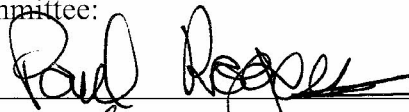


RISK COMMUNICATION: A STUDY OF THE EFFECTS OF ASYMMETRIES IN  
PUBLIC AND EXERT RISK PERCEPTION

by

Katelyn Noland  
A Thesis  
Submitted to the  
Graduate Faculty  
of  
George Mason University  
in Partial Fulfillment of  
The Requirements for the Degree  
of  
Master of Arts  
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Spring Semester 2014  
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Risk Communication: A Study of the Effects of Asymmetries in Public and Expert Risk  
Perception

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## **DEDICATION**

This study is dedicated to the employees of the U.S. Army Corps of Engineers (USACE), who daily face the difficult task of communicating technical risk measures to colleagues, communities, stakeholders, cost-share partners and other audiences.

## **ACKNOWLEDGEMENTS**

Completion of this study would not have been possible without the insightful guidance provided by my Thesis Committee members, supervisors and colleagues at the Institute for Water Resources (IWR), and members of the flood risk management community at the U.S. Army Corps of Engineers (USACE) Headquarters. I would like to thank all that were involved in the process including study participants from the broader USACE community, as well as the USACE Norfolk District, the USACE Baltimore District, and USACE Headquarters in particular. The information and responses provided by USACE employees was invaluable to the study and it is hoped that these findings can be used to the organization's benefit. I would also like to thank family members and friends for their support.

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## **LIST OF ABBREVIATIONS**

1. U.S. Army Corps of Engineers (USACE)
2. Institute for Water Resources (IWR)
3. Federal Emergency Management Agency (FEMA)

## KEY DEFINITIONS

### *Risk:*

1. Risk is the chance of an undesirable outcome in any given situation. It is a measure of the probability and consequence of uncertain future events and it includes: potential for gain (opportunities), and exposure to losses (hazards) (Risk Analysis Gateway).
2. A situation or an event where something of human value (including humans themselves) is at stake and where the outcome is uncertain (Rosa, 2003).

### *Flood:*

The rising and overflowing of water onto an area that is normally dry land (Merriam-Webster). There are multiple types of floods such as flash floods, coastal floods, groundwater floods, fluvial floods, and several others. In each case, the principle remains largely the same: that water is in a place it should not be.

### *Flood risk:*

The exposure of people and assets to floods and the susceptibility of the elements at risk suffering from flood (Karmakar, Simonovic, Peck, Black).

*Risk analysis:*

A framework for making decisions when there is uncertainty. Risk analysis is designed to evaluate the level of risk if no action is taken and the costs and benefits of reducing risks when making decisions. It is designed to address the risks discussed earlier in the course and it is often considered to consist of three tasks: risk management, risk assessment, risk communication (Risk Analysis Gateway).

*Risk assessment:*

A systematic, evidence-based approach for quantifying and describing the nature, likelihood and magnitude of risk associated with the current condition and the same values resulting from a change condition due to some action (Risk Analysis Gateway).

*Risk management:*

The process of problem finding and initiating action to identify, evaluate, select, implement, monitor and modify actions taken to alter levels of risk as compared to taking no action (Risk Analysis Gateway).

*Risk communication:*

Open, two-way exchange of information and opinions about hazard and risk leading to a better understanding of the risk and better risk management decisions (Risk Analysis Gateway).

*Risk perception:*

Subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences. To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome. Perception of risk goes beyond the individual, and it is a social and cultural construct reflecting values, symbols, history, and ideology (Weinstein, 1989). It follows from the specificity and variability of human social existence that it should not simply be presumed that scores and ratings on identical instruments have the same meanings indifferent contexts (Boholm, 1998; Sjöberg, Moen, Rundmo, 2004)

*Asymmetric communication:*

Communication that involves the organization as the expert and the public as the entity needing education. It is based on the concept that the audience is deficient in some area of knowledge and in need of education. The technocratic communication model is also called the deficit model, characterized by asymmetries in power (Hayenhjelm, 2006).

## **ABSTRACT**

### **RISK COMMUNICATION: A STUDY OF THE EFFECTS OF ASYMMETRIES IN PUBLIC AND EXPERT RISK PERCEPTION**

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George Mason University, 2014

Thesis Director: Dr. Paul Rogers

This study aimed to understand the values, beliefs, attitudes and experiences of U.S. Army Corps of Engineers (USACE) flood risk communicators in order to explore the disconnect between the public and expert understanding of risk. This disconnect in understanding of risk has been considered the cause of previous risk communication failures. Surveys and discourse-based interviews were used in order to understand how USACE personnel define risk, consider the public, and how these components impact risk communication practice

# **CHAPTER 1: INTRODUCTION TO THE STUDY**

## **REPORT OVERVIEW**

This report details the findings of a study that explored potential asymmetries of risk communication in the context of a federal government agency responsible for water resources infrastructure projects and programs. This document includes an introduction to the study contained in this first chapter. The second chapter of this document discusses relevant research that informed the study questions and design. The third chapter details methodologies used to examine the topic, as well as some lessons learned when designing research protocols to be used in the context of a government agency. Findings are reported in the fourth chapter of this report. The final chapter discusses results of the study and broader implications for the fields of risk communication, and technical communication and rhetoric.

## **TOPIC INTRODUCTION**

Risk is loosely defined as the possibility that something bad or unpleasant will happen, or as the possibility of loss or injury (Merriam-Webster). Throughout history humans have dealt with risks of all kinds, ranging from the probability that the crops they have in storage are sufficient for survival, to the expectation that waging war against another country will protect their community from loss of sovereignty. Every field and situation



has contextually specific risks; in each case, risk is defined differently and entails varying probabilities that damages will be incurred (Schumann, 2011). Indeed, the definition of risk has monumental implications for how risk is measured, mitigated, accepted, perceived, and communicated.

One risk that humans confront today is the risk of damages posed by flooding. Floods are typically the rising and overflowing of water onto an area that is normally dry land (Merriam-Webster). There are multiple types of floods, but in each case the basic principle remains largely the same: water is in a place where it usually is not. Flooding is a perennial problem, claiming approximately 20,000 lives and adversely affecting at least 20 million people worldwide each year (Kellens, Terpstra & De Maeyer, 2013). In the United States, flooding continues to be one of the costliest and most frequently occurring natural disasters, costing billions of dollars in damages per year and causing thousands of deaths annually (Highfield, Norman, Brody, 2013). Tropical Storm Lee and Hurricane Irene caused over \$1 billion in damages, negatively impacting economies and coastal communities. Hurricane Katrina, Superstorm Sandy, and the floods in Colorado are other recent events that demonstrate the catastrophic damage that can result from flooding. Risks posed by flood events are expected to continue as more of the U.S. population lives in coastal and flood-prone areas and as the intensity and frequency of storms increases. The level of risk that floods pose changes based on the specific event and on the ways in which the event affects individuals, objects, and other related elements (Karmakar, Simonovic, Peck, Black, 2010). Additionally, the perceived risk of a flood event can change based on personal values and beliefs.

Existing research in risk conceptualizes risk through one of two main paradigms: a technical, measured perspective and a more perception-based perspective. Risk in terms of the technical lens can be understood as an objective function of probability, uncertainty, and adverse consequences, by which risk is measured and used to make decisions (Slovic, 1998). In the perception-based lens, risks consist of forces and circumstances that pose danger to people or to what people value (McComas, 2006). Given that individuals have differing values, large variances will also exist in the ways in which people understand risks. Herein lies the problem: the two general lenses for measuring and determining risk do not always align well. Research shows that individuals' perceptions of risk do not necessarily correspond with measurable, quantitative risk (Slovic, 1987). Thus, a public/expert disconnect has existed historically between these two lenses (Siegrist & Gutscher, 2006; Sandman, Miller, Johnson, Weinstein, 1993; Frewer, 2004; Slovic, 1987; Slovic & Weber, 2002; Sandman, 1993; Sandman, Miller, Johnson, Weinstein, 1993). Researchers characterize this disconnect as a gap, or lack of shared understanding; the subsequent relationship between experts and publics often depicts the expert as the entity with the correct understanding of risk, and who view members of the public as needing to be educated in order to align their understanding of risk with the experts', correct definition of risk. This relationship has been coined as the "disconnect," in research and has shaped the development of the field, resulting in two distinct focuses—either on quantitative components of risk, or on the psychological aspects such as affect, emotions, and perceptions (Slovic, Finucane, Peters

& MacGregor, 2007; Finucane, Alhakami, Slovic & Johnson, 2000; Slovic, Finucane, Peters & MacGregor, 2004).

The resultant, conflicting model of risk—utilizing either primarily technical or perception-based frames—has led to ineffective communication, conflict, and even occasional outrage that diminishes publics’ trust in the organizations responsible for mitigating risks, according to research (Slovic, 1987; Chess, 2001). Research suggests those who think of risk technically tend to believe that the public needs to be educated in order to correct risk perceptions and align them with the technical understanding of risk (Fischhoff, 1995; Hayenhjelm, 2006). This approach to risk communication tends to alienate the public and perpetuate risk-communication models in which the publics and the experts are in unequal power positions; the entities considered the experts are typically viewed as having more power in these communication scenarios (Hayenhjelm, 2006). The difference in the way that individuals and scientists understand risk can create an asymmetric communication relationship that can in turn hinder experts’ ability to convince publics to respond appropriately to risks—leading to inaction, financial losses, fatalities, and other consequences. This suggests that the definition of risk can impact communication and interactions between experts and non-experts negatively.

