

Fuzhou University: Emergency Disaster Preparedness

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I. Introduction to Disasters in China and Fuzhou

The Fujian Province, with its lush and mountainous landscape, is susceptible to earthquakes, floods and subsequent landslides. The region faces two major challenges in emergency management: (1) natural disasters, or those caused by extreme weather in which no level of preparation could successfully stave off damage caused and (2) man-made disasters (Ming Zou, 2010). While the latter can be difficult to quantify, there are some indicators that can be used to determine what level of responsibility is shared by human error. The Fujian province relies on many reservoirs and dams; which, in tandem with the frequency of typhoons that unleash great amounts of water causing the reservoirs to swell beyond capacity, place the area at risk for flood-like events. Recently, a devastating landslide occurred in Taining County that took 35 lives. The region experienced 35% higher rainfall this year than is seasonally normal (BBC, 2016). Meteorological predictions suggest that such weather patterns are likely to continue increasing in coming years, characterizing such abnormal rainfall as typical. As a result, rivers, dams and reservoirs are likely to begin flooding beyond capacity with greater frequency and magnitude (Baoping Wen, 2004).

Given these developments, several agencies have taken steps to mitigate damage caused by major flooding and earthquakes. Further action is recommended to bolster community involvement and education. To this end the Chinese government “attaches great importance to disaster prevention, reduction, and relief, [which] is guided by the principle of people-centered, government-led, multi-level management, mutual support within social networks, and self-rescue of victims” (Ming Zou, 2010).

II. Research Orientation

The Fuzhou Lab visited three government locations during its time in the city: Fuzhou Municipal Public Service Center, Flood Control and Drought Relief Command Center, and the Fujian Earthquake Administration. In addition to visits to the government, students visited flood prone areas and discussed emergency management with current professors and students at Fuzhou University.

All site visits yielded a deeper insight into the robust technology utilized by each department in addition to the expansive and hierarchical chain of command that disseminates information and coordinates actions from the Central State government all the way to the village level. Although their communication and technological systems are robust, the officials at the Flood Command center identified the need for greater input from citizens on how effective their processes are and how they can improve. In addition to expanding their technology and systems to take into account individuals, it was evident that the Flood and Earthquake Center lacked third party evaluation of their procedures. From our brief time spent with these government agencies we developed the following research questions:

- How does the government of China organize its emergency management systems?
- How are citizens interfacing with emergency management systems? How can those relationships be improved?
- What technological tools are used by industry leaders in emergency management and response?

- Who are the vulnerable populations in China? How does the government reach and educate individuals, especially vulnerable populations?
- What are people's perceptions and knowledge of emergency management in Fuzhou?
- What are the best practice for evaluation and feedback?
- How can the Fuzhou University establish deeper connections with emergency management agencies?

III. China, Fuzhou, and Emergency Management

Governance Context

On August 30, 2007, China adopted its first comprehensive emergency management legislation (Emergency Response Law..., 2011). The passage of the *Emergency Response Law of the People's Republic of China* was a major milestone which streamlined emergency response on all levels of government (Bai, 2008). Before November 2007, when the new law took effect, there were 35 laws and 37 regulations governing emergency management (Bai, 2008). These laws were extremely limiting and inefficient because they could not be aggregated into one coherent response system.

The new legislation also initiated the development of emergency plans across all government entities: including nationally owned corporations (Bai, 2008). By March 2009, 51 emergency plans were created and instituted, which included 138 nationally owned corporations and all mining and chemical corporations (Bai, 2008). Before 2007, China was highly vulnerable to frequent natural disasters and faced significant loss of life due to a lack of unified emergency management organization and an incident management system (Bai, 2008). The system specifically lacked sufficient and well-trained first responders, which resulted in frequent military intervention for rescue, relief and security efforts (Bai, 2008).

The new law requires enhanced government intervention through short-term efforts that generate quick responses to hazardous situations. For instance, in 2008 China was struck with a catastrophic 7.9-magnitude earthquake in the Sichuan Province resulting in the death of about 70,000 people and 18,000 missing (Sichuan Earthquake, 2009). In an effort to provide fiscal relief for its citizens, the Chinese Ministry of Finance & State Administration of Taxation implemented post-disaster tax deductions and exemptions on income tax, house property tax, resource tax, stamp tax, urban land use tax, vehicle and vessel use tax, and import tax (Bai, 2008). The *Emergency Response Law of the People's Republic of China* Chapter IV, Article 51 was important for implementing this measure. It states that the State Council or relevant departments may take safeguard and controlling measures to guarantee basic necessities during an emergency disruption of the national economy (Emergency Response Law..., 2011).

The legislation also clarifies other emergency handling, and rescue/relief measures. Article 48 calls for the immediate organized response of relevant departments and emergency rescue teams when a disaster strikes. Article 49 specifies the necessary government responsibilities that need to be implemented after a natural disaster, calamitous accident or public health incident occurs. The following are key requirements the government mandates (Emergency Response Law..., 2011):

- Disperse and evacuate affected persons
- Provide and/or identify adequate shelter centers

- Keep source of danger under control (clearly mark and block danger zones)
- Conduct immediate “rush repairs” to critical infrastructure (transportation, communications, water supply, drainage, power supply, gas supply and heat supply)
- Prohibit or restrict use of similar facilities, or areas of harm which may lead to an increased scale of damage (protective measures)
- Access fiscal reserves and rescue/relief resources set aside for emergencies
- Guarantee essential resources (food, water, shelter, etc.)
- Punish those who disrupt public order by looting or interfering with emergency handling

One measure that aims to enhance cooperation amongst China’s local people’s governments is Article 52. This article requires unaffected local people’s governments to support affected governments with human, material or financial resources or technologies when requested (Emergency Response Law..., 2011). Article 53 requires government entities coordinating disaster relief to publish timely and accurate information on the emergency response. Article 54 prohibits these entities from publishing or disseminating false information. Article 55 empowers resident and village committees to lead publicity and mobilization efforts as well as organize self-rescues and maintain social order. Article 57, requires all citizens comply with all levels of government during and after a disaster.

