

2013

Examining the Role of Interagency Coordination when Addressing Flood Risk Management and Flood Disasters in Southern Illinois

Irene J. Upson

Southern Illinois University Carbondale, upson.jessica@gmail.com

Follow this and additional works at: http://opensiuc.lib.siu.edu/gs_rp

Recommended Citation

Upson, Irene J., "Examining the Role of Interagency Coordination when Addressing Flood Risk Management and Flood Disasters in Southern Illinois" (2013). *Research Papers*. Paper 436.

http://opensiuc.lib.siu.edu/gs_rp/436

This Article is brought to you for free and open access by the Graduate School at OpenSIUC. It has been accepted for inclusion in Research Papers by an authorized administrator of OpenSIUC. For more information, please contact opensiuc@lib.siu.edu.

EXAMINING THE ROLE OF INTERAGENCY COORDINATION WHEN ADDRESSING
FLOOD RISK MANAGEMENT AND FLOOD DISASTERS IN SOUTHERN ILLINOIS

by

Irene Jessica Upson

B.S., University of California, Davis, 2004

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the
Master's of Public Administration.

Department of Public Administration
in the Graduate School
Southern Illinois University Carbondale
December 2013

RESEARCH PAPER APPROVAL

EXAMINING THE ROLE OF INTERAGENCY COORDINATION WHEN ADDRESSING
FLOOD RISK MANAGEMENT AND FLOOD DISASTERS IN SOUTHERN ILLINOIS

By

Irene Jessica Upson

A Research Paper Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Masters of Arts

in the field of Public Administration

Approved by:

Dr. John Hamman, Chair

Dr. Randolph Burnside

Dr. Roberto Barrios

Graduate School
Southern Illinois University Carbondale
September 27, 2013

AN ABSTRACT OF THE RESEARCH PAPER OF

Irene Jessica Upson, for the Master's of Arts degree in Public Administration, presented on September 27, 2013, at Southern Illinois University Carbondale.

TITLE: EXAMINING THE ROLE OF INTERAGENCY COORDINATION WHEN ADDRESSING FLOOD RISK MANAGEMENT AND FLOOD DISASTERS IN SOUTHERN ILLINOIS

MAJOR PROFESSOR: Dr. John Hamman

Based on qualitative data, this paper examines the various roles of government organizations tasked with responding to and guiding recovery from flood disasters in southern Illinois. Interviews and reports provided the data to conduct a need assessment of the interagency relationships at work in southern Illinois. The paper specifically examines the effects of climate change on the region and the need to incorporate more sustainable practices in flood prevention and response.

DEDICATION

This research paper is dedicated to my son, Robert Thomas Upson McPherron. He is my motivation to always do the best that I can do. Because of him, this is about a year and a half past due.

ACKNOWLEDGMENTS

I gratefully acknowledge the help, guidance, and support I received from several people throughout this process. Dr. John Hamman offered insightful feedback, Dr. Randolph Burnside provided thoughtful comments and history about the subject of flooding, and Dr. Roberto Barrios encouraged me to consider the deeper social impact of flooding on communities.

I am also deeply grateful for my husband, Paul McPherron. His support has been invaluable. I would also like to thank my family, who stood by me and cheered me on, especially when this seemed like a distant goal.

TABLE OF CONTENTS

<u>CHAPTER</u>	<u>PAGE</u>
ABSTRACT.....	i
DEDICATION.....	ii
ACKNOWLEDGMENTS	iii
CHAPTERS	
CHAPTER 1 – Introduction.....	1
CHAPTER 2 – Literature Review	5
CHAPTER 3 – Methods	25
CHAPTER 4 – Discussion.....	28
CHAPTER 5 – Conclusions and Recommendations	31
REFERENCES	33
VITA	36

CHAPTER 1

INTRODUCTION

Southern Illinois has several features, including proximity to major rivers, watersheds, and floodplains, which provoke concern about flooding. The region is bordered by the Mississippi River on the west and by the Ohio River on the east. The two rivers are part of a vast network of watersheds and wetlands, including tributaries and floodplains. Recently, much of the floodplains along the Mississippi River have been altered to serve as agricultural lands, which has greatly reduced the regions ability to absorb excess water. At the same time, the effects of climate change have pointed to increased likelihood of flooding (IPCC, 2007). The combination of reduced floodplains and increased flooding poses a problem for public administrators who must answer to both agricultural needs and environmental concerns.

Despite its valuable environmental role, floodplain acreage has been dramatically reduced by the US Army Corps of Engineers (USACE) who altered the flow and path of these major rivers to improve navigation. Ironically, the corps also sought to protect field and pastures from flooding. Indeed, much of the land in the area has been modified for farming, particularly along the watersheds and floodplains of the two rivers, in order to capitalize on the fertile river land. As rivers have been narrowed to ease navigation, newly created bottomlands are exposed, which farmers can legally claim and cultivate (Faber 1996). Farmers have also increased agricultural acreage by draining wetlands, floodplains, and water-saturated soils, contributing to an ill-defined drainage network (Faber, 1996). However, these modifications to the rivers have reduced the rivers' natural capability to accommodate excessive precipitation and water flow. During the 1993 floods, 57 percent of the original wetlands in the nine Midwestern states affected had been converted to other uses (Faber, 1996, p. 5).

In addition to the anthropogenic forces, which have reduced the area's natural ability to absorb any increases in precipitation and moisture, studies warn that storms and floods in the southern Illinois region are likely to occur more frequently and be more severe (Interagency Floodplain Management Review Committee, *Sharing the Challenge*, 1994). Precipitation in the Midwest is projected to increase up to 30% in the winter (IPCC, 2007; Wuebbles & Hayhoe, 2004). This will result in an increase of soil moisture and runoff over the winter and spring. Spring and summers are projected to be drier and hotter. Saturation and increased runoff will further reduce the river's ability to absorb the projected increase in rainfall. These climate changes, coupled with heavy modifications of the natural path of the Mississippi River and human use of floodplains for agricultural purposes will likely result in increased flooding along the Mississippi and Ohio River watersheds. According to the IEMA Regional Coordinator, a regional coordinator at the Illinois Emergency Management Agency (IEMA), since 2000, southern Illinois has had the highest number of declared disasters in Illinois including floods, heavy storms, and tornados (personal communication, May 25, 2012).

Problem Statement and Research Question

The Southern Illinois region is clearly at the center of regional, national, and international debates about the best ways to balance disparate interests and needs in response to disaster preparation and climate changes. Thus, the purpose of this research is to conduct an initial assessment of the readiness of state agencies in southern Illinois and their ability to meet the imminent likelihood of greater regional flooding. More specifically, the paper analyzes IEMA, the agency that is charged with flood disaster response, USACE, the agency that is charged with flood disaster response, Illinois Environmental Protection Agency (IEPA), the agency tasked

with protecting wildlife and human living conditions, and the Illinois Department of Natural Resources (IDNR), the agency that coordinates water resources.