### **PROBLEM STATEMENT AND EXIGENCE FOR THE STUDY**

The analyze how this gap in understanding of risks between publics and experts has resulted in ineffective communication with the public, this study will focus on factors that affect risk communication within the context of a U.S. federal agency with flood- related

missions: the U.S. Army Corps of Engineers (USACE). The study will examine the ways in which the USACE considers public perceptions of risk and takes those components of risk into consideration when developing risk rhetoric. Examination of this issue demonstrated whether—and how—this particular organizational context speaks to the historical “disconnect” in the ways that publics and experts consider risk. This study focused on the technical organization as opposed to members of the public, who are the subject of a majority of research regarding risk perceptions. In understanding the way the organization considers the public, it will aid to determine the most relevant communication model and how that model can hinder or help to deliver more effective communication to individuals at risk.

This study was designed to address what was considered to be a gap between the two primary areas of focus within risk communication research; these include studies that focus on quantitative components of risk, as well as studies that focus on psychological aspects such as affect, emotions, and perceptions (Slovic, Finucane, Peters & MacGregor, 2007; Finucane, Alhakami, Slovic & Johnson, 2000; Slovic, Finucane, Peters & MacGregor, 2004). These two focus areas are sometimes associated with the two groups involved in risk communication: technical experts and non-technical laypeople, respectively. It was felt that these research fields are divergent in many ways and leave a gap where challenges in risk communication could be considered irrespective of methods that purely focus on technical risk or on the psychology of laypeople’s risk perceptions. Thus, this research was designed in an effort to address this gap in research on technical experts in order to consider the way that risk is measured and understood by technical

experts, and how these components impact communication practice. Rhetorical analysis of risk communication also contributes to disaggregated concepts of the public and experts, which have often been viewed as unitary audiences (Schwartzman, Ross, Berube, 2011). This study speaks to this notion by exploring the ways in which risk communicators consider the public—for instance, as a unitary audience or as an audience riddled with different understandings of risk as a result of demographics or other contextualizing factors.

These key problems create an exigency to examine risk communication within the context of a professional organization. As an organization responsible for water resources infrastructure such as levees and dams. The USACE has missions for flood risk management but does not have a direct mission for risk communication; risk communication is a secondary task performed in relationship to projects. Federal organizations have a role in flood-hazard reduction and promotion of national prosperity by reducing human suffering and property damages under the Flood Control Act of 1936 (Scodari, Shabman, unpublished). Since Hurricane Katrina the USACE and other federal agencies have developed new programs and accelerated existing programs to assess and communicate flood-risk-related data and information to communities (Scodari, Shabman, unpublished). In order to gain access to the thoughts, values, and beliefs of the USACE flood risk managers and project managers, it was necessary to use methods conducive to an exploratory study that could gain access to this information. The purpose of this study was to explore the tacit knowledge and beliefs of USACE personnel with flood-risk-related tasks. In exploring the values and beliefs of technical experts, this study touched

on topics such as how risk is defined, the purpose of risk communication, and how a select group of experts in the USACE consider the more subjective understanding of risk that the publics tend to have.

## **RESEARCH QUESTIONS**

This research examined flood risk communication within the context of a government agency in the United States and explored to what degree technical experts within this context take the publics' perceptions of risk into consideration, especially while developing and crafting flood risk communications. Specifically, this study addressed the following questions:

- To what degree do technical experts within the U.S. Army Corps of Engineers take the public's perceptions of risk into consideration when developing and crafting flood risk management related messages?
- How does the inclusion or exclusion of public perceptions of risk affect rhetorical practices?

The study also touched on the following sub-questions:

- What training do risk communicators receive?
- How do technical experts consider audience?
- From the perspective of technical experts, what is the goal of risk communication?

## **RESEARCH METHODS**

To address these questions, surveys and discourse-based interviews with USACE practitioners were conducted. Overall, 46 surveys and 12 discourse-based interviews with USACE practitioners responsible for preparing public risk messages were collected and analyzed using a qualitative analytical framework.

The first phase of this research began with a survey. The survey was sent to internal distribution lists by a U.S. Army Corps of Engineers employee who volunteered to do so as there were perceived institutional benefits to the study. The survey was shared with the flood risk management community, as well as communities that had taken risk communication or risk-related training. Responses to the survey were submitted using Adobe Forms, which captured responses in an electronic document that was submitted by email upon completion. The survey was only sent once, with one reminder email; it was also forwarded to several groups that were not the original target audience, but provided value to the study. The resulting data is reported in aggregate and was coded for qualitative analyses. Attention was given to themes as they emerged and compared to the study questions in order to assess if and how experts consider audience, and whether this was a reflection of suggestions from previous research that definitions of risk impact communication practice.

In the second phase of this project, discourse-based interviews were conducted in order to gain additional insight into thoughts, values, and beliefs of U.S. Army Corps of Engineers risk communicators. Discourse-based interviews were used to gain access to tacit knowledge of individuals performing risk related tasks. Participants were first asked

several questions about their experiences as risk communicators. They were then asked to assess a piece of risk communication. Having participants assess an external source of risk communication revealed how individuals think about risk rhetoric. Their responses to the communication sample helped identify what participants viewed as gaps or strengths in the sample material, and also encouraged respondents to situate their assessments within their own personal experiences. The study sample for discourse-based interview included individuals from the U.S. Army Corps of Engineers Baltimore District, the U.S. Army Corps of Engineers Norfolk District and several employees that work in the organization's Headquarters office and policy divisions. The study sample ranged from four to six professionals from both districts, and four individuals participated at the Headquarters level. Study participants volunteered based on availability. Reflections on tacit knowledge gathered through the research methods in this study were designed to examine how an organization considers its audience, conducts rhetorical practice, and what information or organizational structures informed or impacted that practice.

## **STUDY FINDINGS AND IMPLICATIONS**

This study demonstrated the dynamics involved in developing risk communication as well as the need for a rhetorical approach to the field of risk communication. Interview and survey data was extremely diverse and showed the complexity of both the organization and the task of communicating risks to the public. Although the USACE conducts risk communication as it relates to flood risk management projects, there is no major, official agency regulation on how to conduct risk communication. Some guidance



or general principles do exist, but whether they are enforced is unclear. Additionally, the organizational goals for risk communication are unclear. Data on the training participants reported receiving suggested there is not a set of required training for employees performing risk communication tasks; additionally, beliefs as to whether personal values should be a part of risk communication vary significantly. It was evident that many survey and interview participants had strong desires to create and disseminate effective communication messages, but there was a general suggestion that the organization is not communicating risk as effectively as it could. Additionally, most demonstrated a loyalty to the quantitative or scientific-expert perspective on risk, thereby showing the tension within the organization between its technical nature and its communication requirements. These findings and their implications will be discussed in more detail in later chapters of this document.

This study provides the basis for additional research relating to the USACE's rhetorical and technical communication practice. Researchers have suggested there is a lack of rhetorically based studies that examine risk (Schwartzman, Ross & Berube, 2011; Grabill & Simmons, 1998; Sauer, 2003). There were evident benefits to using a rhetorically based approach such as the ability to examine practice as well as the tools and means for communicating. Future research could focus on the tools used for communication; many participants specifically called out the need for better tools to describe risks to audiences. This study did not touch on tools, documentation, or examine existing guidance in great detail. A future study could build on the findings of this effort by comparing beliefs with documentation and determine the degree to which employees are assimilating to

organization norms, and whether and how organizational structure is impacting risk communication. While this study did provide some insight into communication models, future research could also consider power structures (both within workplaces charged with a risk communication mission and between organizations and the public) in more detail than was done for this study, since that is another factor that can impact an individual's ability to communicate with another party.

## **CHAPTER 2: LITERATURE REVIEW**

### **INTRODUCTION**

Research shows a historical “disconnect” between the publics’ understanding of risk and the scientific understanding of risk, shaping the development of the field and framing it in terms of the public versus the expert (Siegrist & Gutscher, 2006; Sandman, Miller, Johnson, Weinstein, 1993; Frewer, 2004; Slovic, 1987; Slovic & Weber, 2002; Sandman, 1993; Sandman, Miller, Johnson, Weinstein, 1993). This disconnect refers to a gap in understanding of risk information between publics and experts; the difference in risk understandings between the two parties is often attributed for risk communication failures. The gap in understanding includes latent issues such as the definition of risk, perceptions of risk, and prior research and communication practice. Frequently the issue is framed such that experts measure risks empirically, and publics understand risk based on individual perceptions and values. Risk is defined differently between these two generalized groups, creating a source of conflict.

This dichotomous relationship has played a role in how organizations develop and relate to communication models, and theoretical approaches to the problem. This chapter will examine the literature demonstrating this “disconnect” between publics and experts understandings of risk. This section will first define risk based on field research, define risk communication and associated models, explore related studies that demonstrate

issues that arise as a result in a lack of shared understanding of risk, and finally will touch upon studies that inform the methods used in this research study.

### **RISK DEFINED THROUGH RESEARCH**

Risk communication related conflict and failures often seem to be a result of a difference of definition between the communication parties. In the context of this study, a source of conflict is the definition of risk and how this definition impacts communication practice. A basic definition of risk describes it as the possibility that something bad or unpleasant will happen, or the possibility of loss or injury (Merriam-Webster). Risk has undoubtedly been an ever-present part of the human existence whether it includes risks imposed to survival, financial risk, or personal emotional risks. In each situation, risk is defined and mitigated differently. Researchers suggest a multitude of definitions for risk that include varying content. Most suggest risk can mean expected loss, probability of loss, or any situation where something of value to an individual is at stake and the outcome is uncertain (Rosa, 1998).

