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Determinants of Organizational Preparedness for Floods: U.S. Employees' Perceptions

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Determinants of Organizational Preparedness for Floods: United States Employees' Perceptions

Abstract

Globally, and in the United States, flooding is considered one of the most destructive natural hazards in terms of lives lost, injuries, and economic losses. Despite the growing concern of climate change impacts on organizations in particular and society in general, very little is known about the factors influencing public, private, and nonprofit organizations to prepare for flood hazards. This article examines the predictors of flood preparedness in organizations using information collected via an online questionnaire from a national sample of 2008 employees of public, private, and nonprofit organizations in the United States in 2014. The findings revealed that in general, organization size and organization age are robust predictors of flood preparedness. This article concludes by discussing the implications of the results for theory, offering recommendations for practice, and outlining an agenda for future research on the predictors of flood preparedness at the organizational level.

Introduction

Globally, flooding is considered one of the most destructive natural hazards in terms of lives lost, injuries, and economic losses (Kreibich et al., 2007; Sadiq & Noonan, 2015a). A recent report indicates that 53 percent of all victims of natural disasters worldwide in 2012 were flood victims (Guha-Sapir et al., 2013). Similarly, in the United States, flooding has and continues to cause deaths, injuries, and property damages (Gopalakrishnan, 2013; Sadiq & Noonan, 2015b). According to the National Weather Service (NWS) (2013), the 30-year average for flood-related deaths and flood damage in the United States between 1982 and 2011 are 95 fatalities and $8.20

billion, respectively (in 2013 dollars). Due to the devastation induced by floods, experts have studied ways of reducing the impacts of flood on society for decades (Kellens et al., 2013).

Of particular relevance to this study is the impact of flood hazards on organizations. Direct impacts of floods on organizations include damage to facilities, economic loss, disruption in operations, and higher operating costs (Center for Climate and Energy Solutions (C2ES), 2013). However, organizations can minimize these disruptions by adopting preparedness measures (Sadiq, 2009). Preparedness measures include the provision of disaster preparedness and response training programs (e.g., CPR, first aid) for employees and talking with employees about disaster preparedness (Dahlhamer & D'Souza, 1997; Han & Nigg, 2011). The adoption of such preparedness measures has become increasingly important due to persistent developments along the United States coastline and floodplains (Brody et al., 2010), causing organizations to become more vulnerable to flood hazards (Knutson et al., 2010). Consequently, the risk and anticipated impacts from flood hazards are a big concern for scientists, governments, and organizational decision-makers (Bouwer, 2011).

Despite the vital role organizations play in society (Sadiq, 2009), little is known about the factors influencing organizations to prepare for flood hazards. This is because previous research on flood preparedness has almost exclusively focused on households (e.g., Zhang et al., 2009) and individuals (e.g., Kellens et al., 2011; Miceli et al., 2008; Terpstra & Lindell, 2013; Terpstra et al., 2009). Hence, the goal of this article is to answer the following question: "What are the predictors of flood preparedness in organizations?" Answering this question is particularly significant, especially now that the Intergovernmental Panel on Climate Change (IPCC) has predicted an increase in sea-level rise of 0.3-0.6 m for the 21st century as well as increases in frequency, intensity, and amount of heavy precipitation events (IPCC, 2007, 2013). The data

used for the analyses were collected via an online questionnaire from a nationally representative sample of 2008 employees from public, private, and nonprofit organizations in the United States in 2014.

This study contributes to the literature on flood preparedness at the organizational level by using a large-N data to understand the predictors of flood preparedness in organizations. By understanding the factors influencing organizations to prepare for flood hazards, decision-makers may be able to design policies around these factors to alter the behaviors of organizations. The goal of such policies will be to increase organizational preparedness for flood hazards, and ultimately enhance organizational resilience to future flood disasters. In the following section, this article discusses the impacts of floods on organizations and reviews the extant literature on the determinants of disaster preparedness at the organizational level. Then, the method of data collection, variable measurement, and the findings are presented. Next, the article discusses the findings. Finally, it concludes by offering recommendations for practice and outlining an agenda for future research on the predictors of flood preparedness at the organizational level.

Flood Impacts on Organizations

Public, private, and nonprofit organizations are essential entities in any community. They provide fundamental services and store readily available resources that can be used to improve the physical, psychological, social, and economic wellbeing of communities. For example, public organizations such as police and fire departments are tasked with responding and stabilizing a disaster situation to prevent further loss of life and property damage (Haddow et al., 2014). Moreover, big corporations can also provide essential resources to communities affected by a disaster. In the aftermath of Hurricane Katrina, Wal-mart donated 2,498 trailers containing

merchandise to victims and Verizon Wireless supplied 5,000 cell phones to first responders after the 9/11 terrorist attacks (Abou-Bakr, 2013).

Organizations are vulnerable to the effects of floods. For example, Hurricane Katrina resulted in monumental physical and economic losses for organizations, causing over $3 billion in damages to government facilities (Townsend, 2006). Other direct impacts of floods on organizations include disruptions in operations and higher operating costs (Center for Climate and Energy Solutions (C2ES), 2013). Flood impacts on organizations cut across myriad sectors and industries, and it is expected that overall impacts will grow significantly in various industries and regions (Winn et al., 2011). Consequently, the risk and anticipated impacts from flood hazards are a big concern for scientists, governments, and organizational decision-makers (Bouwer, 2011).

Due to the unexpected nature and detrimental damages floods may cause, it is critical for organizations to adopt preparedness measures to lessen flood impacts (Sadiq, 2009). Preparedness measures include the provision of disaster preparedness and response training programs (e.g., CPR, first aid) for employees and talking with employees about disaster preparedness (Dahlhamer and D'Souza, 1997; Han and Nigg, 2011).