As discussed in more detail below, USACE and IEMA play the largest roles in flood management and responses in southern Illinois. USACE is a federal agency and is responsible for the country's flood risk management (FRM). In efforts to meet the needs of FRM, the USACE has constructed over 11,000 miles of dikes and levees along the nation's shorelines (Retrieved April 3, 2013 from <http://www.corpsresults.us/flood/floodpreparing.cfm>). USACE works with local and state agencies to address flood risks and management. The mission of the regional flood risk management goal of USACE is to "integrat[e] and synchroniz[e] USACE flood risk management programs and activities, both internally and with counterpart activities of the Department of Homeland Security, Federal Emergency Management Agency (FEMA), other Federal agencies, state organizations, and regional and local agencies" (Retrieved April 3, 2013 from <http://www.mvd.usace.army.mil/Missions/FloodRiskManagement/RegionalFloodRiskManagementProgram.aspx>). During a flood disaster, USACE serves as the leader of responding agencies and coordinates efforts among local and state authorities. These public agencies face several obstacles when managing flood risk and responding to flood disaster, including land that has been stripped of natural defenses against floods, growing development on land near the river, environmental changes that indicate increase in rainfall, and coordination among several government agencies. In fact, for years, various flood management and development projects carried out in part by USACE, have compromised natural flood plains and the flow of the Mississippi and Ohio rivers. Moreover, a growing number of studies forecast that rainfall and water flow into the region will increase due to further alterations and the effects of future global

weather change. The issue remains as to how disaster response agencies such as USACE intend to approach the likelihood of increased flooding in the area.

IEMA is the primary agency in Illinois charged with responding to disasters. The mission of IEMA "...is to better prepare the State of Illinois for natural, manmade or technological disasters, hazards, or acts of terrorism" (Retrieved May 26, 2012 from <http://www.state.il.us/iema/about/>). When a disaster occurs, IEMA coordinates with several agencies to develop the best approach to dealing with the disaster (IEMA Regional Coordinator, personal communication, May 25, 2012). However, most of IEMA's focus is on response in times of a disaster and post-disaster relief, and less effort is placed on coordinating efforts to mitigate environmental concerns that could increase potential damages from floods.

In conducting an initial needs assessment in regards to governmental agencies in Southern Illinois, this paper focuses on the following research question: what steps have state agencies taken to address the threat of increased flooding in Southern Illinois, including inter-agency communication and responses to the needs of Southern Illinois communities? The paper first reviews the context and dynamics for current flood control in the Southern Illinois region focusing primarily on the Mississippi River basin. It then undertakes an investigation into the various agencies' current posture toward accommodating greater flooding in the future by interviewing key IEMA personal, as well as examining efforts undertaken by the USACE in flood risk management. The paper then discusses the preparedness of all of the agencies for the likelihood of increased flooding and their efforts at coordination. The final section of the paper then makes recommendations for future policy.

CHAPTER 2

LITERATURE REVIEW

The literature review will briefly outline the agencies involved in flood risk management, with emphasis on human impact on flood events. Following is an examination of the history of flood control along the Mississippi River, with a discussion of previous approaches to flood control. Next, issues regarding climate change and its effects on river management are discussed. Finally, there is a brief discussion of interagency or intergovernmental approaches and response to flood risk management. While there are several agencies involved in flood risk management and disaster response, the scope of this paper will focus on the efforts made by USACE and IEMA, as these two agencies often hold a leadership role in both risk management and response.

2.1 History of flood control in southern Illinois

In the 1800's, the federal government's primary goal related to the Mississippi River was to create navigable paths for trade and commerce. River management and flood control was under the jurisdiction of the state and local governments (Meyers and White, 1993). The need for a federal response to floods became apparent during a 1927 trip down the Mississippi River by Chicago politicians, including mayor William Hale Thompson (Pearcy, 2002). The trip was intended to be a celebration of federal legislation allowing construction of a waterway from Lake Michigan to the Gulf of Mexico. However, the 1927 flood of the Mississippi River changed the focus of the trip. The 1927 flood killed more than two hundred people, caused hundreds of millions of dollars in damage, and killed more than one million farm animals (Pearcy, 2002). Mayor Thompson called for the federal government to cover the full cost for flood control on the Mississippi River (Pearcy, 2002).

The flood was a result of several levee breaks along the Mississippi River. The water had overcome the levees built by the Mississippi River Commission (MRC). These breaks brought to light the challenges and weaknesses of the structural approach to flood control that was used by the USACE during that time.

The MRC was established in 1879 and held a strong structural, “levees-only” policy and opposed using diverse flood control managements, instead focusing exclusively on building levees in the Lower Valley (Percy, 2002). Their efforts were further strengthened by the 1917 Ransdell-Humphreys Flood Control Act, which authorized the federal government to assume primary responsibility for flood control (Percy, 2002). Local governments would pay one-third of the cost and allow all rights-of-way. However, the 1927 flood revealed the weaknesses of a levees-only approach to flood control. Five breaks occurred in Illinois levees during the 1927 flood. The floods covered over 200,000 acres of agricultural land in Illinois (Percy, 2002).

After a series of outcries and debates regarding who should be in charge of flood control in the Mississippi River Valley, President Calvin Coolidge signed the 1928 Flood Control Act. One result of the Act was that the USACE developed a plan for the Mississippi River Basin, which involved designing the New Madrid Floodway south of Cairo, IL to help manage and control flooding, primarily with the use of levees, floodwalls, and dams (Olson & Morton, 2012, a; Galloway, 2005). Although the Act authorized construction of floodways, a spillway, and higher and stronger levees, it did not include a more comprehensive flood control plan as advocated by Democratic leadership at the time. Percy (2002) notes that the 1928 Flood Control Act gave “evidence to the reality that politicians, rather than engineers, drove the formation of federal flood control policy in the United States” (p. 190). The Flood Control Act of 1936 furthered the federal government’s structural policy toward flood control. This Act authorized

the USACE to focus flood control efforts by “constructing levees, floodwalls, dams and other structural measures” (Galloway, 2005, pg. 5).

In addition to modifying the river for flood control, the river has been shaped to accommodate navigational and agricultural purposes. In order to access the rich land around the river, wetlands and floodplains have been drained and the USACE have built levees, dams, and dykes to redirect the river, employing largely structural methods to control the flow of the water. Land modifications have had a lasting impact on the river’s ability to respond to any increase in water. Policies that allow for draining floodplains to create more useable land or that authorize the building of levees and dikes to change the flow of the River directly impact how extensive the damage from flooding can be. Faber (1996) points out that this intensive use of land along the river contributes to increased damage from heavy floods. The natural layout of the area that would have normally absorbed rainfall has been paved over or engineered to accommodate farming. He notes that the damage from the 1993 flood was, in large part, a result of the decisions to alter the natural floodplain for agricultural use.

The U.S. government and USACE focus on structural flood control shifted to nonstructural controls in 1980’s and early 1990’s, in large part, because of the research of Gilbert White (Fritsche, 2004). The USACE defines nonstructural measures as “techniques that modify susceptibility to flooding (such as watershed management, land use planning, regulation, floodplain acquisition, floodproofing techniques and other construction practices, and flood warning) from the more traditional structural methods (such as dams, levees, and channels)” (Interagency Floodplain Management Review Committee, pg. GL6, 1994).