Risk has been defined as forces and circumstances that pose danger to people or what people value; risk is also described as the “likelihood or probability of loss occurring” (McComas, 2006). Another definition suggests risk is an objective function of probability, uncertainty and adverse consequences (Slovic, 1998). Each component of the definition can be given a numerical value so that the relative risk can be measured in order to inform decisions to mitigate this risk. An online educational risk resource defines risk as the change of an undesirable outcome; it is a measure of the probability and

consequence of uncertain future events (Risk Analysis Gateway, 2009). Many of these definitions provided through research include probability or likelihood of an event and loss or harm to something of value. A popular equation used to conceptualize the probability of risk occurring is described as the following:  $\text{risk} = \text{probability} \times \text{uncertainty}$  (Covello; Sandman, 2012; Risk Analysis Gateway, 2009). While this equation does not assist in measuring the probability of certain risks, it is used as a frame for risk managers to assist them in understanding components that go into managing and mitigating the impacts of risks. However, it is interesting that by using this equation as a framework, risk necessarily becomes a mathematical consideration with numerical values.

While many of these definitions deal with loss of something that can be given a numerical value, some researchers advocate for a more subjective and value-laden understanding of risk (Slovic, 1998). Slovic asserts that “risk judgments, are to some degree, a by-product of social, cultural and psychological influences” as opposed to being objectively measured phenomena (Slovic, 1999). Geography, sociology, political science, anthropology and psychology also contribute to this more subjective consideration of risks (Slovic, 1987). Studies that examine the psychology of risk have shown that risk perception and acceptance have their roots in social and cultural factors, implying the definition of risk would differ vastly from person to person, as opposed to a definition or measurement that innately exists (Slovic, 1987). The concept that risk is purely values-driven seems to contradict the notion of giving components of risk a numerical value in an equation. From this research perspective, risk is a socially constructed concept comprised of physical processes as well as social systems and the actors that play a role

(Cvetovich and Lofstedt, 1999; Leiss, 1996). Such a definition again seems to not align well with an equation-based understanding of risk since this would require giving numerical values to loss of life, or other similar elements.

This perceptions-based definition makes up an extensive section of risk research, some of which suggests that non-expert audiences consider factors such as risk voluntariness, controllability, catastrophic potential, scientific understanding, and effects on future generations (Slovic, 1987, 1999, 2000). This proves to be a multifaceted definition of risk including aspects beyond measurable probabilities. Additionally, much research separates publics and experts, and suggests that experts typically align with a technical understanding of risk, while publics demonstrate nuanced, and value-driven definitions. In order for an organization or experts to understand the publics' risk perception, numerous factors would have to be considered and accounted for that typically is not from a technical standpoint. Cultural and probability based risk perceptions are not mutually exclusive; however, a body of research suggests that in many cases in the last 20 to 30 years, they have been. This is the underpinning of the public versus expert "disconnect," that is depicted in research and that seemingly results from the difference in definitions and resulting perceptions of risk. Some researchers suggest that defining risk is a political act in and of itself since defining risk inherently suggests it is the definition others should accept and adhere to (Beck, 2007).

There is great political power in being able to define what is risky since it stands that whoever has the power to define risk also holds the rational solution (Beck, 2007). This would put any opinion or understanding that is not in accord with the given

definition as invalid and needing to be corrected. Some researchers suggest this is why science was granted a greater influence in recent years since the field was able to define what was too risky and mitigate without necessarily involving the affected parties (Chess, 2001). Others have said they deliberately avoid the traditional “risk is likelihood times consequence” probabilistic definition of risk since it tends to suggest a strictly quantitative interpretation and would draw criticism as a result (Vlek, 2013). This recent apprehension to rely too heavily on a technical definition of risk could be reflective of changes derived from public outrage following massive crises and disasters that cause publics to question experts. This is a trend identified in the 1970s and 1980s as well.

### **A Difference in Definition as Evident through Crises and Disasters**

Effective communication, or lack thereof, can have a major bearing on how well people are prepared for disasters and dealing with risk (Kellens, Terpstra & De Maeyer, 2013). Added, publics’ perceptions of risk as well as the organization itself can impact the way information is received. While multiple organizations and agencies have made efforts to communicate technological and environmental risks to affected parties, research suggests it has often been the case that publics are not always readily accepting of this information as presented for a variety of reasons (Chess, 2001). One reason is the fact that organizational experts communicating risk understand and measure risk differently than the average individual does, which in turn affects the way risk communication is conducted (Siegrist & Gutscher, 2006; Sandman, Miller, Johnson, Weinstein, 1993;

Frewer, 2004; Slovic, 1987; Slovic & Weber, 2002; Sandman, 1993; Sandman, Miller, Johnson, Weinstein, 1993).

Historically, organizations and corporations have held the power to define what risk is and what level of risk the general population should accept (McComas, 2006). However, during the 1970s and 1980s, there were multiple crises that researchers suggested called into question the authority of technical experts. Some of these events include the “Love Canal,” a Niagara Falls, New York, neighborhood where 21,000 tons of toxic waste were discovered buried beneath neighborhood homes; the Three Mile Island nuclear accident in Pennsylvania; and the Bhopal, India, disaster, where thousands died from accidental release of hazardous chemicals” (Rowan, 2010). While these events included failures and crises, there were also significant links to the development of technology. Slovic claimed that developments in technology actually led many individuals to become more concerned with risk instead of less because of the “unfamiliar and incomprehensible” applications of nuclear, chemical, and complex technologies (Slovic, 1987). These crises in the 1970s and 1980s were significant not only because they led to the development of regulatory bodies such as the Environmental Protection Agency, but also because such events brought to question experts’ trustworthiness, and also began to highlight a difference between a group of experts’ definition of risk, and the affected publics’ definition. (Rowan, 1991; Chess, 2001).

Crises in the last ten years such as the terrorist attacks of September 11, the earthquake in Haiti, the Japanese tsunami and nuclear power plant meltdown, and Hurricane Katrina have raised similar questions about risk and crisis communication as



previous events did; these recent events also highlighted how risk perceptions heighten during and decline after an event, which is another factor that could impact the communication of risk (Slovic & Burns, 2012). These various crises, failures and events are important to note since they have an impact on the way technical organizations are perceived or trusted. It was suggested by researchers that technical organizations involved in some of the events in the 1970s and 1980s lost legitimacy in the public eye, as well as trust (McComas, 2006). Given that there was a lack of trust after these events, there was a prioritization of risk communication, which researchers imply was not the case prior to these multiple large-scale environmental disasters (Chess, 2001). The waning confidence in technical organizations during this time had a major bearing on how risk communication was approached, and began to highlight a difference in definition and understandings of risk. These differences in definitions seem to be what researchers consider a part of the expert-public dichotomy is the field of risk, where the two entities seem to be on very different spectrums and understandings when it comes to risk.

### **DEFINING RISK COMMUNICATION**

Crises such as those mentioned in the previous section had a major impact on the way risk communication has been defined and approached by many organizations. Research suggests risk communication has been conducted largely in response to events and subsequently evolved without the benefit of a theoretical framework, largely relying upon rhetorical approaches (Chess, 2001, Grabill & Simmons, 1998). As a result, there are

numerous definitions and models used to communicate risk. One such definition describes risk communication as any purposeful exchange of information about health or environmental risks between interested parties (Covello, Slovic, Von Winterfeldt, 1988). This definition uses the phrase “exchange of information,” which implies that information is flowing to and from senders and receivers, as opposed to messages only being sent to the receiver, with no feedback loop. Risk communication in this case is seen as the act of conveying or transmitting information between parties. Interested parties can include government agencies, corporations, unions, the media, scientists, professional organizations, interest groups, and individual citizens. Risk communication definitions vary among groups and agencies.

A definition in a U.S. Army Corps of Engineers white paper suggests risk communication is an “open, two-way exchange of information and opinion about hazards and risks leading to a better understanding of the risks and a better risk management decision” (USACE). This definition again implies that information is moving to and from receivers. There is also an implicit goal embedded in this risk communication definition that suggests the goal is to improve understanding of the risks as well as to make better decisions to manage that risk. This definition is interesting since it suggests the two-way flow of information can lead to this better decision. This concept may have been implied in other definitions discussed by researchers, but it is not blatantly stated in most cases. An additional common definition describes risk communication as the “process of conveying to interested parties the outputs of the various stages of risk analysis and risk management” (Fiksel and Covello 1987). This definition differs slightly

from previous definitions since it focuses on conveying information to interested parties, instead of sharing information in a two-way communication scenario. This evident difference in definitions between what is considered a one-way versus two-way communication captures a larger issue evident in risk communication literature.

### **Impacts of One-Way Risk Communication Methods**

When viewed as a conveyance of information, risk communication begins to become a one-way communication method where information flows from sender to receiver and stops. A similar description of risk communication frames it as the process where experts inform the public about the decisions that have been made through risk analysis and management (Rowan, 1991). In this approach to risk communication, decisions are made about risk without involvement or communication with affected parties in some cases. Such communication methods are sometimes referred to as deficit or technocratic models of risk communication, where the communicator's goal is to persuade the audience to accept their message. The deficit model aims to convince opposing parties to accept a certain fact. In the case of early risk communication, technocratic risk communication focused on encouraging publics to accept technology, while more recent risk communication has focused on restoring public trust in organizations' ability to manage risk (Frewer, 2004).

The deficit model is built on the assumption that the public is deficient in its understanding of scientific risk (Frewer, 2004). Researchers suggest that the peoples' risk perception often reflects a higher concern for low probability high consequence events,

whereas technical experts tend to give equal weight to probabilities and magnitudes of a given risk (Renn, 1992). In other words, these researchers are suggesting that non-experts focus on risky events that are not as likely to occur, but have a higher risk of loss, whereas experts weigh risks proportionately. Similarly, some researchers' suggestion that risk perceptions heighten during and decline after a crises event, suggest that the heightened risk perceptions also do not align with a probabilistic measurement of risk (Slovic & Burns, 2012). Some suggest that scenarios where the understanding of risk is not aligned between involved parties led to expert entities treating publics as under-informed parties as opposed to making them as partners (Grabill and Simmons, 1998). Considering publics to be deficient and needing to accept the correct risk perception demonstrates the way in which a difference in definition of risk can lead to misunderstanding and potential conflict.