Determinants of Organizational Preparedness

Previous research on flood preparedness has almost exclusively focused on households (e.g., Zhang et al., 2009) and individuals (e.g., Kellens et al., 2011; Miceli et al., 2008; Terpstra & Lindell, 2013; Terpstra et al., 2009). Kellens et al. (2013) carried out a systematic review of 57 studies on flood risk perception and communication. With the exception of one study, all other studies were conducted at the household and individual levels. The only organizational level

study included in this review was by Kreibich et al. (2007) who examined the preparedness level of 415 private companies and their ability to cope during the flood of August 2002 in Saxony, Germany. However, this study did not examine the predictors of flood preparedness at the organizational level.

Although a body of literature on organizational preparedness exists, the attention has been on multiple hazards (Chikoto et al., 2012; Dahlhamer & D'Souza, 1997; Fowler et al, 2007; Sadiq, 2010) or disasters other than floods (e.g., Han & Nigg (2007) focused on the Northridge Earthquake). These studies, although beneficial, are not able to offer specific recommendations regarding the determinants of flood preparedness in organizations. The only known study on the determinants of organizational preparedness for flood is that by Dahlhamer and D'Souza (1997). There are two differences between Dahlhamer and D'Souza's (1997) study and this study. First, Dahlhamer and D'Souza's (1997) study focused exclusively on private businesses, while the current study examined, public, private, and nonprofit organizations. Second, their study was based in Des Moine/Polk County, Iowa, while this study is national in scope. Due to the paucity of research on the determinants of flood preparedness at the organizational level, this article borrows empirical insights from Dahlhamer and D'Souza's (1997) study as well as from studies that have examined the predictors of organizational disaster preparedness for multiple disasters or disasters other than floods.

Organization Size

The size of an organization is one of the most consistent and dependable predictors of disaster preparedness (Dahlhamer & D'Souza, 1997). Indeed, researchers have reliably demonstrated a strong positive relationship between organization size and disaster preparedness (Chikoto et al., 2012; Dahlhamer & D'Souza, 1997; Han & Nigg, 2011; Sadiq, 2010, 2011; Sadiq and Graham,

2015; Sadiq & Weible, 2010). For example, Sadiq (2010) and Sadiq and Weible (2010) studied disaster mitigation and preparedness among public, private, and non-profit organizations in Memphis, Tennessee and found a significant positive relationship between organization size and the adoption of mitigation and preparedness measures. One plausible explanation for this result is that larger organizations have the necessary resources to mitigate and prepare for disasters (Dahlhamer & D'Souza, 1997).

Risk Perception

Risk perception refers to the way organizations discern the probability that a hazard will indeed occur (Phillips et al., 2011). Thus, risk perception is a subjective measure and may not necessarily reflect factual information about the severity of the risk (Nemeth, 2013), but it is a significant factor in understanding flood risk management (Kellens et al., 2011). Previous research has demonstrated that risk perception has a positive relationship with disaster preparedness. Han and Nigg (2011) studied disaster preparedness among businesses in Santa Cruz, California, and found a positive and significant relationship between risk perception of business owners/decision makers and the adoption of preparedness measures.

Disaster Experience

The extant disaster literature has shown that when organizations experience a disaster they are more likely to be prepared for future disasters (Dahlhamer & D'Souza, 1997; Han & Nigg, 2011). Dahlhamer and D'Souza (1997) found a significant and positive relationship between previous disaster experience and current preparedness levels among a sample of businesses in Memphis/Shelby County, Tennessee and Des Moine/Polk County, Iowa. In addition, Han and Nigg's (2011) study demonstrated that businesses that suffered lifeline losses from previous

disasters were more prepared for future disasters in comparison to businesses that did not suffer lifeline losses.

Ownership Type

Researchers have established ownership type—whether an organization is a single entity or part of a franchise—as a predictor of disaster preparedness (e.g., Drabek, 1995; Sadiq, 2010). Both studies found that franchises are more prepared for disasters than single location firms. These results are understandable because franchises might be required to implement preparedness measures by their corporate headquarters (Dahlhamer & D'Souza, 1997).

Own or Lease Business Property

Whether or not an organization owns or leases their property is an important determinant of disaster preparedness according to previous research (Dahlhamer & D'Souza, 1997; Mileti, 1999). Dahlhamer and D'Souza (1997) found that businesses that owned their properties were more prepared than renters in Memphis/Shelby County, Tennessee and Des Moine/Polk County, Iowa.

Organization Age

The age of an organization has been found to be a significant determinant of preparedness (e.g., Drabek, 1991; Han & Nigg, 2011). Previous findings, however, have been inconsistent in terms of the direction of the relationship. For instance, Drabek (1991) found a positive relationship between age and preparedness among firms in the tourist industry, while Han and Nigg (2011)

found a negative relationship between the two variables in a sample of businesses in Santa Cruz, California.

Organization Sector

In this study, 'organization sector' refers to specific types of organizations such as education, health, and wholesale/retail. Despite the extensive work on organization sector as a predictor of preparedness, previous findings are inconsistent. Some sectors have been found to be more prepared than others: education, health, and wholesale/retail sectors (Chikoto et al., 2012; Sadiq, 2010); lodging (Drabek, 1991); finance/insurance sector (Han & Nigg, 2011); and finance/insurance/real estate sector (Dahlhamer & D'Souza, 1997).

The previous studies discussed in this section provide the empirical rationale for proposing the following seven hypotheses:

> *Hypothesis 1:* There will be a significant positive relationship between organization size and the adoption of flood preparedness measures.
>
> *Hypothesis 2:* There will be a significant positive relationship between employee risk perception and the adoption of flood preparedness measures.
>
> *Hypothesis 3:* There will be a significant positive relationship between previous disaster experience and the adoption of flood preparedness measures.
>
> *Hypothesis 4:* There will be a significant negative relationship between single location organizations and the adoption of flood preparedness measures.
>
> *Hypothesis 5:* There will be a significant positive relationship between ownership of business property and the adoption of flood preparedness measures.
>
> *Hypothesis 6:* There will be a significant relationship between organization age and the adoption of flood preparedness measures.
>
> *Hypothesis 7:* There will be significant relationships between organizations in the education, health, finance/insurance/real estate, and wholesale/retail trade sectors, and the adoption of flood preparedness measures.