White advocated that river management and flood control consider the natural flood control elements of rivers and wetlands, as well as a focus on building flood-proof structures and

policies focusing on flood mitigation. Galloway (2005) reviews the USACE's response to recent floods, specifically the 1993 flood, and emphasizes the value of developing floodplain management policies that include structural and nonstructural approaches. He notes that there is continued interest in building along floodplains and that local and federal governments should have strong and enforced policies considering the environmental impact of new construction and post-disaster construction (Galloway, 2005). Additionally, he points out that the USACE has declared that nonstructural approaches and structural approaches should receive equal consideration when preparing construction plans (Galloway, 2005). Overall, post-flood reconstruction is seeing a shift from a structural policy with little focus on environmental protection, to a nonstructural approach with higher consideration for environmental factors.

The 2011 flood in southern Illinois illustrates the tension that can occur when the river floods and threatens both towns and agriculture. On May 2, 2011, Major General Michael Walsh of the Memphis District of USACE made the order to blow the Birds Point levee on the Mississippi River in an effort to prevent the town of Cairo, IL from flooding. Consequently, the water was redirected and inundated over 100,000 acres of farmland (Retrieved May 27, 2012 from http://www.huffingtonpost.com/2011/05/03/missouri-levee-exploded-by-us-army-corps-of-engineers_n_856744.html). Walsh and the USACE decided to blow the levee due to the requirements set forth in a 1986 revision of the Birds Point operation plan by the Mississippi River Commission (Mississippi River Commission, undated). The operation plan states that when a flood reaches 56 feet on the Cairo gage, the USACE must begin preparing explosives to blow the levee with all preparations complete when the flood reaches 60 feet. Then, the USACE should commence blowing the levee when before the flood gauge reaches 61 feet on the Cairo gage. In the 2011 flood, water levels at Birds Point Levee had reached record highs and the

pressure from the river forces created sandboils, which pushed water up from underneath the levee (IEMA Regional Coordinator, personal communication, May 25, 2012).

Perhaps not surprisingly, when the USACE blew the levee, farmers in Missouri fiercely opposed the action along with the governor of Missouri and the entire Missouri state legislature. The state of Missouri went so far as to sue the USACE in an attempt to halt the levee demolition (*State of Missouri v. U.S. Army Corps of Engineers, 2011*), but their case was judged to lack merit due to the need to save a community of residents and their homes over agricultural land. This tension between Missouri farm interests and the USACE is actually a long standing debate, and a brief review of the history of the Birds point levee and the numerous changes to the operational plan over the years since 1928 reveal numerous instances of political and legal challenges between Missouri, Illinois, and USACE (IEMA Regional Coordinator, personal communication, May 25, 2012).

2.2 Agencies involved in flood risk management

When a flood occurs, several agencies are called upon to respond. Most notably are the USACE and FEMA and the local Emergency Management Agencies. All of these agencies must coordinate and work together to effectively respond to the communities' needs. Wood et al. (2012) note that the USACE is "conducting FRM planning alongside FEMA, DHS, and a host of other federal, state, and local agencies" (p. 1350). Often, tensions or miscommunications occur while trying to coordinate across different agencies. This is especially so when involving federal, state, and local agencies. Dirmeyer (2008) and Kettl (2007) discuss that information is often lost or miscommunicated across agencies. Messages or "language" of one agency don't always translate to another agency. Dirmeyer (2008) argues that a centralized control of flood disaster response doesn't allow for nimble decision-making and sensitivity to local concerns. As public

agencies consider flood risk management approaches, responding agencies and risk management agencies will need to be involved and coordinate to ensure that all areas of concern, such as environmental and economical, are addressed.

2.3 U.S. Army Corps of Engineers and Illinois Emergency Management Agency

The United States Army Corps of Engineers (USACE) is responsible for “383 lakes and reservoirs, 8,500 miles of dikes and levees” throughout the country, as well as working with local and non-Federal authorities to manage and maintain smaller flood risk reduction projects (Wood et al., 2012). Initially, the Mississippi River Commission was formed in 1879 and was primarily concerned with navigation issues along the Mississippi River and was prohibited from being involved with flood issues (Dirmeyer, 2008). The 1928 flood control act acknowledged the need for federal oversight of flood risk management (FRM) and tasked the Mississippi River Commission with this role for the Mississippi River. Dirmeyer (2008) lists the justifications for federal control of the Mississippi River flood protection as including the interests of keeping river trade smooth, the cost of building high enough levees might be prohibitive for some local districts, and ensuring that ‘local considerations’ did not prevent engineers from accomplishing the technical tasks of flood control (p. 628).

Today, the stated mission of the USACE Mississippi River Commission includes preventing destructive floods (Retrieved May 20, 2012 from <http://www.mvd.usace.army.mil/defaultex.php?pID=mission>). This is accomplished through working with local communities to share costs of smaller projects and providing technical assistance and planning to other federal agencies. Of particular note is the agency’s stated role of “exploring innovative ways to incorporate environmental protection and restoration features into structural and non-structural flood protection works.” (Retrieved May 25, 2013 from

<http://www.mvd.usace.army.mil/Missions/FloodRiskManagement.aspx>). Historically, the USACE focused flood risk management efforts on structural methods; that is, methods that involved creating structures, such as dams or levees, to control the flow and water level of the Mississippi River. The purposes of these structures were to minimize flood risks, as well as to allow for more navigable paths for shipping along the Mississippi River (Galloway, 2005). However, growing awareness of the importance and effectiveness of natural flood control measures, such as wetlands and floodplains, led to the USACE incorporating these non-structural methods in their flood management projects (Galloway, 2005). Examples of non-structural approaches that reduce flood damages include evacuating the area around the floodplain, altering the way people use the flood area, and reducing the susceptibility of human activity to flood risk (retrieved April 3, 2013 from <http://www.mvd.usace.army.mil/Missions/FloodRiskManagement.aspx>).

The 1993 flood demonstrated the value of incorporating both structural and non-structural approaches to flood risk management (Interagency Floodplain Management Review, 1994; Galloway, 2005). Although the 1993 flood was devastating, the Interagency Floodplain Management Review Committee noted in their report, *Sharing the Challenge* (1994) that the USACE estimated that over \$19 billion in damages was prevented by both structural and non-structural flood control approaches (pg. 21). Looking forward, public agencies should consider how to best use both approaches when developing flood control plans, particularly in areas that already have established structural approaches, such as levees and dams, already in existence. Galloway (2005) notes that public agencies grappling with flood control must incorporate structures and communities that already exist within the floodplain.

Illinois Emergency Management Agency (IEMA) is the primary agency involved in responding to disasters and focuses preparing the state and its citizens to be able to safely respond to disasters (Retrieved May 20, 2012 from <http://www.state.il.us/iema/about/>). IEPA responds to disasters that are at risk of releasing pollutants into the environment (Retrieved May 20, 2012 from <http://www.epa.state.il.us/about/inter-agency.html>). The mission of IEMA is to “...act as lead in crisis/consequence management response and operations to notify, activate, deploy and employ state resources in response to any threat or act of terrorism” (retrieved May 26, 2012 from <http://www.state.il.us/iema/about/>). IEMA coordinates the responding agencies and maintains the State Emergency Operations Center (SEOC), which “... acts as lead in crisis/consequence management response and operations to notify, activate, deploy and employ state resources in response to any threat or act of terrorism.” (Retrieved May 25, 2012 from <http://www.state.il.us/iema/about/>). Although IEMA focuses efforts at reducing damage during a flood, the agency is not closely involved in efforts at reducing factors that contribute to the severity of floods (IEMA Regional Coordinator, personal communication, May 25, 2012).