The deficit model for risk communication most resembles the Shannon-Weaver communication model, since it is typically a one-way flow of information from sender to receiver, where entities such as the media could cause “noise” that can misconstrue and affect the message. The goal of the communicator is to deliver the message with the least amount of noise possible. Specific to risk communication, this model is designed so that an expert can educate an individual in order to align the understanding of risk with the expert definition of risk (Rowan, 1991). This risk communication model is often discussed as the asymmetrical communication model, where the power lies with the expert entity delivering the message, leaving the public without any power to decide what level of risk is acceptable. Risk communication is often framed in this way: as a response

to gap in risk perception between experts and public (Hayenhjelm, 2006). This understanding of risk communication is vital for considering how an organization may take into account public perceptions of risk, or provide evidence for a conclusion that an organization's goal for risk communication is not to account for public perceptions, but to correct them. This demonstrates the way differences in definitions of risk can create a domino effect, impacting risk communication practice, and responses to any risk message through the risk communication process.

### **Why Discrepancies in Definition Matter**

Research over the past few decades indicates that scientific experts define and evaluate levels of risk differently from non-experts (Fischhoff, Watson, Hope 1984). This separateness of definition led to a dichotomy aforementioned in this document between the public and expert. These differences in understandings of risk are perceived as areas where communication breakdowns can occur (Slovic, 1987, Schwartzman, Ross & Berube, 2011). In case after case, it has been suggested that discontent with expert knowledge arises when expert accounts of physical reality conflict with local people's knowledge; researchers suggest that experts often view the public as incapable of grasping the language of science and therefore liable to make poor decisions based on misapplied values and misplaced priorities (Young & Matthews, 2007). Although it is evident no audiences of risk communication will have the same set of assumptions or enthymemes, there seems to be a belief evident in research that publics should draw on

the same assumptions (Sauer, 2003). These differences in assumptions drawn upon by the communicator, the experts, and the publics can be a source of disagreement.

Researchers suggest the conflicts that arise between experts and publics are not a result of public ignorance or irrationality, which is sometimes considered the case. Instead, they are a result of public “sensitivity to technical, social, and psychological qualities of hazards that were not well-modeled in technical risk assessments” within a democratic system (Slovic, P., 1993). Most of these conflicts between publics and experts are in fact a result of differing definitions and understandings of risk, causing parties to ineffectively communicate (Slovic & Weber, 2002). The ineffective communication practice seems linked to a lack of understanding or consideration of audiences’ definitions of risk. Added, there is agreement among scientists and policy makers alike that publics tend to react emotionally or viscerally to complexity and are considered incapable of comprehending uncertainty surrounding natural and environmental issues (Garvin, 2001). Meanwhile, publics perceive policy makers as not acting in response to risk perceptions, and accuse scientists of using inaccessible language and failing to provide absolute answers. Ultimately, it can seem as though the risk communication players are not using the same language, each relying on their own discourse and agreed-upon conventions (Garvin, 2001).

An example of the impacts a gap in understanding of risk between involved parties can have can be seen with Hurricane Katrina when government officials involved failed to understand subjective risk factors necessary to perform effective risk communication (Cole, Fellows, 2008). Although experts provided the technical

information about the danger of the levee system breaching and failing, researchers suggest the communicators failed to give actionable directions to individuals in a timely manner. Risk communicators failed to convince citizens that it was necessary to evacuate (Cole, Fellows, 2008). Similarly, Congressional leaders also were informed the levee system was bound to fail, but did not take action to prevent the losses that would result from the flood event (Cole, Fellows, 2008). This suggests that a goal of risk communication should be to encourage message recipients to take certain actions, which could serve as a metric in considering the effectiveness of risk communication. This flood event also demonstrates the claim that evidence alone will not persuade audiences and exemplifies the way in which the players in risk communication can be speaking different languages and misinterpreting audience, which can in turn lead to negative consequences (Sauer, 2003).

Underlying differences in assumptions, language, and understanding of audience are areas that can be addressed with rhetorically based approaches to risk communication. Rhetorical strategies for risk communication should address belief, systems, fear, values and other factors involved in communications about risks (Sauer, 2003). Further, many researchers suggest risk communication approaches thus far have decontextualized risk and fail to consider social factors that influence public perceptions of risk. This assumes that experts and publics have different perspectives that form their definitions of risk. Additionally, these researchers attribute risk communication failures to a lack of consideration of audience, and a failure to recognize risk as a socially constructed concept. This leads to an artificial separation of risk assessment and risk communication,

expert from public, which can cause risk communication failures (Grabill, Simmons, 1998). Social scientists call for more reflexive approaches to controversial questions in science and risk, but the theoretical frames provided by social scientists do not address the rhetorical problems policymakers face when attempting to manage disasters and deal with risk related events (Sauer, 2003). A more “rhetorized” approach to risk might take up some of these issues, since such an approach would consider organizational power structures, message channels, communication exigency and audiences’ underlying enthymemes and those enthymemes implications for risk communication (Schwartzman, Ross & Berube, 2011).

### **THEORETICAL GROUNDING**

One notable problem with risk communication is that while research is diverse and multidisciplinary in nature, and thus draws from a well-rounded pool of knowledge and expertise, the field suffers from few integrative theoretical frameworks that make it difficult to centralize or to capitalize on this knowledge (McComas, 2006). Parsing the academic literature across different disciplines, it is not always made clear how different theories and practices of risk communication are connected. There has generally been an atheoretical focus, in addition to being arhetorical, for risk communication and associated research. Different communities with a common interest in risk communication typically talk past one another, being divided by their own particular outlooks, understandings and experiences (Horlick-Jones, 2008). The assumed difference between experts’ and publics’ understandings of risk has led to what is referred to as the dichotomy and



disconnect evident in research and practice. In addition to shaping risk related research and practice, the gap in understanding of risk evident among experts and publics has led to ethical questions as to who is defining risk, since whoever controls the definition of risk also controls the rational solution to the problem (Slovic, 1998).

### **Unequal Power Relations in Communication Practice**

The concept that those that hold the power to define risk also determine how to manage risk has had a profound influence on primary communication models used in reference to risk. These models exemplify the theoretical underpinnings for this study as they highlight the way the differences in definition, and subsequent communication methods reflect the unequal power distribution evident in communication practice. Two resulting communication models have developed as a result of the public-expert dichotomous relationship, and, in fact, seem to continue to impact the field. These communication models include the technocratic model, which was previously discussed, and democratic communication. The technocratic or technical model is based on statistics; typically, lay concepts of risk are viewed as obstacles to be overcome so the correct expert view of risk may be understood or adopted (Rowan, 2010). Experts hold the power to both define risk and mitigate the risk in this communication model, which is particularly evident in the way layperson definitions are largely discounted or disregarded as unreasonable. Some researchers characterize this communication method as an asymmetrical model, since it relies on an unequal relationship between involved parties (Hayenhjelm, 2006). Asymmetrical communication largely involves the organization as the expert and the

public as the entity needing education. It is based on the concept that the audience is deficient in some area of knowledge. Such asymmetries in communication practice bring to question ethical considerations and could perpetuate distrust, inadequate risk understanding, and lack of action from audiences to manage risks.

In technocratic communication, power clearly lies with the organization or expert, but this role can be reversed, giving the public more power over the definition of risk and the organization responsible for managing risk (Hayenhjelm, 2006). Such practice is referred to the democratic model, which focuses on avoiding one-way expert to public communication and instead focuses on creating symmetric two-way communication, combining symmetric purposes with a two-way process (Hayenhjelm, 2006). A two-way purpose implies shared understanding between involved parties, as well as flow of information to and from senders and receivers, as opposed to the technocratic model where information flows from sender to receiver and stops. This two-way approach is considered to be a more interactive relationship between experts and public that helps to remediate the lack of trust individuals sometimes have in risk officials. Research seems to suggest this lack of trust could be linked to more technocratic approaches, where information flows one-way and does not provide an opportunity for involvement in an interactive relationship. Some contexts are more appropriate for the one-way dissemination of information approach, such as during major crises where organizations are expected to tell citizens when the event may occur and how to protect themselves. However, many argue the democratic, two-way communication model generally grants all parties involved equal roles since it is based on a shared understanding, as opposed to

an effort to mitigate deficiencies in knowledge. In this respect, a symmetrical, democratic approach seems more ethical than technocratic and asymmetrical risk communication models.

However, while risk communication is “often framed in terms of being technical and one way or democratic and two-way,” some suggest there always remains an underlying asymmetry within the process of communicating risk (Hayenhjelm, 2006). This is based on the concept that whoever controls the definition of risk and therefore the epistemological frame will have more power. To understand these structures in the context of any specific risk communication situation, one can identify risk communicators’ most common goals by analyzing the context of the communication situation. Further, risk communication situations can be viewed similarly to all communication situations: they include sources, receivers, messages, channels and contexts, as well as power structures (Rowan, 2010). Risk communication is in fact largely a sender-message centered relationship (Reynolds & Seeger, 2005). In this respect, there is evident value in using rhetorical principles in order to understand the context in which risk communication occurs, and how power structures, differences in audiences and goals, and the intended purpose greatly impact and provide a frame to understand risk communication practice that is not always evident in current field research.

## **RELEVANT STUDIES**

Field research on risk communication takes place in multiple disciplines, demonstrating the multidisciplinary nature of risk communication. Two key areas where research takes place include psychology, and math and engineering based fields. Math and engineering based fields focus on quantifying risk and understanding probabilities of events occurring. This research was consulted for this study, but did not serve as a primary basis of research in the same way the psychology discipline did. Psychological research tends to focus on understanding how individuals perceive and understand risk in order to improve risk communication. This specific branch of research developed seemingly in response to outrage following environmental and technological concerns in the 1970s and 1980s and has continued to expand as citizens are subject to additional hazards such as tsunamis, hurricanes, terrorist attacks, among others. There are countless studies that consider how publics perceive and understand risks, and flood risks in particular. While these studies do not directly mirror this study, they inform consideration of the study problem and subsequent methods chosen to consider how experts think about and consider the public in their risk communication efforts.