Although China does not have a national emergency management agency such as the United States Federal Emergency Management Agency (US FEMA), the responsibility lies with many departments such as the Ministry of Civil Affairs (MCA), the State Administration of Work Safety (SAWS), the Ministry of Public Security (MPS), the Ministry of Health (MOH), and the National Civil Defense (NCD). The Emergency Management Office (EMO) is focused on coordinating an emergency response between these departments during natural disasters, technological accidents, public sanitation issues, social security concerns, and recovery and reconstruction activities (Bai, 2008). The National Disaster Reduction Center (NDRC) under MCA is a specialized organization that focuses on information services used during emergency response efforts. It collects and analyzes data, assesses disaster and emergency relief strategies and provides real-time updates by utilizing satellite technology (Bai, 2008).

The Chinese government currently utilizes the Chinese Emergency Management System which categorizes the severity of an incident (Bai, 2008). The system includes:

- Level 1: Extremely Serious Incident, over 30 fatalities, escalate to state council
- Level 2: Serious Incident, between 10-30 fatalities, escalate to province level
- Level 3: Major incident, 3-10 fatalities, escalate to city level
- Level 4: Small case, less than 3 fatalities, escalate to local level

In an effort to prevent the frequency and severity of a disaster, China has invested billions of yuans in reduction projects. For the purpose of this report, flood and earthquake reduction projects will be highlighted. The government has undertaken the following projects in order to reduce the negative effects of flooding (ReliefWeb Report, 2009):

- **Major River Flood Control:** Construction and renovation of dykes on the Yangtze River and the Yellow River. The Huaihe River has undergone 19 major

flood control projects. Water conservation efforts have also been a priority such as the Three Gorges on the Yangtze River, Xiaolangdi on the Yellow River and Linhuaigang on the Huaihe River.

- **2008 Seepage Prevention & Reinforcement for Unsafe Reservoirs:** Requires renovations of large and medium reservoirs threatened by floods to be completed within three years. In 2008, 4,035 seepage prevention and reservoir reinforcement projects were completed totalling 65% of the 6,240 target.
- **Water & Soil Erosion Control:** In 2008, key water and soil erosion control projects covered a total area of 260,000 square km. By the end of the year, 70% of erosion was controlled.
- **Highway Disaster Prevention:** In 2008, 1.54 billion yuan were invested to renovate road embankments, roadbeds, bridge structures and flood-proof and drainage facilities.

The following pre-disaster projects have been implemented to reduce the severity of destruction caused by earthquakes (ReliefWeb Report, 2009):

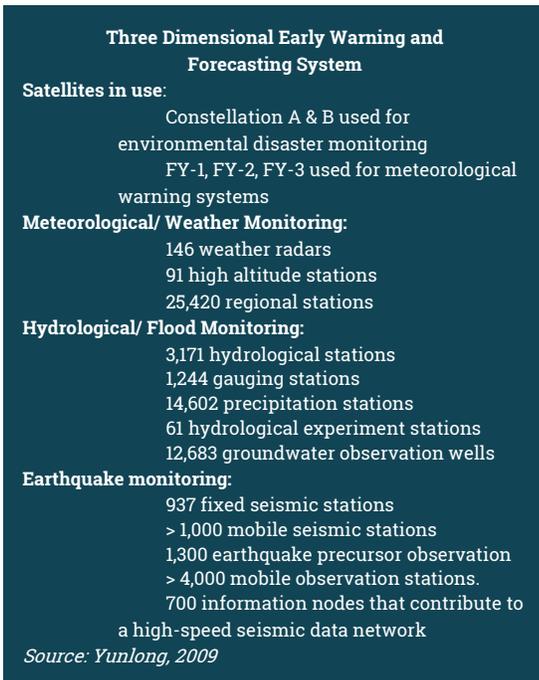
- **Construction of Earthquake-proof Buildings and Facilities:** Enhanced regulations and improved earthquake-proof evaluation management system for key construction projects. Implementing safety standards for houses in rural areas. Publishing the Zoning Map of China with seismological parameters that assist with land use.
- **Housing Renovation for Impoverished Rural Residents:** Technical guidance and quality control stressed on site selection, design and construction. Since 2005, 17,535 billion yuan has been invested nationwide (1,8051 million impoverished households or 6,4965 people).

In addition to its reduction projects, the Chinese government also values public outreach and international cooperation. The government emphasizes the beneficial role citizens play in disaster relief (ReliefWeb Report, 2009). It makes an effort to improve its social mobilization by utilizing both government and society to form a disaster relief culture. Psychological services are important for the Chinese government because it wants its citizens to enhance their confidence during disaster relief and reconstruction. Furthermore, the government supports the development of charities and foundations because they play a major role in disaster relief. It does this through a taxation system that encourages public donations. Volunteerism is also highly encouraged. In 2008, there was 430,000 community volunteer organizations, which totalled 100 million volunteers. This was an increase of 14.72 million from 2007 (ReliefWeb Report, 2009).

In an effort to educate its citizens, the Chinese government conducts various publicity and educational work for disaster prevention and reduction. The state participates in International Day for Natural Disaster Reduction and it utilizes special bulletin boards focusing on disaster reduction in public venues. Moreover, special programs and columns on newspapers, magazines, radio, television and the Internet are used to educate the public on appropriate actions to take during a flood and earthquake. Disaster prevention and reduction classes and exercises are also offered in elementary and secondary school (ReliefWeb Report, 2009).

On the international scene, the Chinese government actively participates in disaster prevention and relief programs and initiatives. For instance, in 2005 China hosted the first Asian Ministerial

Conference on Disaster Risk Reduction. As a result, the *Beijing Action Plan for Reducing Disaster Risks in Asia* was adopted. It helped establish a basis for further cooperation in emergency management between Asian countries (ReliefWeb Report, 2009).