2.4 Human Impact on Flooding and Flood Response Efforts

Floods can occur in many different contexts and are defined by several features. Although most definitions involve the natural overflow of water, it should also include an emphasis on the human factors and impacts on floods. Parker (2000) highlights three definitions of the term ‘flood’: Yevjevich (1992) specifies that floods occur when water inundates a river’s flood plain or when the sea levels rise above average; Chow (1956) notes that a flood occurs when the water flow overwhelms the natural channel of the water flow; and finally, Ward (1978) defines a flood as water which overflows land that is not normally submerged. Parker (2000) highlights that none of these definitions “suggest that a flood must be a purely ‘natural’

phenomenon” (p. 23). Human impacts on land features affect the severity of the flood.

Yevyevich (1992) comments that humans are increasing their role in flood disasters by constructing levees, dams, and reservoirs; in many cases most floods are “in some way human-induced” (Parker, 2000, pg. 23).

When discussing floods, it is important to note the impact of human modifications and activity on floods and severity of floods. The Intergovernmental Panel on Climate Change (IPCC) submitted a report in 2007 outlining the various ways that anthropogenic forces have impacted ecological systems. One finding from the report indicated that flooding magnitude and frequency were likely to increase as a result of human pressure on watersheds and flood plains. Vitousek (1994) argues that land use and land change by humans will be the “single most important” component that influences ecological systems (pg. 1867). The effects from these land changes impact not just terrestrial environments, but water ecosystems as well. In the case of the Mississippi River, much of the land change along the River has been to increase the land available for agricultural use. This raises agricultural and environmental policy issues for policymakers to consider across the fields of environmental protection, agriculture, and local communities.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) also presented findings indicating that the temperature of the Earth is rising and that most of the observed warming is “very likely” due to anthropogenic forces (p. 5). The report provides examples of how warmer temperatures will affect various ecosystems on Earth, including increases in precipitation and heavier snowmelt. For example, North America is projected to see a decrease in its snowpack and increased winter flooding (IPCC, 2007, pg. 11). This could have major implications for waterways in North America, including the Mississippi River.

Human use and modifications of rivers and land directly impact the river floodplain's ability to handle any natural changes, such as floods. Vitousek (1994) argues that changes in the physical nature of land and human use of land have a strong impact on both terrestrial and aquatic ecosystems. Changes in one environmental zone can have consequences on neighboring areas. Carpenter et. al. (1992) note that watershed modifications are the most severe stresses on freshwater systems. That is modifications to any land that is part of a watershed. The EPA (2001) defines a watershed as "any land area that drains into a single body of water" (p. 9). Consequently, flood management plans should consider mitigation efforts that include examining how to manage land and floodplains surrounding the river.

Parker (2000) discusses that the relationship between floods and 'social agents' cannot be ignored (pg. 10). Social agents include the social and political factors that influence who and to what extent people are exposed to a natural disaster. Social consideration of flooding should include the agricultural and environmental sectors, as well as the local community. Social factors, such as who has access to land near floodplains, what is the land used for, and who has access to insurance and knows how to get it, play a large role in a community's reaction to floods. Human forces can have a large impact on who is affected by a flood, including who is rescued and what areas of a community are rebuilt, if at all. A full understanding of the extent of human impact on river environments is still incomplete, yet policymakers should prepare their communities for flexible and shifting efforts at flood response. Wuebbles and Hayhoe (2004) acknowledge this and use a model that includes the uncertain effects of anthropogenic forces on climate change. The analysis also includes projection models of the climate and historical data to examine how extreme weather events may occur more frequently. Both global and local factors influence the Mississippi River and surrounding area's ability to handle increased water levels in

the River and flooding. Wuebbles and Hayhoe (2004) note that in order to effectively preserve natural habitat, policymakers should be informed with an understanding of the climate and how climate change can impact a region.

An example of policymakers acknowledging the value in planning for climate change is Chicago and the Chicago Climate Action Plan. The goal of the plan is “to reduce our [Chicago’s] emissions and prepare for change” (retrieved April 27, 2012 from <http://www.chicagoclimateaction.org>). The plan outlines five strategies the city follows to combat the effects of climate change on the city, as well as efforts the city undertakes to reduce emissions: energy efficient buildings, clean and renewable energy sources, improved transportation options, reduced waste and industrial pollution, and adaptation (retrieved April 27, 2012 from <http://www.chicagoclimateaction.org>). These strategies acknowledge that climate change will impact Chicago’s environment and offers mitigation steps for reducing Chicago’s carbon footprint. These steps cross several sectors and involve creative and collaborative remedies. The Action Plan committee is aware that efforts to “green” Chicago should be seamless. For example, in order to retrofit buildings to be more energy efficient, the Committee will help building owners access technical support and financing (Chicago Climate Action, n.d., pg. 22). Unlike USACE or IEMA officials who must consider many disparate interests and pressures when planning for and responding to environmental changes and disasters, Chicago officials are only concerned with one municipality and its inhabitants, and not all of the plans and policies enacted by a city such as Chicago can be implemented on a larger state or national scale. At the same time, it is worthwhile and, indeed, necessary for policymakers to examine the lessons learned and best practices employed by governments and communities at all levels of society. Our response to climate change will surely involve coordination across many sectors,

and fact that Chicago has already formed a Chicago Climate Action Committee and enacted measures in response to forecasted changes should be instructive for other governmental agencies.

Further, in order to create a comprehensive flood management program, public agencies should include approaches that are at their core environmentally sound. As noted by Meyers and White (1993); Kenyon et al. (2008); and Olson and Morton (2012, a), there is a pressing need to take an environmental approach toward flood prevention and relief. Meyers and White (1993) describe a growing recognition to consider wetlands and habitat diversity in river management. As humans encroach more on river land it will be important to develop rebuilding efforts that are sustainable. Kenyon et al. (2008) discuss that “there is a clear need to link flood risk management, agriculture, and land use management” (p. 352). Creating this link could help guide policymakers to develop policies that effectively capture the needs of environmental purposes and agriculture. However, attempts to address the needs of both of these sectors would not be without conflict. Parker (2000) comments that approaches to flood mitigation should be realistic in accounting for the human modifications on river areas. It would be unrealistic to suggest that a community relocate farmland, or try to reconstruct the river path to its original location. He argues that floods should be viewed not just as natural phenomena, but rather the result of social, political, and natural processes. The severity of a flood can be exacerbated, or relieved, by the human response. As discussed with the 1993 flood, both structural and non-structural approaches have been shown to alleviate potential damages from floods.