One such study conducted in the early 1990s considered how the public's perception of risk could be changed so that the number of flood-related deaths, and amount of flood-related damages could be lessened. The researchers assumed that clear and understandable communication would aid in reducing the amount of flood related deaths and damages, and used a mental models approach in order to explore the topic. A mental models approach in its most basic definition is the attempt to explain someone's thought process in terms of a real world context. Mental models can shape an

understanding of individuals' behaviors. To understand people's behavior and reactions to floods, the researchers interviewed residents in three Pennsylvania flood-vulnerable communities, and developed a diagram of experts' influence to capture the expert view of risk. The researchers found that individuals interviewed knew relatively little about floods (Lave & Lave, 1991). These findings were intended to inform risk communication practices and develop a better method for risk managers. The study was beneficial in that it provides an exigency for audience analysis and an understanding that audiences' thought process may not align with experts' views.

Researchers Atman, Bostrom, Fischhoff, and Morgan similarly explored risk communication using a mental models approach. The researchers were concerned with how they could assist individuals with making decisions about risk. The researchers suggest the purpose of risk communication is to complete a recipient's mental model of the relevant risk processes. In other words, risk communication should serve to inform and educate an individual such that the communication defines the individuals understanding of the topic. The researchers conducted a two-phased study in order to explore this topic (Bostrom, et al. 1994). In the first phase, researchers used think aloud protocols, textual analysis, true/false and multiple-choice tests. The methods used included mental models interviews about the topic, followed by a think aloud session as the study participants read a brochure. These methods were chosen in order to gain access to individuals' thoughts, values and beliefs, and using a risk communication product as a point of comparison in order to assess its effectiveness in completing an individual's mental model with risk communication.

A key take away from the first phase of the Bostrom et al. study was that stating facts alone is unlikely to correct misconceptions that belong to readers' initial mental model. This concept was present in other literature on risk communication, highlighting the need for more involved communication practice that does not limit communication to the conveyance of technical information to the message receiver. The second phase of the study considered how risk managers could implement a mental models approach and what content and organization is most likely to help risk communication recipients make decisions about risk. Reliance on the mental models approach implies a lack of a full understanding on the publics' part. The researchers used refined research methods from the first phase of the study including textual analysis of two risk brochures to determine whether individuals felt brochures were incorrect, indiscriminate, peripheral, or overly specific to suggest improvements to the brochures and related risk communication. Using text and documentation as a source to consider the effectiveness of risk communication is a very practical approach to determine components that make for success or failure in such messages, while also demonstrating the ability of these methods to gain access to individual beliefs, and potentially ascertain information on how risk is defined.

Interviews and surveys are both research tools designed to gain access to this type of information. Research conducted by Eisenman, Cordasco, Asch, Golden and Glik relied on surveys and interviews to explore what causes people to evacuate in some areas impacted by a disaster, but not others. Interviews and surveys provide access to personal values and would grant access to opinions that would inform an understanding of what motivates actions in response to risk. These researchers relied upon grounded theory for

the study and interviewed randomly selected individuals from three evacuation centers in Houston, Texas. Study participants were predominately low income African Americans from New Orleans with strong ties to community groups that influenced factors affecting evacuation such as transportation, shelter, and perception of evacuation messages. Researchers found these social connections both assisted and hindered evacuation decisions, suggesting that individuals' decisions to reduce risk are influenced by those around them. Again, the study demonstrated the way surveys and interviews lend themselves to understanding individuals' beliefs and the link of those beliefs to action, or inaction. This study also echoes sentiments from the broader research field that a key goal and metric of risk communication success is based on whether audiences take actions in response to the risk communication.

Differences in risk perceptions based on ethnicity, priorities and community ties was the focus of another study conducted by Greenberg, who was interested in what risk management priorities of Asian Indian Americans were with regard to environmental, personal/family and violent risks, and how they compare with New Jersey citizen counterparts. The study suggests that Western and non-Westerners have different risk perception priorities, affirming the findings evident in other studies discussed in this chapter. The researchers conducted surveys to examine risk management priorities for government, trust, personal efficacy and demographics. This particular research method allowed researchers to better understand a larger section of the community in order to inform experts' responses to community outrage. The concept that risk is defined differently based on social issues is highlighted by this research since often individuals of

different ethnicities and in different areas were thinking about flood risk in different ways. This study highlights the importance of considering audience, as well as discussing the role trust plays in community actions and acceptable of risk.

Community outrage is in fact a common research motivator. Researchers suggest communities become outraged as a result of organizations making risk related decisions without involving the affected community, leading to a lack of trust. One such example of this is evident in Blythe, Grabill and Riley's action research in a community where the U.S. Army Corps of Engineers planned to dredge a channel and dispose of toxic material in a facility near two schools. Although experts determined the material was not harmful to the students at the schools, the community perceived the risk to be much higher and became so outraged that the project was significantly delayed. Trust was a key factor in this scenario since the community did not want to merit experts' risk communication as a result of previous communication. The researchers' goal was to develop relationships with local community members and work on "new communication models in order to facilitate communication and education in the community."

The researchers examined public documents, observed public and organizational meetings and conducted interviews. They suggest that since the citizens believed they lived in a politically corrupt community, they were inclined to assume scientific corruption as well. Blythe, Grabill and Riley suggest that no choice is risk free, each subject to multiple interpretations. This study speaks directly to the public and expert gap in understanding of risk that many other studies examine. A primary issue the researchers found was that organization representatives failed to understand their audience, which



caused them to act and treat community members inappropriately. The community's anger about the risks imposed by the U.S. Army Corps of Engineers' decision was not alleviated as a result.

In many cases, it is suggested the risk communicator misunderstood the audience in some way, which caused further conflict. It is for this reason that so much research conducts a type of audience analysis by seeking to understand how individuals perceive and define risks in comparison to the way experts and organizations understand and measure risks. While there is no shortage of studies that examine the issue in this frame, there are few that examine the way experts consider and define risk. Researchers Young and Matthews reverse the common emphasis in risk literature on public understanding of science by examining the "experts understanding of the public." The researchers were interested in understanding how the public is constructed among expert populations and whether publics were considered passive receptors of scientific knowledge and claims, or as powerful challengers to the authority of expertise and contributors to the contours of knowledge controversy. Surveys were used to conduct the study since they allowed conducting research with a larger population. However, researchers did suggest that this research method is inflexible in terms of capturing deep ideographic explanations. Young and Matthews argue that swings in "experts' views of the public coincide with issues of control over knowledge." The methods the researchers used as well as the theoretical frame are particularly valuable and informed my study.

Although many of these studies examine perceptions of risk, few focus explicitly on rhetorical components of the problem. While rhetorical practice does seem embedded in

many studies, research on risk perceptions highlights the way risk communication has developed mostly without a direct rhetorical or theoretical influence. So often, risk communication best practices prescriptions were developed after agencies and organizations had to respond to disasters, or system failures (Richardson, 1996). This toolbox of communication best practices developed through psychology based studies and experience permitted risk communicators to draw from a body of techniques without necessarily being aware that these adopted techniques bear imprints of the fields they come from (Richardson, 1996). Overlooking the relevance technical communication and rhetoric provide to this issue of gaps in risk perceptions and subsequent communication failures have been a major trend in examining relevant research. It is believed that such approaches provide values that can shed light on the degree to which experts are granting consideration to non-technical audiences' risk perceptions. By employing methods and findings from prominent research fields, this study will draw upon a field of research that demonstrates a persisting difference in experts' and publics' definitions of risk that has led to unequal power relations, reliance on one directional communication, and general failure in convincing audiences to take the appropriate actions to manage risks.

## **CHAPTER 3 RESEARCH DESIGN**

### **INTRODUCTION**

This research considers the historic disconnect between experts' and publics' as a result in gaps in understanding and definitions of risk. Although much research in this area focuses on how publics perceive risk to develop improved communication processes, this study will instead examine the experts' understanding of risk and how the definition of risk affects the way experts perceive and communicate with publics within a specific context. Rhetoricians argue there is a more contextually based approach to understanding audience that is overlooked by risk communicators. This study was designed to include methods structured to better understand the context in which communication takes place, and to gain access to a target population's thoughts, values and beliefs to explore how individuals responsible for measuring and communicating risk understand their audience. The goal of this study is not only to examine this relationship, but also to highlight areas for future research that could assist in creating more cohesive and rhetorically based risk communication practices that take into consideration audience and creating a shared understanding of risk.

In order to explore risk definitions and communication practice within the U.S. Army Corps of Engineers (USACE), this study employed a survey protocol as well as discourse based interviews, both structured in an effort to better understand how the

definition of risk within this context impacts the way risk communicators perceive and communicate with their target audience. Data and information accessed through this study will be examined using rhetorical approaches and considered in relation to prior research that suggests risk communication practice tends to be asymmetrical, granting the expert party more power, which leads to conflict. This chapter will expand upon the research methodology and methods used, the study timeline, the target population, and hypothesized results. Study limitations as well as steps taken to alleviate ethical concerns are also briefly discussed.

### **ORGANIZTIONAL CONTEXT AND STUDY BACKGROUND**

For this study, I examined risk communication within the context of the U.S. Army Corps of Engineers (USACE), an organization responsible for water infrastructure such as levees, dams and other related structures. The USACE has missions for flood risk management, but does not have a direct mission for risk communication; risk communication is a secondary task performed relating to various projects. These projects require some interaction with public audiences for planning and construction; some requirements do exist for interacting with publics such as through the National Environmental Policy Act (NEPA) processes. The USACE is not the only federal agency with a flood related mission. Several federal organizations have a role in flood hazard reduction and promoting national prosperity by reducing risks and property damages under the Flood Control Act of 1936 (Scodari, Shabman, unpublished). Since Hurricane Katrina, the USACE and other federal agencies have developed new programs and

accelerated existing programs to assess and communicate flood risk related data and information to communities (Scodari, Shabman, unpublished).