Three Dimensional Approach to Utilizing Technology in China

Sensors throughout an area remain imperative for analyzing and collecting data before and during a disaster. They provide real-time geological and meteorological-based data to better inform the actions of emergency responders, and assist in preparing for the eminent disaster (Holdeman, 2017 & Mehrotra et. al., 2013). China utilizes a Three-dimensional Monitoring System which gathers relevant data before and during a disaster. Their main warning technology covers three areas: 1) ground monitoring, 2) ocean and ocean ground monitoring, and 3) space to ground monitoring. The government implements this three dimensional approach using small satellites and the technology outlined in Figure 1.1. As of 2010, these systems permitted 98.8% of all municipalities and 90.6% of all counties to be monitored throughout the region (Yuan, 2010).

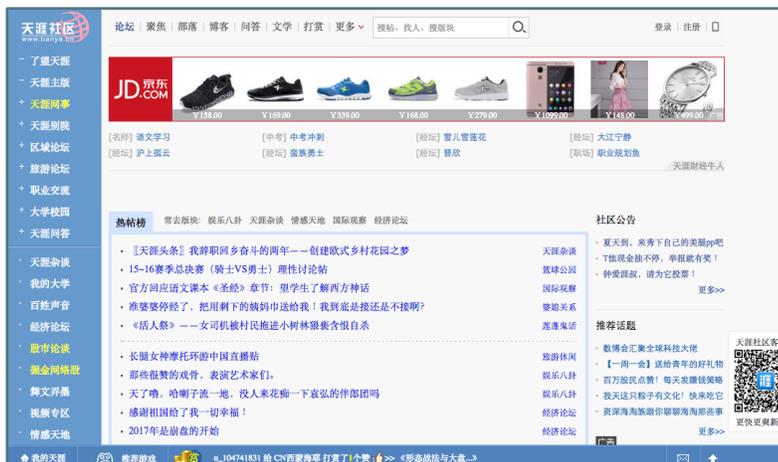
International Technological Cooperation

During a disaster access to accurate and timely information contributes to the resiliency of an area. As such, the Chinese government has taken measures on an international scale to have better flowing information between countries. They are part of the International Charter for Space and Major Disasters, which permits all members to share information gathered from different countries' satellites during a disaster to ensure the affected government has as much information as possible ("Technology to Manage", 2012). They also utilize information networks through the United Nations Platform for Space-based Information for Disaster Management (Zyke, 2013).

IV. Traditional and Modern Community Networks

Community Interaction

With a population of 318.9 million documented in 2014, the United States has a fraction of the total number of people living in China. In an individualist culture, such as that of the United States, special emphasis is placed on independence and self-reliance (Tyson Chung, 1999). While the American culture consists of many "intracultural variations" the pursuit of individual goals is a large part of many American's identity. China, conversely, has a rich history of collective action and an identity centered on the community. Particular emphasis is placed on ideology and social control, with a motivation for in-group success and accomplishments (Tyson Chung, 1999). As a result, emergency response and preparedness is tailored differently in each country.



In the United States emergency preparedness is geared towards tasks the individual can do for themselves and immediate family, independent of governmental assistance. While this type of outreach works for the American culture, it does not necessarily extend its success to collective societies.

In China, populations strongly depend on governmental guidance. This top-down model dictates to the Chinese citizens how they will proceed in the

event of an emergency. Strong reliance is placed on information disseminated and assistance from the government (Ming Zou, 2010). Between our team's research and site visits, we have acknowledged this strong sense of community among the Chinese, particularly those who are older or retired. Through our evaluations, it has been noted that this culture has a sense of belonging to a large group, characterized by interactions and social networks. The Fujian regional government is in an ideal place to harness community involvement in leveraging new avenues for community preparedness and disaster response.

A major obstacle in capitalizing on this collectivism is how one might capture various demographics realistically and effectively. While interactions through social media may prove effective for younger generations, outreach to elderly populations is not feasible and will likely require a more traditional approach (Deborah Cai, 1998).

Much of the urban Chinese elderly population congregate in large public spaces, increasing what is considered *social capital*. Such populations are brought together by shared interests and their direct proximity to one another. To China's advantage, this social capital and tendency to congregate in specific public areas serves a dual purpose both as recreational space and evacuation routes. Based on pilot interviews conducted by the team, the citizens here do seem have an idea of where to go when an emergency strikes but many lack a comprehensive understanding of how to respond *during* an emergency. Dissemination of information through leaders in these environments will be most effective.

Due to the unique nature of social capital in the urban elderly, we have identified key methods for reaching this target demographic.

- Identify key group leaders and teach them emergency preparedness and response.
- Host community events focused on disseminating information and education.
- Clearly outline evacuation centers and critical infrastructure.

Social Media Context

The power and reach of Chinese social media is significant. There are more than 513 million Chinese internet users, exceeding the population of the European Union nations (Gu, 2014). Though technology use is most commonly associated with younger generations, in actuality 88.81% of Chinese netizens over 19 years old are on Weibo, a popular social networking site in Asia (Gu, 2014). Additionally, 91% of Chinese survey respondents said that they visited social networking sites in the previous six months, compared to 30% in Japan, 67% in the U.S., and 70% in South Korea (Gu, 2014). This analysis investigates how the broad reach of social media in China has been leveraged for disaster response and management. Specifically, it discusses the genesis of the practice on Tianya, a message board, as well as the more recent use of Sina Weibo, a microblogging site akin to Twitter, and WeChat, a messaging app, in a sampling of disaster scenarios over the last five years.