As the USACE and IEMA respond to floods, they face pressure from local communities in how to best approach relief efforts. The agencies must also work with the reality that urbanization and human impact on land is growing, as well as negotiate with infrastructure and

communities that already exist in areas at high risk of flooding. *Sharing the Challenge* (1994) discusses that increased flooding in the future is a reality and that urbanization contributes to the rise in flood peaks and volumes. Recently, the USACE recognizes the need to incorporate sustainable practices in its response to floods, and other disasters (retrieved April 3, 2013 from <http://www.usace.army.mil/Missions/Sustainability.aspx>). This involves developing practices that promote a sustainable use of floodplains, as well as developing flood response approaches that consider long-term environmental and economic effects.

2.5 Inter-Governmental Agency Coordination

The USACE functions as the “*de facto* leader of U.S. flood risk management efforts” and coordinates response and relief efforts between other agencies and stakeholders (Wood et al., 2012). One of the main challenges the USACE faces in these efforts is addressing “multiobjective” needs for each specific community and developing inter- and intra-agency coordination between federal, state, and local agencies and stakeholders (Wood et al., 2012).

Since several agencies participate in disaster response and relief efforts, citizens must rely on these agencies maintaining open communication and shared missions (IEMA Regional Coordinator, personal communication, May 25, 2012). Dirmeyer (2008) comments that the USACE has difficulty managing flood response and other agencies because of its “existence as a bureaucracy” (p. 628). She argues that the USACE places too much emphasis on a centralized approach to disaster response, thus limiting agencies’ abilities to be nimble and respond effectively. However, IEMA Regional Coordinator (May 25, 2012) commented that during a flood, different agencies manage different aspects of mitigation and response. Wood et al. (2012) note that tensions do arise when several agencies work together. Their survey of engineers and planners in the USACE list “limits to resources of the other agency and USACE’s available

resources to partner with that agency, role ambiguity that arises from overlapping jurisdiction, and a history of poor interaction with some partners (particularly FEMA)” as factors that contribute to weak partnerships (p. 1364). As the USACE examines past practices and areas for improvement, there should be consideration on how to best coordinate with partnering agencies at the state and local level. In addition to the need to improve coordination, all of the agencies should consider the best way to communicate flood risk management and post flood disaster plans to the public.

Looking toward flood risk management, the USACE’s efforts might include coordination with agencies that manage other factors that contribute to flooding, such as agriculture and environmental protection efforts. FEMA manages the National Flood Insurance Program and EPA manages cross-state pollutant hazards. It is important to note that climate change is beyond the scope of IEPA; rather it is the national office of EPA that focuses efforts on climate changes (IEPA, Program Communications Manager, personal communication, May 18, 2012), which could pose as an area for more collaboration between the two agencies as it becomes more apparent that climate change and its effects have an impact on the level of disaster to which IEMA is responding. Kettl (2007) discusses the importance of creating open channels between organizations in order to avoid fragmented and compartmentalized expertise. He cites examples of failure to communicate and coordinate between various government agencies and the effect of these failures on government’s ability to effectively manage and respond to Hurricane Katrina and 9/11 (Kettl, 2007). In order to create a seamless coordination process across agencies, FEMA created a National Incident Management Resource Center, which teaches agents the same procedures and ‘language’ (IEMA Regional Coordinator, personal communication, May 25, 2012). During a time of disaster FEMA manages a Joint Field Office, which supports agents

from different agencies in responding to the disaster, gathering data, and preparing their reports. As such, the efforts at disaster mitigation and response are dependent upon the liaisons from each agency (IEMA Regional Coordinator, personal communication, May 25, 2012).

IEMA's flood watch is in part managed by other agencies in that IEMA gathers information from several agencies to determine when a flood is likely to occur. That is, the actual flood watch within IEMA doesn't occur until the agency is alerted to the risk by other agencies. IEMA participates in the strategy, tactics, and planning meetings responding to a disaster; however, they have a minimal role in pre-mitigation efforts, especially efforts pertaining to environmental factors, and a minimal role in post-disaster reconstruction. IEMA is not involved in efforts at reducing environmental factors or flood risk management approaches that influence the severity of a flood. Instead, IEMA receives flood projections and environmental information from the National Weather Service (NWS), IEPA, and the USACE (IEMA Regional Coordinator, personal communication, May 25, 2012). IEMA agents watch the NWS website to follow water levels and when certain levels are reached, predetermined mitigation steps are taken (IEMA Regional Coordinator, personal communication, May 25, 2012).

The IEMA website highlights the steps state and local governments should take to qualify for FEMA funding for mitigation support, through the Disaster Mitigation Act of 2000 (DMA2K). The purpose of these steps is to ensure strong communication between local, state, and federal governments during times of disaster. Mitigation planning should include input from both state and local governments. In fact, in order to receive federal aid, state and local governments must demonstrate cooperation with each other through using the risk analysis designed for each county by the State of Illinois. The State must include local governments' mitigation plans into the State plans. Additionally, the steps outline funding opportunities to

allow states and local governments to implement “pre-disaster hazard mitigation measures” through the National Pre-Disaster Mitigation Fund (Retrieved May 26, 2012 from <http://www.state.il.us/iema/planning/MitigationPlanning.asp>).

IEMA outlines attempts at mitigating disaster post-flood in the Comprehensive Planning Guide (CPG) and the Threat and Hazard Identification and Risk Assessment Guide (THIRA) (IEMA Regional Coordinator, personal communication, May 25, 2012; FEMA, CPG, 2012). The THIRA outlines a step-by-step process to assess the various risks and threats in a community, as well as the community’s vulnerability and capability for handling a variety of threats. Part of the process of the THIRA involves assessing resources available in the community to strengthen the community’s capability to respond to a threat. This process calls for the need to consider partnerships between agencies when examining mitigation steps. The THIRA notes that continuously “...assessing capabilities, plans, and programs and incorporating the results into future THIRAs allows a jurisdiction to manage changes to its risk landscape” (FEMA, CPG, 2012, pg. 2). Additionally, the THIRA emphasizes the importance of considering the full context of a disaster, including possible changes in the natural environment that could affect the severity of a disaster, such as a flood. The THIRA is an example of creating an explicit expectation to create collaboration among agencies.

The THIRA involves a detailed assessment of various contexts of possible threats and hazards, as well as an analysis of the capabilities of a community to respond to new threats. This includes considering the threat in the context of the community, such as, examining whether or not the community is at repeated risk for a specific disaster, or if the community is situated in an area that is particularly vulnerable to a disaster. One of the core capabilities is reducing long-term vulnerability, whose outcome is measured by decreasing vulnerability of infrastructures and

systems (FEMA, CPG, 2012). In the case of floods, this often means costly rebuilding of buildings and other local infrastructure so that it meets new codes developed to reduce damage from flooding (IEMA Regional Coordinator, personal communication, May 25, 2012). As public agents consider the capability of communities to respond to threats, it might be useful to include structural and non-structural approaches to flood risk management. A diverse approach to flood risk management will allow a stronger and more nimble response plan.