While the USACE conducts risk communication as it relates to flood risk management projects, there is little guidance requiring risk communication. Some suggested best practices in risk communication exist, but it is unclear whether these practices are used broadly in the organization. There are several educational courses and ongoing efforts to improve communication practices. However, the organization is so large that it seemingly does not have a unified and consistent approach. Additionally, the organizational goals for risk communication are unclear. Further, existing guidance tends to focus more on how the organization thinks about and measures risk related to water infrastructure projects; this type of guidance does not typically include information that signifies to USACE employees the differences that arise in publics' perceptions of risk. In this context, risk is defined as the probability that an area will be flooded, which results in undesirable consequences (ER 1105-2-101, 1996). The focus in this context tends to be determining the probability that an event will occur; mitigating the flood risk that remains after a flood risk damage reduction project is in place; and determining the best decision based on what will eliminate the most risk. The heavy focus on technical definitions of risk provides an important context for considering risk communication practice, and also aids in understanding the knowledge base study participants draw upon for their understanding and beliefs as they relate to the problems identified through this study.

## **Target Population**

This research focuses on a specific community of practice within the USACE. Many members of this community have a different background and associated expertise, but in general have responsibilities that relate to determining the probability that certain risks will occur and result in negative consequences; this is similar to the conceptual understanding of risk identified in existing USACE guidance. This community also has the secondary task to communicate the measured risk to multiple populations, including superiors and team members within the workplace, stakeholders such as Congress, other federal, state, tribal and non-governmental entities, and more importantly, individuals who will be affected by the risk. Given that this study considered risk communication within USACE, it was necessary to limit the study scope to consider a few communities of practices with risk related experiences and responsibilities in a particular field, since nearly every business practice in the organization contains a risk component that can be measured, mitigated and communicated. The distinction of flood related risk duties was used to narrow the study scope, which led to the focus on the flood risk management community. This study touches on additional communities of practice such as former students of risk related training courses, and the public involvement community of practice members.

## **KEY STUDY QUESTIONS AND DATA SOURCES**

In examining these communities, the research will explore the degree to which technical experts are taking the publics' perceptions of risk into consideration when developing key

flood-related risk messages and communication. The research addresses risk definitions, perceptions of audience and how this information informs communication models. Key questions include the following:

- To what degree do technical experts within the U.S. Army Corps of Engineers take publics' perceptions of risk into consideration when developing and crafting flood risk management related messages?
- How does the inclusion or exclusion of public perceptions of risk affect rhetorical practices?

The study will also touch on the following sub-topics:

- What training do risk communicators receive?
- How do technical experts consider audience?
- From the perspective of technical experts, what is the goal of risk communication?

These questions helped explore how experts are viewing the public; in understanding experts' underlying perceptions, it was hoped I would be able to understand the choices made when practicing risk communication. I was interested in exploring how much these perceptions in fact affect risk communication. If experts viewed the public negatively and also practiced asymmetrical risk communication, for example, this would give weight to prior research assertions of the public-expert disconnect. Additional sub-topics of the study such as training, consideration of audience, and risk communication goals were also considered as they all impact communication practice in this particular context.

Two methods used to begin to answer these research questions include a survey protocol and discourse-based interviews, both of which are discussed in more detail in the following sections. In order to understand the extent to which practitioners understand the public's perceptions of risk and integrate those understandings into their communication, I invited working professionals in USACE to respond to a survey and a smaller group to take part in discourse based interviews. Survey data was collected from several different communities of practice within the USACE: former students of the risk analysis training courses; former students of the risk communication training course; flood risk management employees; and public involvement community of practice members. The interview subgroup was selected from the flood risk management survey group since these individuals have experiences most related to the context and questions of the study. Individuals were asked to participate and suggest other co-workers within their office to participate. Interviews were completed in two U.S. Army Corps of Engineers District offices (located in Norfolk, Virginia, and in Baltimore, Maryland), as well as with employees at the USACE Headquarters located in Washington, D.C.

### **PROTOCOL DESIGN: THE SURVEY**

Surveys have been shown to be effective in understanding participant values, beliefs, and attitudes, as well as for obtaining descriptive information from a larger population (Lauer & Asher, 1988). The survey for this study was designed to gather trends not apparent in smaller data sets such as through interviews. It was developed using the Janus-faced approach, which looks at survey design in a way that encourages researchers to consider



the participant's experience while also planning for usable research outputs (Lauer, McLeod, Btyhe, 2013). This approach encourages consideration of both how participants interact with questions to produce data, and how those responses are stored and best utilized for the most dynamic data collection set. To answer the key questions of this study, the survey was structured to include open-ended questions seeking respondents' opinions. The other primary set of questions asked respondents to specify the degree to which they agreed with a given statement. The use of open-structured and semi-structured questions with set response options gave respondents the opportunity to respond as they saw fit, while also bounding the questions and potential responses in some cases to narrow the focus of the survey. The mixture of responses illuminated the larger focus of the study to gain access to technical experts' perceptions and thoughts in order to understand how this may or may not affect communication.

As part of the Janus-faced approach design, study questions were ordered for the optimal response rate, so that questions I wanted answered appeared earlier in the survey. The optimal question sequence provided for the best data, while ensuring the survey protocol was not too cumbersome for respondents. Research suggests that surveys lasting no more than 20 minutes have a higher completion rate. For this reason, I designed the survey to include no more than 10 questions. The time required for the survey also helped to encourage responses since respondents could feasibly complete the survey during their lunch break, for example. Questions in the survey were numbered such that participants were able to tell how many questions they had answered and how

many were left. These design components were meant to engage the users long enough to complete the survey so that I could gain access to the information needed.

Respondents were first asked how they define risk. It was assumed that how a person defined risk would sway how risk communication is approached. A technical definition of risk and a perception of publics being incapable of understanding could both be factors affecting communication practice. This question was followed by a gradient question, where respondents specified the degree to which they agreed with a specified topic. Half of the survey used questions structured in this way. These questions touched on components such as whether risk is a technical or values decision; whether personal values should be accounted for in risk communication; and whether the public understands risk better today than 10 years ago. These questions were designed to probe respondents to think about particular topics such as considering public risk perceptions and meriting them despite any evident differences from expert perceptions of risk. Each of these semi-structured questions provided an option titled “Other,” and a text box where respondents could choose to expand upon their answer or provide an alternative response. Providing the option to write in additional responses was included in the design so that respondents with strong opinions on the topic could have the opportunity to provide additional information. However, written responses were not required on every question specifically so that the survey did not become too cumbersome or take too long.

The open-ended questions in the survey were ordered alternately with the more structured questions. This design choice was intended to keep respondents focused and interested in the content. In addition to touching on how risk is defined, these questions

also cover what respondents believe to be the primary reason publics are unable to understand risk; how they would improve USACE risk communication; what the goal of risk communication should be; and to specify what they believed to be the primary reason risk communication fails when it does. Each of these questions provided respondents an opportunity to provide their opinions on risk communication processes. The data from these questions were used in conjunction with data from the semi-structured questions, which provided more specific information as to how risk communication should be structured. These data are used to gauge whether respondents are thinking about risk technically, and what they believe to be important when communicating risk. The survey protocol is available in the Appendix of this document.

### **Conducting Survey Research in a Government Context**

The original intent when designing the survey protocol was to use a web-based survey design that would make it easier for individuals to respond, and also ease tracking responses. Google Forms was considered as well as SurveyMonkey since both are free and available to users simply by providing a web-based link. These formats were also acceptable based upon George Mason University research standards. However, as a result of confidentiality and other concerns for government employees, web-based tools were not used to create the survey. The target organization would not be able to participate in the survey using these tools since such tools store data on servers that could leave personally identifiable information from employees vulnerable. Since the

information would be located on a private server controlled by an external company, the U.S. Army Corps of Engineers Office of Counsel found such formats disconcerting.

In order to alleviate these concerns, Adobe Forms was used. Adobe Forms is software that converts Word document files into a PDF format. The software also provides design capabilities such that participants can choose options by checking boxes, and provide text answers using an expandable text box. Adobe Forms also provided the capability to submit responses automatically by email by using a hyperlink such that when participants click on the “Submit Form” button, the survey was automatically sent to a specific email address. Adobe Forms provided the capability to administer multiple-choice questions, fill in the blank boxes, and many of the same capabilities online tools do. The Adobe Forms software allowed for tracking surveys; each time a participant submitted a response, an email was sent to the Form owner. Each survey could be opened individually, or consolidated into a spreadsheet and exported to Excel. Although this method was slightly more time consuming than an online tracking system, it was still fairly easy to maneuver. Users also had the option to save the filled out form to their desktop and to send it directly using email. Using this option avoided concerns of data security, while also providing a backend, which eased consolidating and sifting through the responses in one place.

Once the survey was fully designed with the users in mind, it was necessary to find a distribution method. In this particular study, there was access to the community of practice. Email was used to distribute the survey electronically to save cost and to reach a broader geographic population since USACE has offices nationwide. A leader within the

agency's Flood Risk Management business program agreed to forward an email soliciting voluntary participation from individuals working on flood risk and risk communication related tasks. A second leader from a different community of practice forwarded the same email to another community that focuses on public participation. The survey was also sent to a third community list of former participants in educational courses on risk analysis and communication. By having the email sent out by particular leaders, it received a bit more attention than it may have from sending to a random group without an introduction.