Citizen Reporting and Two-Way Communication

Though these tools have primarily been a source of entertainment and social engagement, they have also been repeatedly and organically leveraged as mechanisms for citizen reporting during disaster scenarios. The most salient historical example of this phenomenon was the use of Tianya during the 2008 Sichuan earthquake (Qu et al, 2009). Measured at 8.0 M, the earthquake killed nearly 70,000 and produced even greater numbers of injured and homeless (Qu et al, 2009). With phone lines crippled, Tianya's 20 million registered users turned to the the message board for communication, information, and community support (Qu et al, 2009). Within one minute of the earthquake, the first message related to the event appeared on Tianya, long before it was covered by mass media (Qu et al, 2009). Notably, the forum also provided citizens the opportunity to engage in two-way communication with the government. For instance, when the government reported difficulty finding a place to land a rescue helicopter in a remote area of Sichuan, a Tianya user who grew up in the area posted detailed instructions on the forum and asked other users to help get the information to the government (Qu et al, 2009). The community rallied around the post and the message was forwarded thousands of times, ultimately resolving with the government contacting the original poster and successful landing the helicopter with her instructions (Qu et al, 2009).

In the last five years, Tianya has fallen out of favor as Chinese netizens shifted towards the microblogging site Sina Weibo and messaging app WeChat. Despite this shift, social media has remained an essential component of Chinese disaster management since the genesis of the practice during the 2008 Sichuan earthquake. Citizen reporting and two-way communication remain central characteristics, but the utility of social media in disaster scenarios has been further optimized thanks to deliberate and thoughtful engagement in the medium by the Chinese government.

Government Adoption

On November 10, 2012, the Chinese State Council opened an official Sina Weibo account, which attracted 240,000 followers within the first 48 hours (Zhang et al, 2016). Other Chinese agencies, including those specific to disaster preparedness and relief, soon followed suit. Through these official channels, government agencies can speak directly to broad cross-sections of their citizenry in one missive. For instance, in 2012 the Beijing Municipal Authority used Weibo to warn residents of flooding when Beijing had its heaviest rainfall in 60 years ("Rarest,"

2015). Similarly, when the 2013 Ya'an earthquake hit the Sichuan region, the China Earthquake Networks Center used its Sina Weibo account to inform the citizenry about the event. Within one minute of the earthquake, they sent out their first tweet (Li, 2014). In contrast, mass media reports related to the earthquake would take an additional hour and half to be released (Li, 2014). With the official accounts established, citizens were better able to engage in enhanced two-way communication with the government. For instance, within a half hour of the 2013 earthquake, the China International Search and Rescue Team reported on Weibo that they were receiving messages via the service from earthquake victims with information about urgent needs and services (Li, 2014).

While official Chinese agencies successfully leveraged Sina Weibo for broad communications and informational announcements, WeChat has also played an important role in disaster communications. While the first official Sina Weibo message about the earthquake was post one minute after the 2013 Ya'an earthquake hit, the first official WeChat message wasn't issued until 19 minutes after the event (Tai & Liu, 2015). This more directed communication came from a local agency, the Chengdu municipal government, rather than a national agency (Tai & Liu, 2015). With more than 90.8% of Chinese internet users on messaging services like WeChat and 72.5% of local WeChat users subscribed to the WeChat accounts of their local governments, the medium allows official agencies to issue more in-depth, detailed, and instructional announcements than on Sina Weibo (Dwyer & Zu, 2015; Tai & Liu, 2015). WeChat also serves the essential function of protecting communication lines for official use while still connecting private citizens to one another even in the peak moments of panic that occur after a devastating event (Tai & Liu, 2015). While phone service bandwidth is easily exceeded as hundreds or even thousands of individuals attempt to contact loved ones, the bandwidth needed to send and receive WeChat messages is minimal enough to allow easy contact (Tai & Liu, 2015). Given this, Chinese disaster agencies requested after the 2013 Ta'an earthquake that private citizens use WeChat instead of making phone calls, thereby reserving phone channels for official use in rescue and recovery efforts (Tai & Liu, 2015).

Areas of Opportunity for Improvement

Perhaps due to the fact the the use of social media channels in disaster scenarios developed organically, there are still areas of opportunity for improvement. Although citizen reporting is central to why social media is so potent in a disaster scenario, the flood of communications that's typical after a disaster can make it difficult for users to tease out the most important information (Qu et al, 2011). Furthermore, official government communications can be lost in this fray, making them difficult to retrieve or even to identify (Qu et al, 2011). Qu et al suggest that additional functionalities that allow the user to sort, synthesize, and more easily retrieve information would improve the efficacy of social media in properly informing citizenry and harnessing their collective power, where needed (2011). Doing so would also guide users towards credible sources and diminish the power of rumors and false reports (Qu et al, 2011).

While these components would improve upon the existing social media frameworks, the most powerful improvement possible would be to align traditional community-based systems with social media systems to ensure the all affected Chinese citizens have access to the information they need to empower themselves to make safe choices for themselves and their loved ones. Despite the broad reach of social media channels, some of the most vulnerable

populations (including the very young, very old, impoverished, or transient) are unlikely to have access to this information. A deliberate analysis of how traditional systems and modern systems can be complementary to and support each other is requisite to building a truly robust system of emergency management in Fujian Province as well as across China.

V. Emerging Global Technology

Freely flowing information assists in better response measures as well as influences citizen's behavior during an emergency. Information flow affects both the government, non-government emergency responders, and individuals. Apps and systems which bolster information technology are becoming ever more important. A few of the prominent applications and development in technology are described below.

Cutting Edge Apps

As the world become ever more connected and access to information systems expands, Apps are becoming increasingly important for communicating with the public, coordinating governmental and on governmental emergency responders, tracking potential disasters and evaluating responses (Holdeman, 2014). Local, national and private apps can greatly assist citizens. The following Apps demonstrate leading technology utilized in the United States today.

