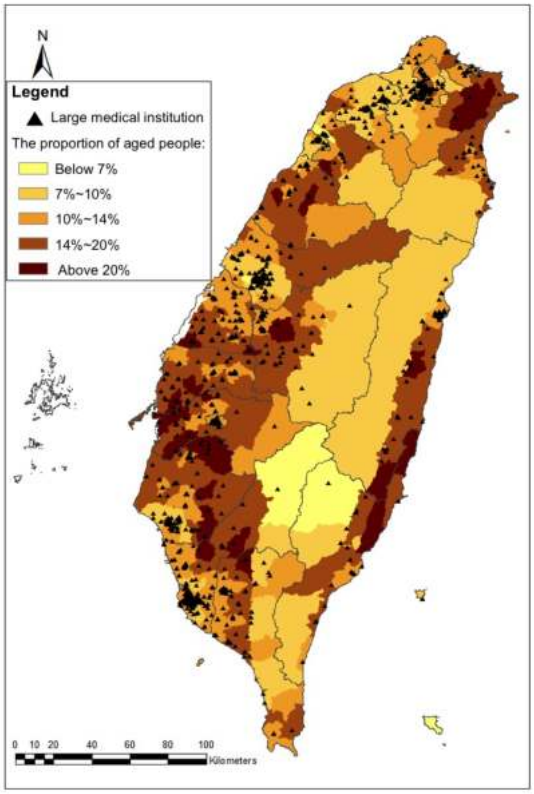


Figure 1. The distribution of large medical institution corresponding to the village

Figure 2. The distribution of large medica
institution with the degree of aging villa

4.1.2.! Issue II: When located in a high-risk environment, elderly welfar
Taiwan should play a more important role based on ageing in place.

! Analysis:
Dilley (2005) estimated countries most exposed to multiple hazards in a
Publication: Natural Disaster Hotspots A Global Risk Analysis. In Taiwan,
area and population are exposed to three and more hazards, and 99% of the
population have suffered from two and more hazards. Taiwan is the riskiest co
hazards in the world.

As the disaster potential area of distribution shows below, almost all of Tai
landslide disaster risk map, earthquake disaster risk map, and inundation
rainfall up to 600mm in one day. Through an overlaying analysis of the t
disasters, four communities are located in multi-disaster potential areas, in
community in Kaohsiung City, the Renhe and Dongshan communities in Nantou Co
the Shuangfeng community in New Taipei City. For high-risk areas exposed to disas

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important to improve their capabilities of responding to a disaster. When co
problem of not having external assistance in addition to local hospitals, lo
institutions with medical resources and professional caregivers can provide r
the community. The function of elderly welfare institutions in a community
than long-term care, and they should be upgraded to provide relief and med
services in the face of a disaster.