Methods

Data Collection

The author is a member of the research team that developed the survey instrument used to gather the information for this study. After developing the survey, it was given to GfK for administration. GfK is one of the largest global survey research organizations and has approval from the National Institute of Health to conduct survey research.[i] The instrument was used to collect the following information, among others, from respondents: perceptions of their employers' level of preparedness for natural hazards; employee demographics; and the characteristics of employees' organizations. The survey instrument was pretested with 17 staff and alumni of a university in Midwestern United States from December 12 to December 20, 2013. The minor issues that were revealed during the pre-test were corrected and the revised survey was given to GfK for administration.

GfK sent the survey to 10,559 United States adults, 18 years of age or older in their KnowledgePanel® in May 2014. GfK's KnowledgePanel® is a representative random sample of the United States population. Panel members are recruited using both Random Digit Dial (RDD) and address-based sampling methods that include households with and without Internet access. If a household does not have a computer or Internet access, GfK will provide the household with both at no charge. GfK sent one reminder to participants to encourage participation. In comparison to RDD and non-probability Internet surveys, probability-based Internet panels yield more accurate results (Chang and Krosnick, 2009). In addition, the American Association for Public Opinion Research (AAPOR)'s report on online panels noted that in cases where it is possible to compare survey results to external benchmarks like the Census, studies using

nonprobability sampling methods are generally less accurate than studies using probability sampling methods (Baker et al., 2010).

Out of the sample of 10,559 invited to participate, 5,079 responded. These 5,079 respondents were then screened based on two eligibility requirements. First, the respondent had to be working as a paid employee for an employer other than themselves. Second, the respondent could not be telecommuting for the majority of their work time. The research team focused on these two eligibility criteria because we believe that employees that work for an employer and report to work on a day-to-day basis are in the best position to provide information about the preparedness activities at the facility where they report for work. Both screenings eliminated 3,053 respondents. An additional 17 respondents were eliminated due to short survey completion times (less than five minutes). Identifying speeders who may have not accurately completed the survey is a common technique in survey research (Olson & Parkhurst, 2013). One respondent was also eliminated after indicating they were a full-time telecommuter thus making them ineligible for the survey. After these 18 exclusions, the remaining 2,008 respondents completed the survey.

Using the guidelines set forth by the AAPOR (http://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf), the study completion rate (COMR) is 48%, calculated by dividing the 2,008 interviews by the sum of 2,026 known eligible cases plus 2,192 estimated eligible cases among the 5,480 who did not respond to the survey invitations (assuming an estimated eligibility rate of 40%, based on the eligibility rate of the 5,079 respondents). To determine a cumulative responsive rate, this completion rate is multiplied by the Knowledge Panel recruitment rate (reflecting those who consented to join the panel) and profile rate

(reflecting those who completed necessary profile surveys). The recruitment rate for this study, reported by GfK, was 13.9% and the profile rate was 65.0%, for a cumulative response rate of 4.3%. GfK weighted the data to account for unequal probabilities of selection as well as to ensure that the data are as close as possible to Current Population Survey (CPS) estimates for the United States population regarding demographic characteristics (e.g., gender, age, marital status, race/ethnicity, household size, household income, etc. (see Table A1 in the Appendix)).

Although the current research design was built upon two smaller studies that also interviewed employees (Fowler et al., 2007; Larson & Fowler, 2009), the data gathered from this survey are quite unique in two respects. First, this survey is one of the largest surveys to date assessing preparedness measures among public, private, and non-profit organizations. Second, this study is one of only a few surveys to gather anonymous information from a national sample of employees about their organization's level of preparedness. Surveying employees instead of the leaders of organizations is somewhat novel and may allow us to avoid two problems. First, sampling organizational leaders is likely to result in low response rates. For example, the response rate for surveying organizational leaders in Sadiq and Weible's (2010) and Han and Nigg's (2011) studies were 31 percent (N=227) and 33.6 percent (N=933), respectively. Second, there is a potential for biased responses from the leaders of organizations as leaders have an incentive to overstate their organizations' preparedness levels (Fowler et al., 2007; Larson & Fowler, 2009). A variant of response bias is selection bias, whereby leaders of organizations that have adopted some preparedness measures may be more likely to respond to the survey than leaders of organizations that have not adopted any preparedness measure. By sampling employees, the authors hope to mitigate these two problems and get a more accurate picture of the the predictors of organizational preparedness for flood hazards.

Measurement: Dependent Variables

The three preparedness measures are: 1) Provided disaster preparedness and response training programs (e.g., CPR, first aid) for employees; 2) Talked with employees about disaster preparedness; 3) Provided employees with written information on where to meet after disasters. These three preparedness measures have been utilized by scholars studying organizational preparedness (e.g., Dahlhamer and D'Souza, 1997; Han and Nigg, 2011) and are employed here as flood preparedness measures. These dependent variables were measured by the following question on the survey instrument: "Has your employer done the following at **the facility to which you report on a day-to-day basis**?" Respondents could either answer "Yes", "No", or "Don't know". All three dependent variables are treated as dummies—1 for those that answered "Yes" and 0 for those that answered "No." Because the three dependent variables are dichotomous, a logit regression was estimated for each.[ii] All three dependent variables were also combined (scale reliability, $\alpha = 0.8216$).[iii] For this new index, a tobit regression was estimated using the same independent variables. Tobit is appropriate for analyzing censored samples because it gives precise estimates of the relationship between the dependent and independent variables (Gujarati, 2011).

Measurement: Independent Variables

Organization size. This variable was measured by the question: "About how many people work at the location to which you report on a day-to-day basis? Count employees in all areas, departments, and buildings at this location." Respondents could select any of the following: small (1-99 employees), medium (100-499 employees), and large (500 or more employees).