Additionally, there are several government programs that aim to assist communities in rebuilding sustainably after a flood. The National Flood Insurance Program (NFIP), which is a FEMA-managed and federally-backed flood insurance program, addresses the need to rebuild communities that are more resilient against future floods. Communities are eligible for the insurance if they adopt and enforce a floodplain management program (Retrieved May 26, 2012 from <http://www.ready.gov/floods>). Part of the Program includes encouraging communities to take “reasonable protective” steps when rebuilding after a flood (IDNR, 2001, pg. 2). The Quick Guide to Floodplain Management outlines how FEMA, the state, and local communities work together to mitigate damage from floods (Floodplain management, 2001). Specifically, FEMA coordinates with the USACE to provide maps and insurance plans, the state provides technical support involving agents from IEMA, IEPA, and IDNR, and the local community provides real-world context and regulates, and pay for, development and reconstruction (Floodplain management, 2001). CPG, THIRA, and NFIP are all programs that demonstrate a growing need to have more collaborative efforts in flood risk management and diversified approaches to flood risk management, especially with an awareness on not just rebuilding communities, but rebuilding them to be more sustainable during future floods.

Another program aimed at assisting communities to rebuild is the National Emergency Grant (NEG), which is housed in the U.S. Department of Labor, Employment and Training Administration. Disaster NEGs can only be awarded to states. In order to qualify for a NEG for a disaster, FEMA must declare the area a disaster that is eligible for public assistance. Initially, the grants are to assist with hiring people for debris removal. After 6 months, states may present a fully documented plan or a modified request for employees who will not return to their workplace after participating in the clean-up activities. These modified grants provide assistance to employees to develop skills necessary to return to the workforce (Retrieved May 26, 2012 from <http://www.doleta.gov/neg/Disaster.cfm>).

In early 2012, FEMA administrators signed the FEMA Climate Change Adaptation Policy Statement (CCAPS), which highlighted the importance of an “Agency-wide directive to integrate climate change adaptation planning and actions into Agency programs, policies, and operations” (pg. 1). Notably, CCAPS acknowledges that weather events affected by climate change could “trigger indirect impacts that increase mission risks” (pg. 1). FEMA is positioning itself to respond to climate change and is aware that these changes will likely affect how they can respond to disasters. The policy statement includes the action of establishing partnerships with state and local agencies in order to share lessons learned and best practices. These partnerships are in their nascent stages, and it will be critical that FEMA continually assesses the partnerships’ strengths. Currently, it seems that IEMA’s role is limited in establishing responses to climate change (IEMA Regional Coordinator, personal communication, May 25, 2012). FEMA has established a policy directly acknowledging increased flood risk from climate change, which has implications for state offices, such as relationship building and data collection. The CCAPS is a relatively new policy and the relationship and communication

structure between FEMA and IEMA regarding climate change isn't fully established. Looking forward, agency administrators should consider a relationship structure that reviews and modifies the process. Ultimately, FEMA might need to create a space for IEMA to develop policies specific to the flood disasters Illinois faces.

The issue of flooding lies within a cross-section of environmental, agricultural, and public policy. One area that IEMA would need to negotiate with is the role that IEPA and the EPA play in efforts to reduce climate change and environmental protection. Currently, the national EPA office is in charge of any policies or projects reducing or mitigating climate change. State EPA offices, such as IEPA, focus more on after the fact events, such as pollutant spillage into a river, as opposed to prevention efforts (IEPA, Program Communications Manager, personal communication, May 18, 2012). It may be worth considering opening a dialogue between IEMA and IEPA about Illinois-specific issues related to agriculture and environment and disaster preparedness.

Although there is an acknowledgement by FEMA and other disaster response agencies that climate changes will likely result in increase flooding, not all of these agencies participate in efforts at reducing climate change. IEMA's role begins and ends with disaster response; any actions taken at future mitigation efforts are beyond the scope of IEMA (IEMA Regional Coordinator, personal communication, May 25, 2012). IEMA relies on and follows efforts and technical expertise from EPA and other agencies in reducing climate change and its effects on flooding. As Kettl (2007) discusses, agencies tasked with the responsibility of responding to disasters must maintain clear and open communication lines between agencies.

Previous floods, such as the floods of 1927, 1993, and 2011, reveal any weaknesses in policies around flood prevention, mitigation, and relief. Kettl (2007) discusses how after a

catastrophe or major event, a “policy window” can open for a particular issue to become a national focus, and even result in revising old or developing new policies. The 1927 Flood Act is a result of a policy window opening after the mayor of Chicago witnessed firsthand the devastation caused by floods. The several major floods in the southern Illinois area have provided policymakers with “windows” to reexamine current policies regarding floods, however, it doesn’t seem that policymakers have taken these opportunities to update flood policies. Meyers and White (1993) note that “the push for mitigation seems to be at its peak only when disasters occur” (pg. 32). Policymakers and public agencies should take advantage of these policy windows to set forth policies and collaborative efforts that will improve flood risk management and response efforts, given that evidence shows that future floods are likely to be more frequent and more severe, in large part due to agricultural use of land, climate change, and growing development pressure on land in flood zones.

CHAPTER 3

METHODS

The data for this paper was collected using qualitative methods, specifically 1) multiple interviews with senior officials at IEMA, IEPA, and IDNR and 2) policy analysis of USACE reports on the history and operational plans of Birds Point Levee. Qualitative analysis was chosen to explore the research questions because as Royse et al. (2010) note, qualitative studies are useful for process evaluations, examining the “*hows* and *whys*” of a program (pg. 84).

The author selected the interview participants based on preliminary discussions with a Illinois Department of Natural Resources (IDNR) official who suggested contacting participant at IEMA and IEPA. The interviews with the IEPA official took place on May 7th (phone interview) and May 14th (follow-up phone interview). The interview with the IEMA official took place on May 25th, 2012 (in-person), May 29th (follow-up phone interview), and June 6 (follow-up phone interview). The in-person interview was conducted in person at the Marion, Illinois Regional IEMA office. As suggested by Royse et al. (2010), an interview guide was used to identify important questions and topics for the in-person interviews with the IEPA and IEMA officials, including the following questions:

- 1) What role does your agency have in flood disaster prevention, response, and relief?
- 2) Is your agency aware of research indicating an increase in flooding in the southern Illinois region?
- 3) What steps or programs, if any, has your agency developed to respond to the likelihood of more flooding in the area?
 - a. If none exist, are there plans to develop any? Why or why not?

- 4) Are you aware of any partnerships between IEMA and IEPA or USACE to respond to flooding disasters?
 - a. Can you describe these partnerships?
 - b. If no partnerships exist, why or why not?
- 5) How does your agency coordinate with FEMA to provide assistance after a flood?
- 6) How does your agency coordinate with the EPA to address the environmental impact of floods?

It is important to note that the interview guide served as only a guide and interviews did cover questions not listed on the guide. The Human Subjects Committee and Southern Illinois University approved the guide and the interview participant signed a consent form, and his name has been withheld from this paper due to the confidentiality statement in the form.