The email sent out included an attached copy of the PDF survey, as well as an instructional document that detailed risks and how the survey should be submitted. The survey could be submitted in two ways: participants could save the document to a desktop computer and email it to the provided address, or use the "Submit Form" icon. By providing an instructional form with the survey, it allowed participants to have the tools necessary to complete the task while the researcher remained relatively unobtrusive. The instruction form also provided an opportunity to explain the survey format and highlight any design areas that may cause confusion. An example of this was the "Submit Form" icon. While participants could submit responses automatically using this feature, the software design did not allow for visual confirmation that forms had indeed been submitted. For example, the icon changing colors or becoming highlighted would suggest to users the survey was successfully submitted. However, since the software did not provide this capability, it was necessary to clarify to users that clicking the icon would submit responses despite the lack of interface change. Since users were alerted to this

issue upfront, most had little to no problem submitting the survey using this feature. Some did submit their survey several times, or submitted a blank form on accident. Many duplicated their survey responses by sending it using the icon, as well as by email to ensure their responses were received.

In order to have approval to be sent out to a broader audience, the USACE Office of Counsel was consulted on matters relating to approved web-based tools, as well as in regard to approval for forwarding the survey. The U.S. government requires approval for surveys depending on the intended audience and size of that audience. If a survey is being sent out to a significant number of people, then it must go through an approval process. Whereas if the survey is using a pre-approved software and is only going to a smaller community, and it is not expected to burden employees, then the same approval process is not in order. For these reasons, this research study used a pre-approved tool, and did not seek higher approval to be sent to a larger group due to the study timeline. Having discussed the research with the Office of Counsel to ensure compliance with regulations, leaders of communities of practices were more likely to respond to research requests and forward them to their respective teams.

### **Survey Distribution**

The survey was first distributed in December 2013. Additional data on survey distribution is provided in the table below.

Table 1: Survey Distribution and Population Sizes

Community of Practice	Date of Distribution	Email List Size
Flood risk management	12/2013	123
Stakeholder engagement	12/2013	359
Risk Analysis course	1/2014	121
Risk Communication course	2/2014	154

The survey was first distributed in December 2013 using a pre-established email list that included 123 employees within the Flood Risk Management community. The survey was also shared with a community that focuses on public participation. The third community, comprised of individuals who took the risk communication and risk analysis courses, received the survey in January 2014. The survey took over three months to be sent out using the specific steps discussed earlier, and as a result of the federal government shutdown in October 2013. As such, it was important to leave the survey open through the end of February in order to accommodate the government schedule, as well as the holidays that followed the survey requests for responses. Significant responses were received the first two weeks the survey was open, and participation significantly fell off after this time. A final reminder was sent to participants that were a part of the Flood Risk Management community to respond if they had forgotten. Reminders were not sent to other communities that received the survey secondhand.

## **DISCOURSE-BASED INTERVIEWS**

The second phase of this research study included discourse-based interviews in order to gain access to personal values and beliefs related to the research questions. Discourse-based interviews are methods used to understand the tacit personal knowledge people bring to their rhetorical practice (Odell, 1983). This method is usually structured such that it elicits and makes normally implicit knowledge explicit. Discourse-based interviews were used to identify the kinds of knowledge and expectations employees bring to their risk communication practice. Individuals who participated in the interview were asked to look at a piece of risk communication during the interview and discuss what worked well and what did not work well in the document. The interview protocol was designed in this way to gather information on how participants think about risk, what they believe the greatest challenges to be when communicating risk, and their perception of publics' abilities to understand risk communications delivered by USACE. The interview discussion also touched on participants' challenges and trainings received.

Since many participants have unique challenges, job descriptions or responsibilities due to the nature of the organization, using a risk communication sample to elicit responses provided a point of commonality between the interviews while keeping the unique experiences of each participant in clear view. Each participant was asked the same questions to describe personal experiences and job duties, but was also asked to judge the effectiveness of a risk communication sample. By assessing the successfulness of another piece of communication, the participants highlighted components of the sample that demonstrate what they believe effective risk communication should include. This method allowed me to consider how individuals are thinking about risk rhetoric and



potentially identify gaps or strengths that the individuals did not specify when recounting their own experiences. Using this method was useful in accessing their tacit knowledge, which is usually so internalized that it often becomes unconscious and inaccessible (Odell, Goswami, Herrington, 1983).

### **Risk Sample**

The risk communication sample used for this study was a news report available from a publicly available website. Much of the USACE's communication dealing with risk is delivered using the media. Additionally, the organization recently underwent a website migration that resulted in the purging of many archived notices relating to risk. It proved difficult to find risk communication messages that would not be contentious and would not seem as though a specific project or part of the organization was being targeted. For example, there are countless articles about Hurricane Katrina and the levee system that failed in New Orleans, but using risk communication relating to this event could result in the conversation focusing too much on the event instead of on the components of the communication itself. For this reason, risk communication samples were chosen that did not surround a nationally controversial event and that were related to relatively smaller flood events and risks. Much communication during larger flood events is considered to be crisis communication, which is structured in a different way than risk communication. This distinction was important when choosing a sample since risk communication is an ongoing dialogue whereas crisis communication ends when the crisis is over. The sample chosen was a two-page article from a media outlet, the Kent Reporter, about a dam in the

Green River Valley located near Seattle, Washington. The news story, available in the Appendices section of this report.

### **Interview Design**

The interviews were designed so that participants answered five questions prior to the questions relating to the risk communication sample. The first five questions are designed to gather information on the following topics:

- The participant's job and particular context.
- Opinions as to the greatest challenges when communicating risk.
- Rating the degree to which it is believed the public understands risks.
- Positive and negative risk communication experiences.
- The goal of risk communication and who is responsible.

These set of questions allowed participants to draw from personal experiences with the public. They also allowed reflections on how the individuals perceived the public as well as how they defined success when communicating risk to general populations.

Questions based on the risk communication sample were discussed in the middle of the interview. After reading a part of the sample, participants were asked to describe how they might change the risk communication to make it more effective. Discussing how to make it effective instead of framing the topic as identifying what was wrong with the sample allowed the participant to make their own judgment as to whether it was a strong piece or not. There were several other follow up questions as to what the goal of the risk rhetoric was, whether it was easy to understand, and how the goals of the

communication piece differed from the participant's method when developing risk messages. These questions were structured such that the participant had the opportunity to identify effective and ineffective communication methods, which provided grounds to suggest how they think about this type of communication without being asked to reflect or make a judgment about their own practice. The final questions included a discussion of the individuals' training in the area of risk communication, definitions of risk, and the participants' beliefs regarding the greatest risks to public safety. These questions were beneficial to understanding how risk communicators perceived publics as well as their roles as communicators.

The interviews were conducted primarily over the phone. The benefit of conducting an interview in person is that it is possible to see non-verbal cues and reactions to questions; these observations cannot be made over the phone. However, in order to reach the target audience, I gave participants the choice of a phone interview. Interviews conducted were recorded using two devices in order to ensure an accurate data file. The audio files were then transcribed and coded based on the scheme developed following the survey protocol data analysis. Similarities were highlighted as well as areas that demonstrated perceptions of the public, and rhetorical practice. Research protocols were tested on staff from the Institute for Water Resources field office. The study sample drew five professionals from the USACE Baltimore District, three participants from the USACE Norfolk District, and four participants from USACE Headquarters. Study participants volunteered based on availability. The following table shows participation from agency offices and dates interviews were conducted:

Table 2: Interview Samples and Date Conducted

Office	Date Conducted
Baltimore District 1	2/11/14
Baltimore District 2	3/4/14
Baltimore District 3	3/5/14
Baltimore District 4	3/14/14
Baltimore District 5	3/18/14
Norfolk District 1	2/14/14
Norfolk District 2	2/25/14
Norfolk District 3	3/6/14
Headquarters 1	3/22/14
Headquarters 2	3/24/14
Headquarters 3	3/26/14
Headquarters 4	3/26/14

### **STUDY TIMELINE**

This study was conducted over a nine-month period. Research was conducted to inform the study over a 12-month period prior to starting collection of data. Approval was granted to begin research in September 2013. After this, the survey and interview protocol were revised. The survey protocol was tested with participants at the U.S. Army Corps of Engineers Institute for Water Resources office in October 2013. The responses

were used to refine the protocol and tool used to disseminate the survey. As a result of the government shutdown in the month of October, little to no research could be conducted. Many federal employees were furloughed or limited as to what resources they had. For this reason, much of the study was delayed. In November following the government reopening, relationships were developed with key leaders in order to gain access to target communities, including the flood risk management community. These individuals agreed to participate and assist in the study, but did not forward the email soliciting requests to participate in the survey until December 2013 simply because of time constraints.

There was a lull in survey responses following the first two weeks after it was sent mostly likely due to the holiday season. Many employees take leave during this time, which impacted how much data was collected, and at what time. The survey was forwarded to another community of practice that is much larger, but because of the nature of the group, their participation was underwhelming. It is often the case that individuals only participate in a survey if they have a vested interest in the topic. Since there is little incentive to participate, an email requesting participation can easily be overlooked. The survey was forwarded to a third community in January 2014. This community is much more varied in background, but is similar in that they have all taken a risk analysis or risk communication course. Responses were received through the end of February 2014.

Discourse-based interviews were conducted in person and over the phone from February 2014 to March 2014. This step in the research took longer due to scheduling conflicts. Each interview was designed to take no more than an hour so it would not require too significant of a time commitment. However, many employees have such busy

schedules it was difficult for them to set aside an hour voluntarily. Many participants' interviews did take longer than what was originally allotted; the variance in length of interviews was based on the participants' contributions on the topics discussed. Some more experienced communicators had much more to say than some who were much newer to the organization. Data was examined and coded concurrently until all data was collected at the beginning of March 2014. The study was complete following a detailed analysis in April 2014.