Risk perception. This was measured by the question: “On a scale of 1 (not likely at all) to 5 (very likely), please indicate the extent to which you perceive flooding as a risk at the facility where you report to work.”

Disaster experience. This was measured by the question: “To the best of your knowledge, has your employer experienced [flooding] at the facility where you report to work?” A respondent could select from three response options: “Yes”, “No”, and “Don’t know”. A dummy variable was created for this variable (Yes = 1; No = 0). The “Don’t know” responses were excluded from the analyses.

Ownership Type. This variable was measured by the question: “Which of the following best describes your employer?” Respondents could select from two options; multiple-location/franchises/chain and single location. A dummy variable was created for this variable: single location = 1, multiple-location/franchises/chain = 0.

Ownership of business property. This variable was measured by the following question: “Does your employer rent/lease or own the building to which you report on a day-to-day basis?” Respondent could either select rent/lease or own. This variable was coded own = 1 and rent/lease = 0.

Organization age. This variable was measured by asking the following question: “How many years ago was the company, organization, or government agency that you work for established?” The respondents could select from the following categories: less than 1 year; 1-2 years; 3-5 years; 6-10 years; 11-15 years; 16-20 years; 21-30 years; 31-40 years; and more than 40 years.

Organization sector. Four sectors were included in the analyses—education, health, finance/insurance/real estate, and wholesale/retail trade. GfK provided information on these

sectors. Each sector was coded 1 if the respondent's organization is in that sector and 0 otherwise.

Results

Table 1 presents sample demographic statistics. The average age of the sample is about 41 years and the sample consists of 57 percent men. Approximately 22 percent of the sample has a bachelor's degree and 70 percent of the respondents are white. Furthermore, 51 percent of the respondents are married and 15 percent have an annual household income of $100,000 to $124,999. In addition, the sample has an average household size of about 3 people, 80 percent of the respondents are household heads, and 86 percent of the respondents live in a Metro area. Finally, 35 percent reside in the south and 86 percent have Internet access.

Table 1. Sample Demographic Statistics[iv]

Variable Description	Mean	SD	Min	Max
Age	41.46	13.80	18	86
Race/Ethnicity: White, Non-Hispanic	0.70	0.46	0	1
Education: Bachelor's degree	0.22	0.42	0	1
Gender: Male	0.57	0.50	0	1
Household Head: Yes	0.80	0.40	0	1
Household Size	2.73	1.38	1	10
Household Income: $100,000 to $124,999	0.15	0.36	0	1
Marital Status: Married	0.51	0.50	0	1
MSA Status: Metro	0.86	0.35	0	1
Region: South	0.35	0.48	0	1
HH Internet Access: Yes	0.86	0.34	0	1

Note: N=2008.

Table 2 shows the sample statistics for the dependent and independent variables. With regard to the three dependent variables, 62 percent of respondents reported that their organizations provided disaster preparedness and response training programs (e.g., CPR, first aid) for their employees, 63 percent of the sample reported that their organizations talked with employees about disaster preparedness, and 54 percent said that their organizations provided employees with written information on where to meet after disasters. The sample reported a moderate level of risk perception for floods (2.48 on a scale of 1-5) and 20 percent of the sample reported that their organizations have experienced flooding. In terms of organizational characteristics, 36 percent of organizations in the sample have single locations, and 62 percent own their buildings. Furthermore, 11 percent of organizations in the sample are in the educational sector, 14 percent are in the health sector, 7 percent belong to the finance/insurance/real estate sector, and 11 percent are in the wholesale/retail sector.

Table 2. Descriptive Statistics for Dependent and Independent Variables.

Variable Description	Obs.	Mean	SD	Min	Max
Provided disaster preparedness and response training programs (DV1)	1662	0.62	0.49	0	1
Talked with employees about disaster preparedness (DV2)	1691	0.63	0.48	0	1
Provided employees with written information on where to meet after disasters (DV3)	1684	0.54	0.50	0	1
Organization Size	1941	1.69	0.80	1	3
Risk Perception	1872	2.48	1.21	1	5
Disaster Experience	1742	0.20	0.40	0	1
Ownership Type	2008	0.36	0.48	0	1
Own Building	2008	0.62	0.48	0	1
Organization Age	1984	7.53	1.97	1	9
Education Sector	2008	0.11	0.32	0	1
Health Sector	2008	0.14	0.34	0	1

Finance/Insurance/Real Estate Sector	2008	0.07	0.25	0	1
Wholesale/Retail Sector	2008	0.11	0.31	0	1

Table 3 presents the bivariate correlations among the dependent and independent variables. The goal of the correlation analysis is to see if the correlation results are consistent with the expectations from the literature. Among 78 correlation coefficients [k (k-1)/2 = (13x12)/2 = 78], 54 (69.23%) are significant. According to the correlation results, there is a positive and significant association between organization size and all three dependent variables. Risk perception is not significantly associated with any of the three dependent variables. There is a positive and significant relationship between past disaster experience and dependent variable 1 and dependent variable 2, but not dependent variable 3. The relationship between ownership type and each of the three dependent variables is negative and significant. Furthermore, the correlations between building ownership and all three dependent variables are positive and significant. The same result holds for organization age, educational sector, and health sector. The relationship between finance/insurance/real estate sector and dependent variable 1 is significant and negative, but the relationships with dependent variable 2 and dependent variable 3 are insignificant. Finally, the relationships between wholesale/retail trade sector and each of the three dependent variables is significant and negative.