O'Sullivan et al. (2008) note that interviews help researchers learn more about the background of a program, as well as identify any areas within the organization examined that employees or agents think are lacking. Since this project is meant to serve as a needs assessment, in-person interviews and phone calls were selected for data collection because they allow researcher and program evaluators "to learn about the background of the program, its objectives, its processes, its accomplishments, and its failures" (O'Sullivan, Rassel, & Berner, 2008, pg. 194). For this project, the key informants were identified by agency websites. Additional informants were identified through snowball sampling techniques. Agents at each agency identified other individuals who had specific technical expertise in an area related to the paper. For example, the early phase of this project contacted the IDNR, and through that conversation it became clear that the agents at IEMA and IEPA would be more informative and have more insight in regards to this needs assessment. Thus, the following discussion section focuses

primarily on two interviews conducted with one official from IEMA and one from IEPA. The IEMA official was a regional coordinator in the Marion, Illinois office of IEMA. He had previously served in the United States Army. In his position, he was responsible for coordinating all emergency efforts for IEMA in region 11. The informant interviewed worked exclusively at this office and with the counties in Region 11. The informant from IEPA worked at the headquarter office in Springfield, Illinois. She was the program communications officer for IEPA. In addition to the interviews, the agency websites and reports posted online were examined as part of the following discussion, specifically USACE documents pertaining to flood mitigation and environmental impact including *The Mississippi and Tributaries Project: Birds Point-New Madrid Floodway* (2010)

CHAPTER 4

DISCUSSION

As natural factors and human influence have affected the environment around rivers, it has become clear that flood risk management should include efforts at including structural and non-structural approaches. Structural approaches, once the primary flood risk management approach and designed to control the river for navigational and agricultural purposes have failed too many times. Nonstructural approaches advocating awareness of the natural environment incorporate a more comprehensive approach to flood risk management. Similarly, post-disaster reconstruction has also followed the path to more environmentally aware and sustainable approaches. This is illustrated by several government agencies adopting policies that emphasize environmental impact of new construction and reconstruction. For example, the National Flood Insurance Program's requires participants constructing buildings in flood-prone areas to be at a certain level above base flood elevation levels. The USACE is adopting river management approaches that give higher consideration to minimizing environmental impact than previous management approaches. Many of these changes are a result of a growing awareness of human impact on factors influencing the severity of flooding and the natural environment's ability to absorb excess water.

Agents interviewed at Illinois EPA expressed desire for the state EPA to be a part of flood risk management plans and climate policies that affect the river's ecosystem. However, as noted, currently the federal EPA office is charged with leading efforts to reduce the effects of climate change and the state EPA office is focused on helping the state address any harmful pollutants that are released as a result of a natural disaster. Comparatively, the agents interviewed at IEMA indicated that there is no in-house focus on environmental concerns. However, FEMA

has taken steps toward outlining response efforts with a stronger focus on environmental concerns. For example, the THIRA assesses a community's resources, including assessing infrastructures and their ability to withstand flooding. This assessment also considers how future building projects could be more sustainable and environmentally sensitive. The NFIP also includes an environmental component to its criteria. The Program places responsibility on the communities to rebuild in a reasonably sustainable way. In order for communities to successfully rebuild sustainably, input and expertise from public agencies such as IEMA and USACE would be useful and calls for a clear and effective collaboration across multiple agencies.

In addition to THIRA and NFIP, CCAPS presents itself as a way for FEMA to establish itself as a stronger player in reducing climate change. CCAPS is a beginning step of FEMA to acknowledge the impact that climate change has on the level of destruction from a natural disaster. Currently, CCAPS provides a space for FEMA to consider ways to be involved in reducing climate change. Next steps might involve creating communication lines for state-level EMA's to be involved with ways to reduce the effects of climate change in their local areas, as well as provide nimble responses for when natural disasters do occur.

The USACE takes a leadership role in flood risk management and is charged with managing the coordination across agencies in regard to flood risk management. As noted by Wood et al. (2012), there can be tensions between the USACE and partnering agencies. Furthermore, as discussed in the interview with the IEMA agent, there is a culture of operating in "silos" across the responding agencies. As USACE brings a stronger consideration of environmental impact into its flood risk management approaches, it would be beneficial to create more collaborative relationships with federal and state EMA's and EPA's.

As floods increase in frequency and severity, officials representing the agriculture sector, environmental sector, and river management, will need to work together to develop policies and procedures that will have minimal impact across these sectors. The 2011 flood is an example of how flooding is an issue that affects multiple parts of a community, or even across many communities. Although there is evidence that manipulating the river results in increased exposure to risks and hazards from flooding, the reality is that many communities have already built infrastructure based on these land and river modifications. However, plans to build new or rebuild existing infrastructures are designed to respect the river's natural boundaries. These plans are among a growing effort to create more flood-resilient communities.

Interviews and the reports reviewed for this paper raised a major issue, which is the cost of rebuilding after a flood. The NFIP provides insurance to individuals, as long as they maintain their buildings up to code. Several government grants are available to rebuild communities after a flood, but these grants are limited and do not always cover the full cost of reconstruction. An issue for public officials after a flood is not only how to rebuild the community, but how to afford to rebuild it up to code so it is not vulnerable to future floods.

As communities recover from floods, it is helpful to reflect upon actions taken and identify vulnerabilities and capabilities. The THIRA provides communities with a process for this assessment. Through this reflection, it is possible that new "policy windows", as described by Kettl (2007), can open and allow policymakers opportunities to review and assess procedures for floods.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This paper examines how climate change, coupled with affects from human impact on floodplains, is likely to affect future floods in the southern Illinois area. Historically, efforts to mitigate floods and control the river involved structural approaches. Efforts were focused on the use of levees and dykes to control and manage the flow of the river. Over the last 60 years or so, there has been a growing emphasis on using nonstructural approaches to managing the river. These approaches include building and rebuilding in a more sustainable manner and with greater consideration on the natural habitat of the river area.

Looking forward, policymakers and agencies involved with disaster mitigation and response might consider efforts with an even greater environmental focus. It is impossible to eliminate land changes and to completely remove communities and structures built along the river. However, it would be beneficial to consider flood mitigation efforts that acknowledge that the borders of the river are constantly changing, as well as adjust agricultural practices to be more environmentally sensitive. Kenyon et al. (2008) suggest an “agri-environmental” approach to flood control, which would take into consideration the needs of both the agricultural and environmental sectors. This type of approach would include all of the sectors involved in flood mitigation and disaster response and action plans for rebuilding sustainably. The Chicago Climate Action Plan provides an example of how a community is reconsidering its infrastructure in response to climate change. Agencies involved in climate change and disaster management, such as USACE and IEMA, might consider how they can develop joint action plans. These action plans might be particularly useful at a more localized level to address specific local concerns.

In order to develop an approach that is comprehensive, it will be necessary to create relationships across the various sectors. Environmental, agricultural, and disaster response efforts need to involve input from the other sectors. For example, as environmental agencies develop programs to reduce the effects of climate change, they might coordinate with agricultural agencies to ensure that program goals include participation from the agricultural sector. Currently, many of these organizations exist in silos and only collaborate during and immediately after a disaster (IEMA Regional Coordinator, personal communication, May 25, 2012). For example, it would be expensive for IEMA to house a climatologist, instead they work with other agencies to monitor flood conditions. In order to overcome the cost, agencies should consider working outside of their silo and include input from other agencies.