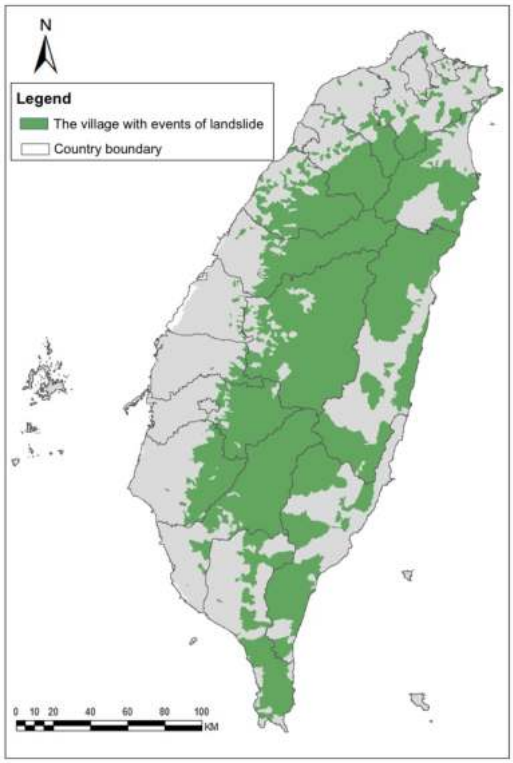

Figure 3. Landslide disaster risk map

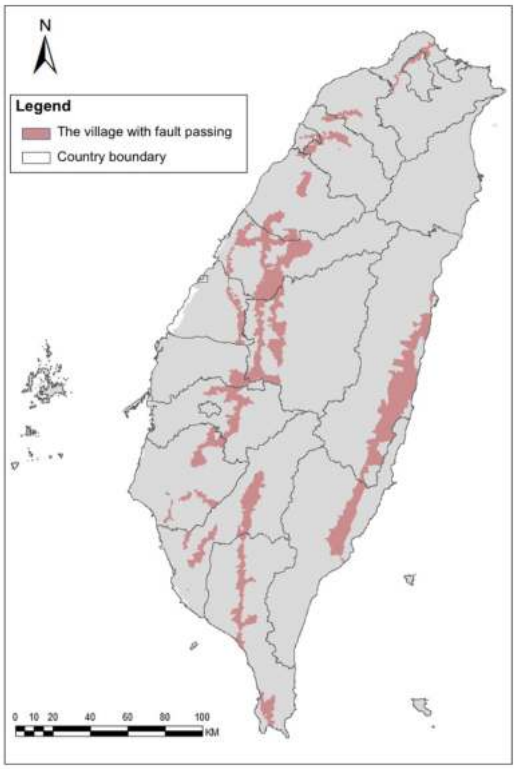

Figure 4. Earthquake disaster

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Figure 5. Inundation potential map of rainfall up to 600mm in one day

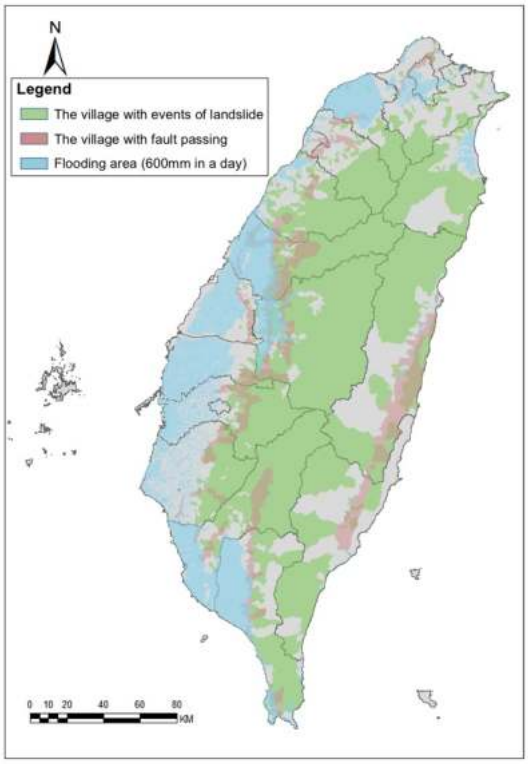

Figure 6. Multiple disaster risk map

4.1.3. Issue III: Review of elderly welfare institutions: elderly welfare institutions should avoid selecting a potential disaster area as a location.

- Analysis:

In order to implement the spirit of the land of ageing, the role of elderly welfare institutions in the community contains community-based care services and medical services. Therefore, they are in an important position to provide services to the elderly, and they should strengthen their response to disasters and enhance resiliency.

Besides the interior facilities discussed earlier, the location of elderly welfare institutions is also the risks in disasters. Therefore, the following analysis will focus on the distribution of facilities prone to slope disasters, earthquakes disasters, and flood disasters to understand the higher level of vulnerability of these elderly welfare institutions.

Table 4. The analysis of disaster distribution in types of institutions

		Disaster type			
		Fault distribution	Slope disasters	Flood disaster	Multiple disaster
Domiciliary care institution		1		2	0
Long-term care institutions	Nursing	48	38	185	6
	Long-term care	13	5	41	0
	Care for dementia senior citizens	0	0	2	0

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Tota	62	45	230	6

Finally, after a comprehensive analysis of the three disasters corresponding
community, it turns out that there are 304 institutions located in potential di
accounting for 29.50 % of the total number of elderly welfare institutions
nearly 30 % of elderly welfare institutions suffer from damage in the face of
the residents in the institutions belong to disadvantaged groups, so the vuln
gets higher. Thus, elderly welfare institutions should have more stringent s
the selection of a location.