Table 3. Intercorrelations (R_{ij}) Among Independent and Dependent Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. DV1												
2. DV2	.59*											
3. DV3	.54*	.68*										
4. Organization Size	.34*	.32*	.33*									
5. Risk Perception	.04	.05	-.00	.04								
6. Disaster Experience	.08*	.06*	.02	.12*	.38*							
7. Ownership Type	-.16*	-.13*	-.18*	-.28*	-.02	-.05*						
8. Own Building	.19*	.14*	.15*	.19*	-.02	.08*	.04					
9. Organization Age	.26*	.26*	.23*	.26*	.03	.14*	-.21*	.28*				
10. Education	.11*	.11*	.08*	-.00	.00	.07*	.05*	.19*	.17*			
11. Health	.10*	.05*	.06*	.11*	.07*	.02	-.02	-.00	-.02	-.15*		
12. Finance/Ins. /Real Estate	-.08*	-.01	.02	.03	-.01	-.02	-.03	-.05*	.00	-.10*	-.10*	
13. Wholesale/ Retail	-.15*	-.11*	-.11*	-.10*	-.06*	-.04	-.06*	-.05*	-.02	-.13*	-.14*	-.09*

*Note: *Significant at 5% level. N=1243[v].*

Table 4 displays the results of the predicted probabilities for the three multivariate logit models. The goodness of fit (R^2) for each of the three models is significant at the $p < .000$. The numbers indicate changes in predicted probability of the dependent variable as the independent variables change from their minimum to their maximum holding other independent variables at their means. For example, in Model 1, the probability of providing disaster preparedness and response training programs (e.g., CPR, first aid) for employees is 9 percent lower for single location organizations than for multiple location organizations, holding other variables at their means. In model 1, six independent variables are significant predictors of the flood preparedness measure: provided disaster preparedness and response training programs (e.g., CPR, first aid) for employees. These variables are organization size, single location, building ownership, organization age, finance/insurance/real estate sector, and wholesale/retail trade sector.

Tables 4. Changes in Predicted Probabilities for Three Organizational Performance Logit Models.

	Model 1/ DV1	Model 2/ DV2	Model 3 DV/3	Tobit Model	
				Coef.	SE
Org Size	.33***	.35***	.35***	1.57***	.18
Risk Perception	-.01	.06	-.06	-.00	.12
Disaster Exp.	.03	-.00	-.03	-.25	.33
Ownership Type	-.09*	-.04	-.11**	-.70**	.26
Own Building	.08*	.02	.02	.16	.26
Org Age	.47***	.46***	.35***	.51***	.08
Education	.10	.16**	.13*	1.32***	.38
Health	.08	.00	.08	.57	.36
Fin/Ins/RE	-.21**	-.04	.03	-.53	.46
Wholesale/Retail	-.17**	-.11	-.13*	-1.09**	.41
Constant				-4.19	.72

N	1381	1404	1405	1243
Wald x^2	149.84	146.25	139.66	F(10, 1233) = 16.79
Prob x^2	.000	.000	.000	Prob>F = .000
Pseudo R^2	.17	.15	0.13	0.11

*Note: ***p < .001 **p < .01 *p < .05. Variation in sample size is due to missing observations. DV1 stands for dependent variable and represents "provided disaster preparedness and response training programs (e.g., CPR, first aid) for employees". DV2 represents "talked with employees about disaster preparedness". DV3 represents "provided employees with written information on where to meet after disasters".*

In short, Model 1 indicates that larger organizations, organizations that own their buildings, and older organizations are more likely to provide disaster preparedness and response training programs (e.g., CPR, first aid) for their employees. Conversely, single location organizations, organizations in the finance/insurance/real estate sector, and organizations in the wholesale/retail trade sector are less likely to provide disaster preparedness and response training programs (e.g., CPR, first aid) for their employees.

In Model 2, three independent variables—organization size, organization age, and education sector—are significant predictors of the flood preparedness measure: talked with employees about disaster preparedness. Specifically, the results show that larger organizations, older organizations, and organizations in the education sector are more likely to talk with their employees about disaster preparedness.

In Model 3, five independent variables are significant predictors of the preparedness measure: provided employees with written information on where to meet after disasters. These variables are organization size, single location, organization age, education sector, and wholesale/retail trade sector. The results of Model 3 suggest that larger organizations, older organizations, and organizations in the education sector are more likely to provide employees

with written information on where to meet after disasters. On the contrary, single location organizations and organizations in the wholesale/retail sector are less likely to provide employees with written information on where to meet after disasters.

Table 4 also contains the result of the tobit analysis where all three flood preparedness measures were combined. This model, which is significant (Prob>F = .000) indicates that organization size, single location, organization age, education sector, and wholesale/retail sector are significant predictors of flood preparedness. The import of this result is that larger organizations, older organizations, and organizations in the education sector are more likely to be prepared for floods. Whereas, single location organizations and organizations in the wholesale/retail trade sector are less likely to be prepared for floods. An important finding is that the size of the organization and organization age are the only two significant predictors consistent across all three logit models and the tobit model.

Discussion

Hypothesis 1 received full support from all the models. According to the correlation analysis, there is a positive and significant correlation between organization size and all three dependent variables. Similarly, organization size is a significant predictor in all three logit models and the tobit model. These results indicate that larger organizations are more likely to be prepared for flood disasters than smaller organizations. One plausible explanation is that larger organizations have the necessary resources to prepare for flood disasters (Dahlhamer & D'Souza, 1997). These results corroborate a long list of studies that found organization size to be a positive and significant predictor of disaster preparedness (Chikoto et al., 2012; Dahlhamer & D'Souza, 1997;

Drabek, 1991; Han & Nigg, 2011; Quarantelli et al., 1979; Sadiq, 2010, 2011; Sadiq & Weible, 2010).

With regard to Hypothesis 2, the correlations between risk perception and the three dependent variables are insignificant. Likewise, in three logit models and one tobit model, risk perception is not a significant predictor of flood disaster preparedness. In sum, there is no evidence in support of Hypothesis 2. This finding is at odds with those of previous studies on risk perception that have demonstrated a positive and significant relationship with preparedness (Han & Nigg, 2011; Sadiq, 2009).