The issue of cost comes up again when considering how communities can rebuild after a flood. The NFIP provides incentive to rebuild in a more sustainable and flood-conscious manner; however, the cost to restructure buildings can be prohibitive for some communities, especially poor and rural communities (IEMA Regional Coordinator, personal communication, May 25, 2012). Local administrators face the issue of paying to rebuild buildings up to code, or risk repeated flood damage to existing buildings. Although there are some federal grants to help communities rebuild, it usually isn't enough to cover the full cost of properly rebuilding the community. Future research might include examining how communities have successfully and sustainably rebuilt themselves after a flood and lessons learned.

REFERENCES

- Carpenter, S.R., Fisher, S.G., Grimm, N.B., & Kitchell, J.F. (1992). Global change and freshwater ecosystems. *Annual Review of Ecology and Systematics*, 23, 119-140.
- Chicago Climate Action (n.d.). Chicago climate action plan. Retrieved April 27, 2012 from <http://www.chicagoclimateaction.org/>.
- Dirmeyer, J. (2008). The futile fight against (human) nature: A public choice analysis of the US Army Corps of Engineers – special focus on Hurricane Katrina. *International Journal of Social Economics*, 35(8), 627-638.
- Federal Emergency Management Agency. (2012, January). *FEMA Climate Change Adaptation Policy Statement*. (2011-OPPA-01). Washington, DC: U.S. Government Printing Office.
- Federal Emergency Management Agency. (2012, April). Comprehensive Preparedness Guide 201: Threat and Hazard Identification and Risk Assessment Guide. Retrieved from <http://www.fema.gov/prepared/plan.shtm>.
- Federal Emergency Management Agency. (n.d.) *Floods*. Retrieved from <http://www.ready.gov/floods>.
- Fritsche, J.R. (2004). *Living on a Mississippi floodplain: Rural occupants' perspectives*. Unpublished master's thesis, Southern Illinois University, Carbondale.
- Galloway, G.E. Jr. (2005). Corps of engineers responses to the changing national approach to floodplain management since the 1993 midwest flood. *Journal of Contemporary Water Research & Education*, 130, 5-12.
- Illinois Department of Natural Resources, Office of Water Resources. (2001). Floodplain Management in Illinois: Quick Guide. Retrieved from http://www.dnr.state.il.us/owr/publications/resman_ilfpmquickguide.pdf.
- Illinois Emergency Management Agency. (2012). Retrieved May 26, 2012 from <http://www.state.il.us/iema/about/> May 26, 2012.
- Illinois Emergency Management Agency. (2012). *Mitigation planning*. Retrieved from <http://www.state.il.us/iema/planning/MitigationPlanning.asp>.
- Interagency Floodplain Management Review Committee. (1994). *Sharing the challenge: Floodplain management into the 21st century*. (ISBN 0-16-045078-0). Washington, DC: U.S. Government Printing Office.
- Intergovernmental Panel on Climate Change. (2007). *Climate change 2007: Synthesis report, Summary for policymakers*. Valencia, Spain.

- Kettl, D.F. (2007). *System under stress: Homeland security and American politics*. (2nd ed.) In *Public Affairs and Policy Administration Series*. Washington, D.C.: CQ Press, SAGE.
- Kenyon, W., Hill, G., & Shannon, P. (2008). Scoping the role of agriculture in sustainable flood management. *Land Use Policy*, 25, 351-360.
- Knapp, H. V. (1994). Physical setup and historical floods on the upper Mississippi/Missouri river systems. In *Governor's Workshop on The Great Flood of 1993: Long term approaches to the management of the Mississippi and Illinois rivers including lessons learned and information gaps*. Springfield: Illinois Department of Energy and National Resources.
- Lincoln Institute of Land Policy. (1994, September). On borrowed land: Public policies for floodplains. Cambridge, MA: Faber.
- Meyers & White (1993). The challenge of the Mississippi flood. *Environment*, 35(10), 7-9; 25-35.
- Olson, K. R. & Morton, L.W. (2012, b). The effects of 2011 Ohio and Mississippi river valley flooding on Cairo, Illinois, area. *Journal of Soil and Water Conservation*, 67(2), 42a-46a.
- Olson, K. R. & Morton, L.W. (2012, a). The impacts of 2011 induced levee breaches on agricultural lands of Mississippi River Valley. *Journal of Soil and Water Conservation*, 67(1), 5a-10a.
- O'Sullivan, E., Rassel, G., Berner, M. (2008). *Research methods for public administrators*. (5th ed.). New York, NY: Pearson Longman.
- Parker, D.J. (Ed.). (2000). *Floods, Volume I*. New York: Routledge.
- Pearcy, M. T. (2002). After the flood: A history of the 1928 Flood Control Act. *Journal of the Illinois State Historical Society*, 95(2), 172-201.
- Royse, D., Thyer, B.A., & Padgett, D.K. (2010). *Program evaluation: An introduction*. (5th ed.). Belmont, CA: Wadsworth, Cengage Learning.
- State of Missouri vs. United States Army Corps of Engineers, Major General Michael Walsh, Colonel Verni L. Riechling, Jr. and State of Illinois and Commonwealth of Kentucky. No.11-1937 (8th Cir. 2011).
- Suhr, J. & Satler, J. (2011, May 3). Missouri levee exploded by U.S. Army Corps of Engineers. *Huffington Post*. Retrieved from http://www.huffingtonpost.com/2011/05/03/missouri-levee-exploded-by-us-army-corps-of-engineers_n_856744.html
- U.S. Army Corps of Engineers, Mississippi Valley Division. (n.d.(a)). *The Mississippi River & Tributaries Project: Birds Point-New Madrid Floodway – Information Paper*.

- U.S. Army Corps of Engineers, Mississippi Valley Division. (n.d.(b)). *Mission*. Retrieved from <http://www.mvd.usace.army.mil/defaultex.php?PID=mission>.
- United States Department of Labor. (2010, March 3). *National Emergency Grants*. Retrieved from <http://www.doleta.gov/neg/Disaster.cfm>.
- United States Environmental Protection Agency. (2001). *Protecting and restoring America's watersheds: Status, trends, and initiatives in watershed management*. (EPA 840-R-00-001). Washington, DC: U.S. Government Printing Office.
- Vitousek, P.M. (1994). Beyond global warming: Ecology and global change. *Ecology*, 75(5), 1861-1876.
- Wuebbles, D.J. & Hayhoe, K. (2004). Climate change projections for the United States Midwest. *Mitigation and Adaptation Strategies for Global Change*, 9, 335-363.
- Wood, M., Kovacs, D., Bostrom, A., Bridges, T., & Linkov, I. (2012). Flood risk management: US Army Corps of Engineers and layperson perceptions. *Risk Analysis*, 32(8), 1349-1368.

VITA

Graduate School
Southern Illinois University

Irene Jessica Upson

upson.jessica@gmail.com (permanent email address after graduation)

University of California, Davis
Bachelor of Arts, Anthropology, June 2004

Research Paper Title:

Examining the Role of Interagency Coordination when Addressing Flood Risk
Management and Flood Disasters in Southern Illinois

Major Professor: Dr. John Hamman