Red Cross Emergency and FEMA Apps

This App run by the Red Cross pulls valuable warning systems' information about a cadre of natural disasters as they are unfolding. Its unique feature allows users to directly post their safety status to social media, and send an SMS or email to friends and family, an essential feature when determining who still needs help and accounting for potential victims. Additionally, the App allows users to locate shelters near them during an emergency. It provides regularly updated information on occupancy levels and openings at the shelters throughout the city, which assists victims in finding help closest to them. Lastly, the App provides useful information for emergency preparedness and allows users to test their own skillset and preparedness through various disaster-specific quizzes ("Red Cross Natural Disaster", 2014).

In addition to providing many of the features outlined in the Red Cross App, The FEMA App allows users to subscribe to information for over 20 different types of disasters and receive weather alerts for up to 5 different locations. It is also essential for the recovery process after a disaster as it permits users to upload pictures and reports of disasters and assists victims in applying for federal assistance (FEMA, 2015).

OCFL ALERT App

Orange County, Florida, a county that frequently experiences hurricanes, designed their own App called OCFL Alert. The App provides real-time information on the location of resources, such as sandbags and drinking water. It also allows residents to submit tickets to the government to report a problem

Key Takeaways from Useful Apps in the US

Scalable. When emergencies occur, they can handle an increase in users

Two-way street. Enables citizens to communicate with their government in addition to government sending out information and resources

Constant Presence. The App constantly communicates with citizens before a disaster strikes so users are familiar with software.

Private Sector. Utilizes private sector ingenuity and resources

Networked. Offers access to and communication with other networks, even international ones

Figure 2.1

or request assistance. The user can track the status of their request on the App and see the government's steps in working towards a solution. Lastly, the App allows the city to manage volunteers by identifying where there is a need and ensuring that volunteers go to the appropriate location, which helps add order to a potential chaotic and unhelpful influx of volunteers (Williams, 2014).

The Cloud

The cloud provides an invaluable resource during disasters as it does not exist in one central location. A disaster that destroys the infrastructure of one city, will not affect the data or fundability in the cloud. This enables large amounts of data not only to be secured safely, but shared even when the affected area's infrastructure is down (Holdeman, 2014).

Project Emergency.lu

The International Organization for Migration and the government of Luxembourg launched Project Emergency.lu which permits a satellite to be deployed to any disaster area around the world within hours of an emergency occurring. The satellite enables information systems to function as it increases bandwidth which enables phones and computers to connect to other networks and the internet, facilitating the emergency response effort ("News: Accord de Partenariat", 2015).

VI. Vulnerable Populations in China

As climate change increases frequency and severity of extreme weather events, many populations now experience increased susceptibility to dangerous incidents and new barriers to recovery (Keim, 2008). Reducing susceptibility and maximizing resilience for disasters like earthquakes, floods, and typhoons is best achieved through emergency preparedness programs on the individual, community, and governmental levels. Preparedness and response policies should target vulnerable populations by specifically aiming to preserve lives; ensure food, water, and safe sewage disposal; and control infectious disease and environmental hazards (Aldrich and Benson, 2008).

Vulnerability Indicators

Developing, implementing, and evaluating strategies for effective emergency response rely on indicators that characterize the relative susceptibility and resilience of the most vulnerable in a population (Chakraborty et al., 2005).

A study characterizing the evolution of interdisciplinary indicators and metrics in the United States focused on creating two indicators: a geospatial risk index and a social vulnerability index (Chakraborty et al., 2005). Each index combined GIS mapping, social, economic, and demographic data to characterize spatial patterns of potential routes for evacuation or connection to emergency needs entities (Chakraborty et al., 2005). The authors found the four most important dimensions to analyze were: 1) population traits and building structures, 2) differential access to resources, 2) special evacuation needs, and 4) combinations of different variables likely specific to setting and target populations (Chakraborty et al., 2005).

Measures of social vulnerability are important in developing concerted evacuation and response strategies, but may complicate and confound strategies to the extent that ineffective practices

result (Chakraborty et al., 2005). A 2014 study by Zhou et al. identified age, rapid population growth, rural character, low level of education, and economic status as the five main components relating social capacity to disaster vulnerability in China between the years of 1980 to 2014 (Zhou et al., 2014).

Profiles of Vulnerable Populations in China

Profile I: Vulnerable Older Adults Aged 65 or Older

By 2025, nearly 15% of China's population will be age 65 or older (Liu et al., 2009). Studies suggest around 80% of elderly adults have at least one chronic disease condition, limiting their physical capacity and increasing reliance on medications and care (Aldrich and Benson, 2008). Chronic conditions in conjunction with physiological, sensory, and cognitive changes associated with aging predispose elderly populations to ramifications and difficulty recovering from disasters. Current disaster preparedness and response policies in China focuses on urban areas and technological capacity to predict and coordinate response efforts. Although imperative given the density of populations living in urban areas, this leaves those living in rural areas with barriers to economic, social, and healthcare disproportionately disadvantaged (Liu, 2009). Therefore, studies aiming to capture rural elderly populations through new emergency preparedness and resiliency policies recommend structural reforms that universally improve access, education, and strengthen rural care (Liu, 2009).

Common metrics for describing older populations for emergency disaster preparedness and resiliency strategies include: 1) general population and structural attributes, 2) access to resources, and 3) special evacuation needs because of physical disability or age (Chakraborty et al., 2005).

Profile II: Young Children Aged 12 and Under

Children 14 and under are identified as a population with increased vulnerability to disasters due to their inability to protect themselves (Zhou et al., 2014). Children tend to lack basic knowledge on resources, experience with disasters, and ability to cope with emergency situations that subjects them to higher consequences within emergency events. Further, events such as mass flood often predispose the developing immune systems of Chinese children to higher rates of morbidity as a result of infectious disease acquisition (Zhang et al., 2016).