With regard to Hypothesis 3, the results generally showed a positive, though non-significant relationship between disaster experience and the three dependent variables. Specifically, disaster experience is positively correlated with dependent variables 1 and 2, but not dependent variable 3. In addition, disaster experience is not a significant predictor of flood preparedness in any of the three logit models or the tobit model. The positive correlation between disaster experience and the two flood preparedness measures corroborate the findings of past studies (e.g., Dahlhamer & D'Souza, 1997; Han & Nigg, 2011), suggesting that organizations that have experienced disasters are more likely than those that have not experienced disasters to be prepared for flood disasters.

With regard to Hypothesis 4, there is a negative and significant correlation between single location organization and all three dependent variables. Similarly, single location organization is negative and significant in Model 1, Model 3, and the tobit model, but not Model 2. This result is in line with that of previous research (Drabek, 1991; Quarantelli et al., 1979) and implies that franchises are more prepared for flood disasters than single location organizations.

This result is understandable because franchises might be required to implement disaster preparedness strategies by their corporate headquarters (Dahlhamer & D'Souza, 1997).

Hypothesis 5 received partial support. According to the correlation analysis, there is a positive and significant correlation between building ownership and all three dependent variables. However, building ownership is a positive and significant predictor of flood preparedness in Model 1 only. These results imply that organizations that own their buildings are more likely to be prepared for flood disasters in comparison to organizations that lease their buildings. Previous studies have found similar results (e.g., Dahlhamer & D'Souza, 1997; Han & Nigg, 2011).

Hypothesis 6 received full support from all the models. The correlation between organization age and the three dependent variables are positive and significant. In addition, organization age is a positive and significant predictor of flood preparedness in all three logit models and the tobit model. These results are robust and suggest that older organizations are more likely to be prepared for flood disasters than younger organizations. These results provide empirical evidence in favor of previous findings of a positive relationship between organization age and disaster preparedness (e.g., Drabek, 1991).

Finally, Hypothesis 7 is partially supported. Education sector is positive and significantly correlated with the three dependent variables and is a positive and significant predictor of flood preparedness in Models 2, 3, and the tobit model. These results are consistent with those of Sadiq (2010) and suggest that organizations in the education sector are more likely to be prepared for flood disasters than organizations in other sectors because they deal with vulnerable populations like children. As a result, they are highly regulated by local, state and federal governments (Chikoto et al., 2012). Further, health sector is positive and significantly correlated with the three

dependent variables, but not significant in any of the three logit models or the tobit model. The result of the correlation is consistent with that of Sadiq (2010) and the reasoning behind this result is the same as that for education sector. Finance/insurance/real estate sector is significant, but negatively correlated with dependent variable 1 only. It is also negative and significant in Model 1, but insignificant in Models 2 and 3, and the tobit model. These negative and significant results are not in line with the positive and significant result found by Dahlhamer and D'Souza (1997). Wholesale/retail sector is negative and significantly correlated with all three dependent variables. It is also negative and significant in Models 1 and 3, and the tobit model. Dahlhamer and D'Souza (1997) also found a negative relationship between organizations in the wholesale/retail sector and disaster preparedness, but their finding was insignificant.

Conclusion

The purpose of this study is to understand the predictors of flood disaster preparedness in organizations. The findings reveal that organization size and organization age are robust predictors of flood disaster preparedness in organizations. This study contributes to the literature on flood preparedness at the organizational level by using a large-N data to identify the predictor of flood preparedness in organizations.

The following limitations provide opportunities for future research to improve this study. First, the cross sectional nature of the data does not allow the examination of a causal relationship between preparedness and the independent variables. As a result, researchers should replicate this study using longitudinal data in order to have a better understanding of the predictors of flood preparedness in organizations over time. Second, there are a few predictors of preparedness that were not included in this study due to unavailable data. Specifically, the

financial condition of organizations (Han & Nigg, 2011), organizational obstacles (Sadiq, 2010; Sadiq & Weible, 2010), and location near or in a floodplain were excluded. Future research on flood preparedness should include these relevant variables. Third, this study did not distinguish between the various types of flooding (e.g., coastal flooding, river flooding, etc.). Future research should distinguish between the various flood types as it is reasonable to expect that certain flood preparedness measures might be more appropriate for a particular flood type than others. Fourth, the analysis did not focus on nuances such as organizational sector (e.g. education versus health care), organizational type (public versus private), organization size (e.g. large versus small), etc. As a result, future research endeavors should use this study as a basis for investigating these nuances. Fifth, this study did not stratify the sample based on actual flood risk. Hence, future studies should stratify organizations based on their actual flood risk. Finally, the preparedness measures employed are not specific to flood hazards, but somewhat general to disasters. As a result, future research should use specific flood preparedness measures such as flood insurance purchase.

Despite these limitations, this article contributes methodologically, empirically, and practically to the literature on the determinants of flood preparedness in organizations. Methodologically, this study demonstrates a different way to collect preparedness information about organizations, one based on employee perceptions and not the perceptions of organizational leaders. Research has demonstrated that organizational leaders are more likely to give bias responses than employees (Fowler et al., 2007; Larson & Fowler, 2009). In addition, the sample is large, nationally representative, and includes public, private, and nonprofit organizations. As a result, the sample provides more information than most previous organizational preparedness studies. Empirically, this study provides evidence using a large-N

data on the factors that motivate organizations to adopt preparedness measures for flood hazard. Practically, this study recommends that policymakers should implement proven flood disaster preparedness programs to enhance flood preparedness among smaller organizations and younger organizations. For instance, a flood preparedness program might provide the employees of smaller and younger organizations with flood disaster preparedness and response training programs at reduce costs. This type of program may be able to alter the behavior of organizations and enhance their ability to be more resilient to future flood disasters.

In sum, this study serves as a first step, albeit a crucial one, in providing significant insights on the factors influencing organizations to prepare for floods. Researchers in the United States and abroad should endeavor to build upon this study based on the limitations discussed above. Only then would we begin to fully understand the antecedents of flood disaster preparedness in organizations and contribute to the development of theories in this line of research. The development of theories will indubitably provide ample opportunities for policymakers to design appropriate policy tools for altering the behavior of organizations and enhancing organizational resilience towards the management and prevention of flood disasters.