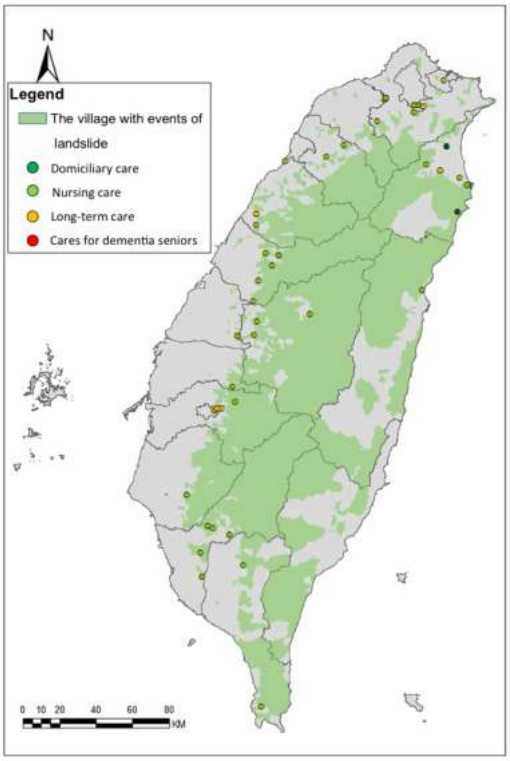

Figure 7. The distribution of institution and landslide disaster risk ma

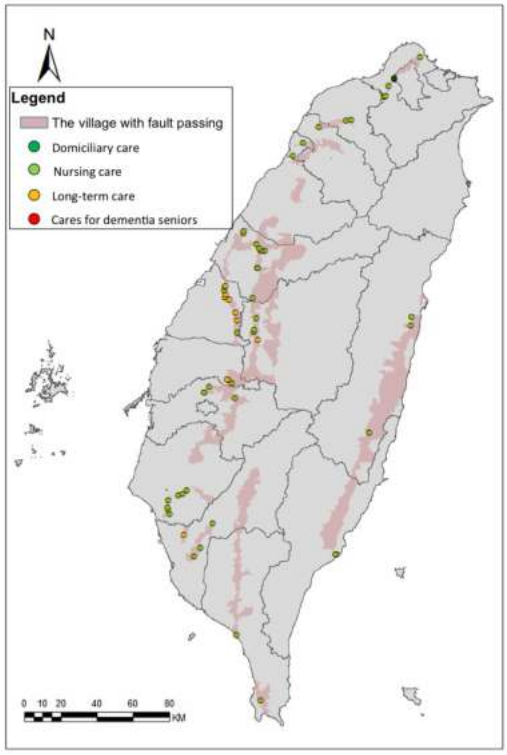

Figure 8. The distribution of institution earthquake disaster risk m

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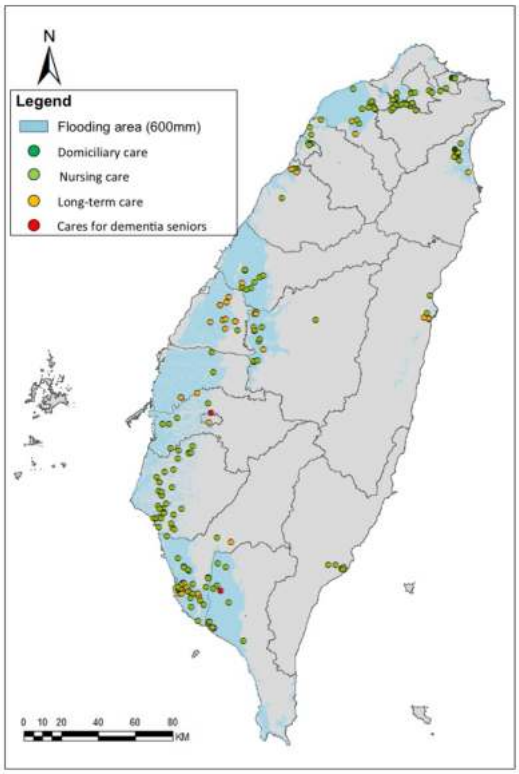

Figure 9. The distribution of institution and inundation potential map of rainfall up to 600mm in one day