A 2015 study investigating China's primary triage (PT) capacity during mass casualty incidents (MCIs) such as earthquakes, floods, landslides, and toxic chemical spills found that children continue to be disproportionately disadvantaged during MCIs due to lack of tailored triage methods for their younger age group (Chen et al., 2015). This study observed China may be lacking in establishing standard triage response protocol across provinces and districts, triage methods for children and special populations, and overall unified responses (Chen et al., 2015).

This evaluation of triage response implementation throughout China also identified several shortcomings that specifically placed children at a disadvantage to receiving the proper treatment and tailored aid for necessary disaster recovery (Chen et al., 2015). According to an extensive literature review, the triage priority schemes vary among the 19 options for triage methods in China, yet all follow the same principle outlined as "do the greatest good the the greatest number

of people” (Chen et al., 2015). This is a justifiable principle to implement, but highlights the need for triage tailored to children and other vulnerable populations relative to those less-vulnerable.

Potential Profiles for Research:

Transient Migrant Workers. In 2010, China announced an effort to extend healthcare coverage to migrant workers across china as a priority to capture vulnerable populations (WHO, 2010). Migrant workers often come from rural areas of the country with lower access to insurance and care, increased vulnerability to workplace accidents due to high rates of labor work, and increased financial barriers to care (WHO, 2010). This vulnerability may be exacerbated during emergency events due to displacement (relative unfamiliarity of resources and protocol in geographic area of work) and education level. Although not as widely documented in literature as younger and elderly vulnerable populations, migrant workers may be a population worth researching to provide comprehensive response and preparedness strategies in Fuzhou.

VII. Interviews and Surveys

Profile development

To gain a general sense of emergency preparedness in the surrounding community, a survey was designed and implemented to ask a small sample their views on emergency preparedness and management. In determining the target sample, we identified two potential profiles of people in the community, based on research identifying vulnerable populations to evaluate how they perceive disasters and how they may respond in an emergency situation. The first profile is an elderly person in the community who may not have access or the ability to utilize technology or they may have limited mobility. Due to their advanced age, they may have limited self-sufficiency, and a survey could help determine whether or not this vulnerable population may be at risk. The second profile is a primary school age child who, while mobile and technologically efficient, may not have the self-sufficiency to make decisions and execute on them during an emergency. In this instance, a survey could help identify gaps in which youth are able to make decisions, as well as their current knowledge of how to respond in an emergency situation.

Focusing on vulnerable populations, such as youth or the elderly would help identify if there are any gaps in emergency disaster preparedness in Fuzhou. The survey (Attachment __) lists a variety of quantitative and qualitative questions to measure the sample’s perception of their own skills in responding to emergencies, as well as how they view the community’s efforts to make information available and accessible to them. These questions will give a broad sense of any potential trends that may indicate there are areas to be further investigated.

Survey Numbers and Data

The survey was administered to 136 people in the community, including elders over the age of 65, youth under the age of 14, and a variety of community members in between these ages. As seen in the data of Figure 4.1 below, the average response for Question 1 is similar when comparing youth and elders. Both groups, on average, feel very unprepared if a disaster were to happen, as shown by an average response of 1.74 on a scale of 1 to 5, 1 being not prepared, and 5 being very prepared..

In addressing how well the responders know where to go in case of an emergency, youth on average knew more about the exact places to go when compared to elders answering the same question. In addition, youth most frequently rated a 4 on the scale of knowing where to go when responding to an emergency, indicating they may be better educated on procedures when compared to the elderly.

The opposite result occurred when asking responders how well they felt the government supported them in learning about disaster preparedness. The elderly responders in this survey not only ranked higher in their response to government support, but they also verbally communicated their satisfaction with the government, and noted that if an emergency were to happen they had full confidence that the government would help them in any way they could.

The third group surveyed included people between the ages of 15 to 64, to provide a comparison to the more vulnerable groups. This group showed a higher level of feeling prepared if an emergency were to happen. On average, the middle range population felt an average of 2.62 on a scale of 1 to 5 when asked how prepared they felt. This drastic change from 1.69 and 1.79 for elders and youth respectively shows that there may be evidence that vulnerable populations feel less prepared for emergencies.

Figure 4.1: Survey Results - Question 1 Averages:

	How prepared do you feel?	How well do you know where to go or what to do in an emergency?	How well does the government support you?
Overall	2.03	2.78	2.44
Youth	1.79	2.93	2.50
Elders	1.69	2.62	2.92
Other	2.62	2.8	n/a

Survey Flaws

Since the sample size of 136 is so small in relation to the population of Fuzhou, which is over 2 million, it is not an accurate representation of the results received. In order for the survey to have more validity, the sample size can be increased to show a better representation of the population.

In addition to sample size, there are many external factors that influence the answers given, so it would be important to capture these factors in a survey if this were to be scaled up. These factors, such as education level, socioeconomic status, and physical and mental health can help advise if any of these factors play an additional role in the sample's responses.

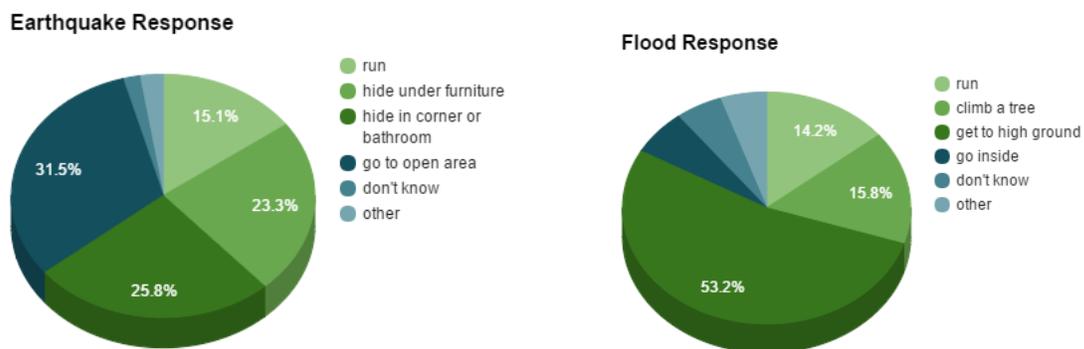
For example, the question in Figure 4.2 below could be further analyzed to see if socioeconomic status plays a factor in the responses. Figure 4.2 below shows the responses to the first question: "On a scale of 1 to 5, 5 being 'very much' and 1 being 'not at all', how prepared do you feel if an emergency were to happen right now?". In response to this question, over ___% of responders chose 1 on the scale, indicating they do not feel prepared if an emergency were to happen. If we had further details on the sample, including socioeconomic status, we could look further at the responders who answered 1 to this question to see if the majority of them were low or high on the socioeconomic scale. This would help determine any potential gaps where the community may need to target certain samples of the population to help increase their preparedness for disasters.