References

Abou-Bakr, Ami J. 2013. *Managing Disasters through Public-Private Partnerships*. Washington, DC: Georgetown University Press.

Baker, Reg, Stephen J. Blumberg, Michael J. Brick, Mick P. Couper, Melanie Courtright, Michael J. Dennis, Don Dillman, Martin R. Frankel, Philip Garland, Robert M. Groves, Courtney Kennedy, Jon Krosnick, and Paul J. Lavrakas. 2010. "Research Synthesis AAPOR Report on Online Panels." *Public Opinion Quarterly* 74 (4): 711-781.

Bouwer, Laurens M. 2011. "Have Disaster Losses Increased Due to Anthropogenic Climate Change?" *Bulletin of the American Meteorological Society* 92 (1): 39-46.

Brody, Samuel. D., Jung Eun Kang, and Sarah Bernhardt. (2010). "Identifying Factors Influencing Flood Mitigation at the Local Level in Texas and Florida: The Role of Organizational Capacity." *Natural Hazards* 52 (1): 167-184.

Center for Climate and Energy Solutions (C2ES). 2013. *Weathering the Storm: Building*

477 Business Resilience to Climate Change. http://www.c2es.org/publications/weathering478storm-building-business-resilience-climate-change

Chang, Linchiat, and Jon A. Krosnick. 2009. "National Surveys Via Rdd Telephone Interviewing Versus the Internet Comparing Sample Representativeness and Response Quality. *Public Opinion Quarterly* 73 (4): 641–678.

Chikoto, Grace L., Abdul-Akeem Sadiq, and Erin Fordyce. 2012. "Disaster Mitigation and Preparedness: Comparison of Nonprofit, Public, and Private Organizations." *Nonprofit and Voluntary Sector Quarterly* 42 (2): 391-410.

Dahlhamer, James M., and Melvin J. D'Souza. 1997. "Determinants of Business Disaster Preparedness in Two US Metropolitan Areas." *International Journal of Mass Emergencies and Disasters* 15 (2): 265–281.

Drabek, Thomas E. 1991. "Anticipating Organizational Evacuations: Disaster Planning by Managers of Tourist-Oriented Private Firms." *International Journal of Mass Emergencies and Disasters* 9 (2): 219–245.

Drabek, Thomas E. 1995. "Disaster Responses within the Tourist Industry." *International Journal of Mass Emergencies and Disasters* 13 (1): 7-23.

Fowler, Karen L., Nathan D. Kling, and Milan D. Larson. 2007. "Organizational Preparedness for Coping with a Major Crisis or Disaster." *Business and Society* 46 (1): 88–103.

Gopalakrishnan, Chennat. 2013. "Water and Disasters: A Review and Analysis of Policy Aspects." *International Journal of Water Resources Development* 29 (2): 250-271.

Guha-Sapir, Debarati, Phillipe Hoyois, and Regina Below. 2013. *Annual Disaster Statistical Review 2012: The Numbers and Trends.* http://reliefweb.int/sites/reliefweb.int/files/resources/ADSR_2012.pdf

Gujarati, Damodar. 2011. *Econometrics By Example*. Hampshire, UK: Palgrave Macmillan.

Haddow, George, Jane Bullock, and Damon P. Coppola. 2014. *Introduction to Emergency Management* (5th ed.). Waltham, Massachusetts: Butterworth-Heinemann.

Han, Ziqiang, and Joanne Nigg. 2011. "The Influences of Business and Decision Makers' Characteristics on Disaster Preparedness—A Study on the 1989 Loma Prieta Earthquake." *International Journal of Disaster Risk* Science 2 (4): 22–31.

Intergovernmental Panel on Climate Change (IPCC). 2007. "Climate Change 2007: Impacts, Adaptation and Vulnerability." In *Contribution Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. Martin L. Parry, Osvaldo F. Canziani, Jean P. Palutikof, Paul J. van der Linden, and Clair E. Hanson. Cambridge University Press, Cambridge, UK.

Intergovernmental Panel on Climate Change (IPCC). 2013. "Summary for Policymakers." In *Climate Change 2013: The Physical Science Basis."* In *Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. Thomas F. Stocker, Qin Dahe, Gian-Kasper Plattner, Melinda Tignor, Simon K. Allen, Judith Boschung, Alexander Nauels, Yu Xia, Vincent Bex, and Pauline M. Midgley. Cambridge, United Kingdom and New York, NY, USA Cambridge: University Press.

Kellens, Wim, Teun Terpstra, and Philippe De Maeyer. 2012. "Perception and Communication of Flood Risks: A Systematic Review of Empirical Research." *Risk Analysis* 33 (1): 24-49.

Kellens, Wim, Ruud Zaalberg, Tijs Neutens, Wouter Vanneuville, and Philippe De Maeyer. 2011. "An Analysis of the Public Perception of Flood Risk on the Belgian Coast." *Risk Analysis* 31 (7): 1055–1067.

Knutson, Thomas R., John L. McBride, Johnny Chan, Kerry Emanuel, Greg Holland, Chris Landsea, Isaac Held, James P. Kossin, A. K. Srivastava, and Masato Sugi. 2010. "Tropical Cyclones and Climate Change." *Nature* Geoscience 3 (3): 157-163.

Kreibich, Heidi, Meike Müller, Annegret H. Thieken, and Bruno Merz. 2007. "Flood Precaution of Companies and Their Ability to Cope with the Flood in August 2002 in Saxony, Germany." *Water Resources Research* 43 (3). doi:10.1029/2005WR004691.

Larson, Milan D., and Karen Fowler. 2009. "Anticipation is in the Eye of the Beholder: Top-Level Managers see Things Differently when it Comes to Crises Preparedness." *Journal of Business and Management* 15 (2): 129-141.