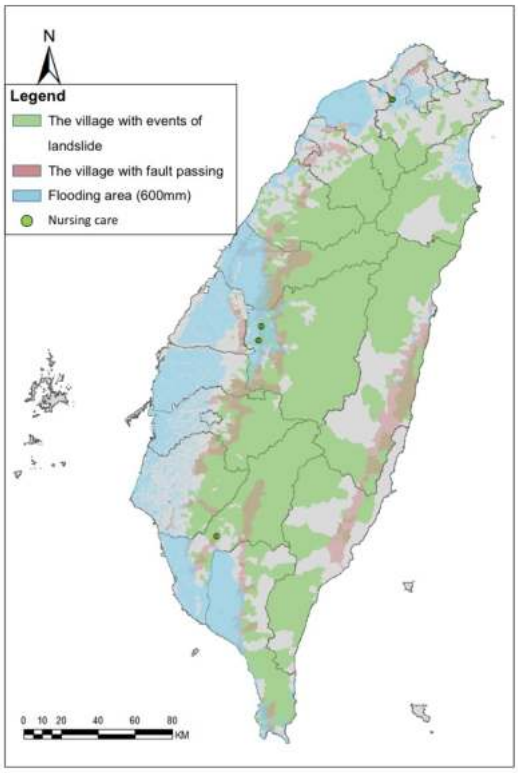

Figure 10. The distribution of institution and multiple disaster risk map

4.2.! Discussions

Overall, the enhancement of the function of elderly welfare institutions can su
medical resources. In addition, to strengthen the function of disaster preventi
about the selection for a location is as follows:

4.2.1.! Location Guidance of elderly welfare institution

First of all, the location being selected should not be in a potential disaste
into consideration its feasibility as a shelter for the community. The authorit
should propose limitations and regulations for location selection in order to r
vulnerability of an institution.

4.2.2.! The equipment for the mitigation of disaster in existing elderly

Regarding the distribution of existing elderly welfare institutions,
institutions are not in disaster potential areas. In other words, nea
institutions might suffer damage in the event of a disaster. While the ex
the institutions cannot prevent a hazard from striking, the institutions
structure of building and obtain equipment for the mitigation of disast
gates and ramps to improve disaster response.

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4.2.3.! Special designs of elderly welfare institutions in a disaster pot

Since community-oriented elderly welfare institutions will be set up in disaste
the future, those institutions should enhance the function of disaster mitigation
Urban Planning Law and Building Code and Regulations. The special designs inclu
relatively low damage prone area as the location, setting water gates, and the
above two floors, which allows residents in the institutions to evacuate to the

4.2.4.! Multi-services of elderly welfare institutions

While the role of disaster response varies in different types of institutions, t
type institutions could increase the resiliency of the institution itself. For
institutions can adopt some elderly people able to take care of themselves,
education and relative training in response to disaster. When disaster strikes,
of the institution can help evacuate incompetent elderly people. Thus, the
institution does not completely rely on the staff, thereby increasing the ef
response.

5.! Conclusions

In this paper, the community-based services of elderly welfare institutions
regarding disaster mitigation in the aim of carrying out the spirit of ageing in
the facilities and caregiver allocations among the different categories of in
institution-based services can offer 24-hour care and medical assistance.
institutions in a community as the disaster mitigation core could provide outrea
pharmaceutical services and living facilities. This would reduce the vulnerabili
in the community. A neighbourhood elderly disaster shelter is particularly si
communities disconnected with outside. Community-based care can reduce the harm
environment in the face of disaster, instead of waiting for external rescue. On
community-based care network is built, it enhances the awareness of the residen
in coping with disaster while increasing the resilience of community. The resil
coexist with the disaster (Beatley, 1998) and implement the concept of resili
future, there will be a more in-depth discussion the cognitive role plays when f
a community within different kinds of institutions.

When responding to a disaster, institutions should be more open to the residents
and should strengthen the role of resistance to a disaster between institutions
resiliency of a community considers not only the old and spaces but also th
between individuals, institutions and community. In consequence, this paper ide
role institutions play in the face of disaster and proposed some suggestion
institutions use when policy making. On the whole, communities and institution
an intimate network of disaster response and mitigation under long-term car
enhances both of the resiliency of community and institutions at local level.

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