Figure 4.2: Survey Results for Question 1

Another flaw in the survey is the implementation of gathering answers. The survey was implemented both in person and via WeChat, though the types of responders gathered from each implementation method varied greatly. In person interviews allowed the surveyors to directly target youth under 12 and elders over 65, while the survey through WeChat was sent to a large group of people from all ages. While face to face surveys may gather more authentic results, they also utilize a large amount of time and money in order to implement. Online surveys can help increase the sample size, but when addressing vulnerable populations who may not be technologically proficient, paper surveys or face to face surveys may still be the best method in gathering data.

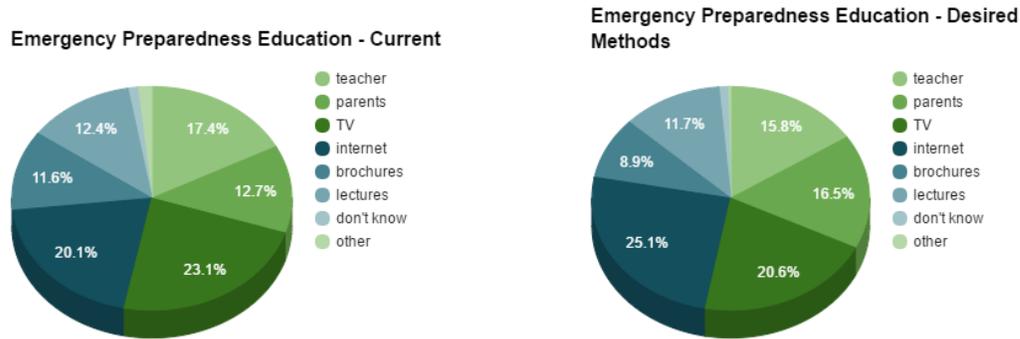
As detailed in Figures 4.3 and 4.4 below, the answers for how to respond to an earthquake or a flood varied significantly.

Figure 4.3: Survey Results for Earthquake and Flood Responses



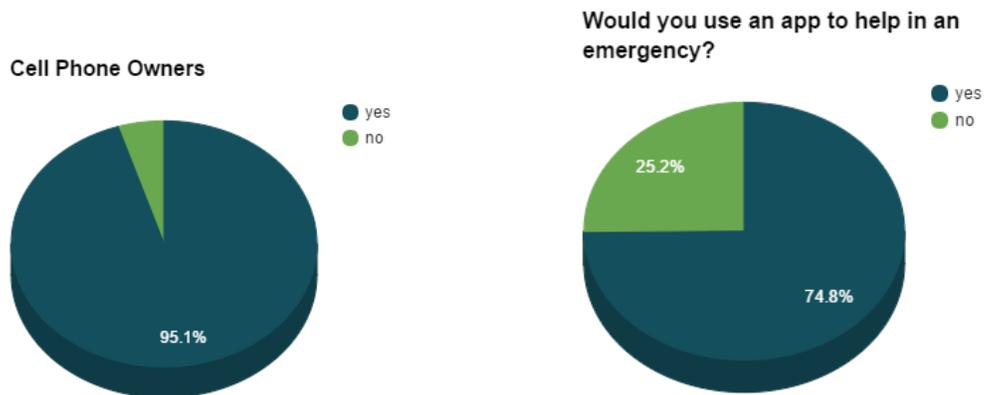
When asked how the respondents currently learn about disaster preparedness, the results were varied. In addition to how respondents currently learn, the survey addressed ways that respondents might want to learn disaster preparedness in the future. As detailed in Figure 4.4 and below, how respondents currently learn and how they hope to learn more in the future are very closely aligned.

Figure 4.4: Survey Results for Emergency Preparedness Education



Finally, the survey addressed respondents ownership of phones as well as their desire of ability to utilize a phone application to help them during an emergency.

Figure 4.5: Survey Results for Cell Phone Use



Scaling Up

In order to successfully scale up this survey, specific populations, should be targeted to gain more valid results. In addition, by extending the survey to include external factors that may influence answers can help determine if there is a specific group in the sample that may stand out against others. In implementing the survey, since paper and face to face surveys may help gather the most useful data from vulnerable populations, Fuzhou University could utilize its students

and research capabilities to implement these surveys as class projects. This would create learning opportunities for students, as well as gather results that could potentially impact how the university addresses any gaps in community disaster awareness.

VIII. Fuzhou University and Emergency Management

Looking forward, Fuzhou University has a unique opportunity to build on its current systems of emergency management, and advise the Fujian Provincial Government and surrounding community on how to become more resilient. In order to be successful, there are specific areas in which the institute can expand, not only to have an impact on the community, but also to increase the university's robustness and recognition as a leader in the emergency management field.

In Figure 5.1, four main focus areas are provided as a potential roadmap to show where the university can focus its efforts in the future to drive results.

Figure 5.1: Strategic Plan Focus Areas



The four focus areas provide a multi-layered approach to bolstering the university's reputation as well as generating high quality and innovative research to ultimately help prepare for and respond to disasters in successful ways. For each of these focus areas, there are many possibilities in which the university can build on its current work in order to increase its effectiveness.