Miceli, Renato, Igor Sotgiu, and Michele Settanni. 2008. "Disaster Preparedness and Perception of Flood Risk: A Study in an Alpine Valley in Italy." *Journal of Environmental Psychology* 28 (2): 164–173.

Mileti, Dennis S. 1999. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington, DC: Joseph Henry Press.

National Weather Service (NWS). 2013. *United States Flood Loss Report-Water Year 2012.* http://www.nws.noaa.gov/hic/summaries/WY2012.pdf

Nemeth, Charles P. 2013. *Homeland Security: An Introduction to Principles and Practice*. Boco Raton, FL: CRC Press.

Olson, Kristen, and Bryan Parkhurst. 2013. "Collecting Paradata for Measurement Error Evaluations." In *Improving Surveys with Paradata: Analytic Uses of Process Information,* ed. Frauke Kreuter. New Jersey: Wiley & Sons, 33-64.

Phillips, Brenda. D., David M. Neal, and Gary Webb. 2011. *Introduction to Emergency Management*. Boco Raton, FL: CRC Press.

Quarantelli, Enrico L., Clark Lawrence, Kathleen Tierney, and Ted Johnson. 1979. "Initial Findings from a Study of Socio-Behavioral Preparations and Planning for Acute Chemical Hazard Disasters." *Journal of Hazardous Materials* 3 (1): 77-90.

Sadiq, Abdul-Akeem. 2009. *Mitigating and Preparing for Disasters: A Survey of Memphis Organizations* Doctoral diss., Georgia State University and Georgia Institute of Technology.

Sadiq, Abdul-Akeem. 2011. "Adoption of Hazard Adjustments by Large and Small Organizations: Who is Doing the Talking and Who is Doing the Walking?", *Risk, Hazards & Crisis in Public Policy* 2 (3): 1-17.

Sadiq Abdul- Akeem. 2010. "Digging through disaster rubble in search of the determinants of organizational mitigation and preparedness." *Risk, Hazards & Crisis in Public Policy* 1 (2): 33–62.

Sadiq, Abdul-Akeem, and Douglas Noonan. 2015a. "Local Capacity and Resilience to Flooding: Community Responsiveness to the Community Ratings System Program Incentives." *Natural Hazards* 78 (2): 1412-1428.

Sadiq, Abdul-Akeem, and Douglas Noonan. 2015b. "Flood Disaster Management Policy: An Analysis of the United States Community Ratings System." *Journal of Natural Resources Policy Research* 7 (1): 5-22.

Sadiq, Abdul-Akeem, and John D. Graham. 2015. "Exploring the predictors of organizational preparedness for natural disasters." *Risk analysis 36* (5): 1040–1053.

Sadiq, Abdul-Akeem, and Christopher Weible. 2010. “Obstacles and Disaster Risk Reduction: Survey of Memphis Organizations.” *Natural Hazards Review* 11 (3): 110–117.
Terpstra, Teun, and Michael K. Lindell. 2013. “Citizens’ Perceptions of Flood Hazard Adjustments: An Application of the Protective Action Decision Model.” *Environment and Behavior* 45 (8): 993-1018.
Terpstra, Teun, Michael K. Lindell, and Jan M. Gutteling. 2009. “Does Communicating (Flood) Risk Affect (Flood) Risk Perceptions? Results of a Quasi-Experimental Study.” *Risk Analysis* 29 (8): 1141-1155.
Tierney, Kathleen J. 1997. “Business Impacts of the Northridge Earthquake.” *Journal of Contingencies and Crisis Management* 5 (2): 87-97.
Townsend, Frances F. 2006. *The Federal Response to Hurricane Katrina: Lessons Learned*. Washington, DC: The White House.
Winn, Monika, Manfred Kirchgeorg, Andrew Griffiths, Martina K. Linnenluecke, and Elmar Günther. 2011. “Impacts from Climate Change on Organizations: A Conceptual Foundation.” *Business Strategy and the Environment* 20 (3): 157-173.
Zhang, Yang, Seong N. Hwang, and Michael K. Lindell. 2010. “Hazard Proximity or Risk Perception? Evaluating Effects of Natural and Technological Hazards on Housing Values.” *Environment and Behavior* 42 (5): 597–624.

APPENDIX

Table A1. Comparison between the Weighted Sample (N=2008) and the Current Population Survey (CPS)

Variable Description	Weighted Sample (N=2008)	CPS 2013 Estimates for Adult Civilian Workers 18+ Years of Age
Age	41.81	42.49
Race/Ethnicity: White, Non-Hispanic	0.69	0.66
Education: Bachelor's degree	0.22	0.22
Gender: Male	0.53	0.53
Household Head: Yes	0.80	N/A[6]
Household Size	2.73	2.81
Housing Type: A one-family house detached	0.67	N/A[7]
Household Income: $100,000 to $124,999	0.14	N/A[8]
Marital Status: Married	0.52	0.55
MSA Status: Metro	0.85	0.85
Region: South	0.35	0.36
Ownership Status of Living Quarters: Owned or being bought by someone in household	0.72	0.68
Household Internet Access: Yes	0.86	0.85

Notes:

[i] More information about GfK is available at http://www.gfk.com/us/About-us/Pages/default.aspx

[ii] The "Don't knows" were not included in the three logit analyses and the tobit analysis because this article is interested in employees that know whether their employers have adopted the three flood preparedness measures or not.

[iii] All three dependent variables were added together, and an index was created in Stata statistical software. Since all three dependent variables are dichotomous, the minimum value for the new index is zero (for organizations that did not adopt any of the three preparedness measures) and the maximum is three (for organizations that adopted all three preparedness measures).

[iv] All the analyses were conducted using the weighted sample

[v] The lower sample size is due to pair-wise deletion of missing observations.

[vi] Data not collected on household head in CPS (CPS collected data on "householder," which is a slightly different concept).

[vii] Data not collected on CPS.

[viii] $100K+ is all that is available from the CPS data.