Leading Institution

Fuzhou University has an opportunity to be recognized as a relevant and robust leader in emergency management. In order to do so, the university must first address the needs of the community and how they can focus their research towards identifying best practices and advising strategic partners on how to best respond to emergencies. Not only will the research itself help bolster the university's reputation, but if the university were to provide a clear and concise image of what they are able to provide, the community at large would recognize them as a leading institution in this field. This includes publishing articles in academic journals, or white papers, implementing surveys and research to identify best practices to inform the government, and providing evaluations to show the university's success in helping shape emergency management for the Fujian Province.

Collaborative Partner

While Fuzhou University currently has many partnerships with government agencies, there are opportunities in which the university can establish strong and successful partnerships for the university and its students. Aside from government agencies, there are nonprofits in the field of emergency management that may be able to lend their expertise and research in helping the university. In addition, for-profit partners, such as technology agencies, can be a great resource when identifying how technology can play a role in emergency management. These types of partnerships can help expand on the university's research and financial capabilities. In addition, partnerships with government agencies can create a "career pipeline" for current students. Internship and fellowship opportunities as well as research initiatives can be created at the government level and managed through Fuzhou University. These opportunities can not only help students gain a hands-on experience, but also provide government agencies with a pool of highly qualified and committed students for future employment opportunities.

High Quality Deliverables

In order for Fuzhou University to be recognized as a leading institution in emergency management, the university must produce high quality results for its partners and community. Research plays an important role in validating the university's work, as well as helping government agencies mitigate the frequency and severity of disasters. By building on its partnerships, resources, and identifying best practices, the university can produce high quality work that can ultimately save lives. By focusing on proprietary research and surveys, the university can deliver quality data specific to Fuzhou and the surrounding areas in order to best address the needs of those in the Fujian province.

Innovative Approaches

Fuzhou University can position itself to be an innovative leader, by utilizing technology, partnerships and other innovative approaches to help the university stand out against others. By understanding technology that can be used and finding ways to better implement it in the

community, the government and community members can potentially be better equipped to respond to disasters. In addition, finding ways that community members can use the technology, making sure they are well informed on how and when to use it, and supplying them the education to respond to disasters can help the community as a whole. Finally, finding ways to leverage research and partnerships to increase effectiveness can provide Fuzhou University with an edge that sets them ahead of other universities in regards to emergency management.

IX. Conclusion

Fujian Province already has a robust network of services in place to prepare and protect their citizens in the event of natural or man-made disasters. As outside consultants with an international perspective and training in processes and public administration, our charge was to evaluate the current systems and find areas of opportunity for improvement. Ultimately, our findings revealed that while Fujian Province's systems are strong, not all citizens are being served equally, and those who are being served are not being served adequately. Though further primary research and secondary study is requisite for proper planning and implementation, it's evident from our findings that meaningful improvements can and should be made.

Deliberate attention should be paid to the most vulnerable populations, including the very young, elderly, the transient, and those of low-socioeconomic status. While expanding targeted service approaches would be appropriate, the more effective approach would be to integrate, overlay, and align existing systems in such a way that no citizen of Fujian Province can fall through the cracks. Based on preliminary survey results, an easy and potentially cost effective way to begin would be with sophisticated and deliberate public outreach campaigns in schools, parks, and other public convening areas.

Fuzhou University is an obvious and capable ally for the government agencies working locally in Fujian Province. As described above, there are multiple methods by which Fuzhou University can position itself as a leading authority in emergency management, and our hope is that our preliminary findings can catalyze and help guide that process. By utilizing its partnerships and identifying innovative approaches to its work, Fuzhou University can produce quality data and research to exceed the community's expectations and become a leader in the field of emergency management.

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Appendix A: Fuzhou Disaster Preparedness Survey - English

Emergency Preparedness Survey

A study by the University of Southern California, United States of America

We define an emergency as a natural disaster, such as a flood, typhoon or earthquake that disrupts regular activities and may cause potential safety concerns. The following questions will help us measure how prepared you feel and steps we can take to help make you feel more prepared for an emergency.

Name: _____

Age: _____

Current hometown: _____

A. On a scale of 1 to 5, 5 being “very much” and 1 being “not at all”, how prepared do you feel if an emergency were to happen right now?

1 2 3 4 5

B. On a scale of 1 to 5, 5 being “very much” and 1 being “not at all”, how well do you know where to go in case of an emergency?

1 2 3 4 5

C. On a scale of 1 to 5, 5 being “very much” and 1 being “not at all”, how well do you think the government provides support to make you feel safe in case of an emergency?

1 2 3 4 5

D. If an earthquake were to happen right now, what would you do?

E. If a flood were to happen right now, what would you do?

F. What would make you feel more prepared for an emergency?

Appendix B: Fuzhou Emergency Preparedness Survey - Mandarin

应急管理准备阶段调查

---美国南加州大学调查研究

此问卷中我们将应急事件定义为自然灾害，比如台风、洪水、地震等影响社会正常活动并引起社会安全问题的事件。以下问题将帮助我们了解你们对这些事件的准备情况，我们也将基于此调查来研究如何帮助大家更好的做好这方面的准备。

姓名： _____

年龄： _____

所在城市： _____

A. 在1到5这个范围内， 5表示最强1表示最弱， 您个人感觉自己在应急准备中做的如何？

1 2 3 4 5

B. 在1到5这个范围内， 5表示最强1表示最弱， 您对灾害来临时该去哪里避难的了解情况如何？

1 2 3 4 5

C. 在1到5这个范围内， 5表示最强1表示最弱， 您认为在灾害来临时，政府对老百姓的支持和保护工作做得怎么样？

1 2 3 4 5

D. 如果现在地震来临， 您会采取什么措施？

E. 如果现在洪水来临， 您会采取什么措施？

F. 怎样做会让您感觉到在灾害防范准备中做得更好？