### **HYPOTHEZED RESULTS**

It was expected that this study would demonstrate the dynamics involved in developing risk communication, and the need for a rhetorical approach in the field. This study demonstrated recognition of differences in perceptions of risk between publics and experts, which has been a focal point of research for many years. Since much of the organization studied is technically oriented, I expected most employees would define risk more technically. This tendency to define risk in a technical way has a bearing on how individuals approach risk communication, as well as how individuals view the publics' ability to understand risk messages. It was hypothesized that perception of publics' abilities to understand risk affects rhetorical practice. I expected there to be variance in terms of the communication models individuals relied upon; however, it was assumed that many communicators would use the message-centered approach similar to the Shannon-Weaver model.

Interview data was expected to be extremely diverse and show the complexity of both the organization and the task of communicating risks to the public. Data on training received and personal values was expected to vary greatly as well since there is no defined requirement for individuals conducting risk communication to be trained ahead of time. I thought there would be a strong desire from risk communicators interviewed to create and disseminate effective communication messages, but I predicted that individuals would feel they are not doing so effectively. It was assumed most individuals would be true to the science, which, again, would demonstrate the tension within the organization between its technical nature and communication requirements. I hoped the flood risk management community would show a degree of concurrence among responses and practice since many of these individuals carry out the same tasks and have the same job duties. The other communities of practice that this study touched upon were not expected to show the same type of concurrence. These groups are comprised of individuals with titles such as public affairs specialists, hydraulic engineers, project planners, economists, and many others. Since these communities are so diverse, it was expected that their definitions, practice, experiences and goals would vary much more than they actually did based on survey responses.

This study provides the basis for additional research relating to rhetoric and technical communication to be completed in the context of the USACE, as well as the field of risk more generally. As researchers have suggested, there is a gap in rhetoric and risk communication research; this study provides a basis for further research on the rhetoric of risk by exploring related problems with contextual approaches that consider

audience, organization power structures, documentation, and similar topics that impact practice (Schwartzman, Ross & Berube, 2011; Grabill & Simmons, 1998; Sauer, 2003). Other expected results included initial insight as to how well proposed communication models align with the organization representatives studied, an area that will need to be further studied in the future. It also provides information on how much risk communicators studied take the publics' perceptions of risk into consideration when conducting risk rhetoric. These findings provide the grounds for recommendations for improvement to the organization of study. However, there is a need for a broader study prior to making any large-scale recommendations to the agency as a whole.

### **STUDY LIMITATIONS**

The U.S. Army Corps of Engineers has approximately 37,000 employees across the Civil Works program and Military program, with missions and services provided in more than 130 countries. This study captured a small community within the organization and would need to be expanded in order to make any broader assertion about the agency as a whole. In addition, more research would be needed to address how larger power structures impact communication practice since USACE is a sub-agency of the Department of the Army, and Defense Department as a whole.

This study largely relies on self-report data through the interviews and surveys. While this can pose a challenge, the data holds great value in its reflection of risk communicators' thoughts, values and beliefs that are tied into communication practice. Interviews enriched the study data and delved more deeply into issues the survey could



not gain access to. Interview participants volunteered and suggested others to participate in the study. Since participants were suggested, this is a limiting factor. One would assume that a group within a community will have similar perceptions and thought processes when dealing with risk communication. Although data gathered demonstrates how unified the approach to risk communication is within this context, it still does not reflect the organizational values or practice as a whole. Additional interviews are needed in order to make such an assertion.

### **ETHICAL CONSIDERATIONS**

Participants' privacy and confidentiality were protected in this study. Participants are identified when data is reported using descriptive information that would not link their names to this study. Some data on position titles, gender and names was available to the researcher, but none of this information is shared and will remain confidential. The data for this study was stored digitally with original files kept in a locked file cabinet in the principal investigators office on George Mason's campus and will be destroyed after July 2017.

## **CHAPTER 4 - SURVEY AND INTERVIEW DATA OVERVIEW**

### **SURVEY DATA COLLECTED**

As noted in the previous chapter, the survey developed for this study was targeted to a primary community referred to as the Flood Risk Management community. This group was most likely to have risk and risk communication related tasks in reference to flood risk management projects and programs. Flood risk management can include a multitude of projects and studies, such as levees already built, or proposals for projects that would help to minimize the impact of flooding on various communities. The pre-established email list included for the Flood Risk Management community included 123 individuals. The survey was also forwarded to a list of individuals who had previously taken risk communication training and a risk analysis training both offered by the U.S. Army Corps of Engineers. Another larger group received the request to participate forwarded from other individuals. These email lists are not representative of the entire community that has risk related work, or those who conduct risk communication. Additionally, many individuals are a part of more than one of the communities that received the forwarded request to participate in the survey. The study was not originally designed to share the survey with such a varied group of personnel; however, by having employees forward the survey, it reached additional individuals who may not directly work with flood risk management projects, but who have a vested interest in the topic.

The survey distributed to these communities included 10 questions that relate to risk communication, the definition of risk, personal values, the goal of risk communication, and risk perception. Forty-six responses were received; a majority of the responses came from the Flood Risk Management group that received the email soliciting participation. Individuals in the public participation group who seem to have risk related tasks supplemented this response sample. A handful of the surveys were submitted from the individuals who had previously taken the risk and risk communication related courses. The data reported in this section is based on the 46 responses. Data will be reported by question.

### **Practitioners' Definition of Risk**

Survey respondents were first asked to define risk in the context of their professional activity, and were given a text box to fill in their response. This was the first question asked as it was believed this question would be among the most important to have answered. Although the question asks individuals to consider risk within the context of their professional activity, some respondents did provide multiple definitions for risk. The overwhelming majority of respondents indicated that risk includes components of probability and consequence, with some variations.

Thirty-one of 46 participants' response heavily relied upon the concept that risk is comprised of probability and consequence, where probability means the likelihood or chance that an event would occur, and the consequences refer to the outcomes that would result from the event occurring. Consequences are frequently thought of in terms of

negative impacts the risk would have on a given project, community or alternative entity or object that is exposed to the risk. Several respondents used the risk equation referred to earlier in this report: risk = probability x consequences. Some used a variation of this equation: Risk = (frequency of an occurrence) x (magnitude of the consequences). Another variation submitted included another component of the equation as resilience: Risk = f (probability, consequences, resilience of existing mitigation). Resilience implies the ability of a project or piece of infrastructure to withstand the risk or event. Another factor embedded in several answers, but that was not present in all of the risk equation related responses was the concept of uncertainty. Uncertainty is taken in this context to mean a lack of concrete information or facts to base a decision on.

While the concept of consequences was present in the majority of responses, there were several that defined risk only by consequences. Since so many participants included both probability and consequences, it was worth noting that a few defined risk only with half of the equation frequently used. The responses that were heavily focused on consequences or the concept of uncertainty are listed in the table below.

Table 3: Responses to Question 1 that Focused Heavily on Consequences and Uncertainty

<b>Consequence/ Uncertainty Heavy Definitions</b>
Risk is the exposure to potential negative impacts/outcomes. It could be the consequence of an agency's actions, impacting external parties' financial outcomes, personal safety, or societal disruption. It could be administrative embarrassment of the agency that made took the action.
Risk to me is defined as those elements of work, process, or policy that are unknown and have undefined consequences on any particular action.
Risk is facing the unknown, with the fact that there could be consequences based on the actions taken
Risks are measure of future uncertainties and the best way to deal with it is to utilize lessons learned to diminish the impact it may cause on future undertaking.
There is risk that the assumption is not true or parts of it may not be true. Basically, I define risk as the possibility that all or part of assumptions made will not hold true.

There were five responses of the 46 submitted that focused less on the likelihood that the event would occur and more on the fact that there is uncertainty involved in defining consequences, and the consequences themselves.

Several respondents submitted responses that included the concepts of probability, consequences, and uncertainty, but their responses were focused on risks relating to projects and project scopes. These participants may be project managers or project planners, so in the context of their work activity, risk is likely considered mainly in relationship to what the proposed budget, timeline and project plan includes.

Table 4: Responses to Question 1 that Focused Heavily on Projects or Infrastructure

<b>Project Related Definitions</b>
Risk is the metric describing the outcome of a evaluation of meeting/not meeting the desired target.
Risk is the chance that my projects, preferred courses of actions, or advice may not work, may cost more, may be delayed, or may be denied.
Risk is a predicted (known-unknown) or unforeseen (unknown-unknown) event or activity that can impact the project's execution in a positive or negative way. The judgmental degree of possibility of a factor or group of factors having a negative impact on ability to reach pre-established outcomes such as scope of a project, schedule of a project (and specific milestones), and/or cost of a project. Factors can be factual/technical in nature and/or judgmental such as responses of stakeholders, congressional interest, risk decision precedence, local & regional & national value, etc.
In my activities I define risk as time risk assessments, cost risk assessments and quality risk assessments. All are interrelated to completing the project as planned. We have been working to actively control risk by identifying critical project milestones that are required to achieve success.
Risk of failure of the final product. i.e. failure of a levee. 2) Risk to the overall outcome of the project process

Although these responses focus on projects and infrastructure, there are still similar themes to the definitions such as the concept of unknown consequences, undesirable outcomes, the chance or probability of something occurring, and negative impacts. These themes are present in the majority of responses, but similar to the responses that focus heavily on consequences, these project-focused responses are not as heavily focused on the probability that the harm or risky event will occur. This theme of project risk was only evident in five of the 46 responses.

There were several responses to the first question that seemed to be outliers for various reasons. Three respondents provided more than one definition and broke their responses out similarly to the themes evident in other responses. These multi-response definitions stuck out since an overwhelming number of respondents focused purely on the technical equation to depict risk. The first respondent that submitted a three-tiered response provided the following:

- Flood Risk = probability of event x consequences (measured in structural damage and/or lives lost) of that event.
- Project Risk = potential for increased costs, environmental documentation uncertainty; timeliness of funding stream, interagency cooperation breakdown, etc.
- Personal Risk = consequences associated with unpopular recommendations and/or resistance to agency procedures and policies.
- Political Risk = agency views not aligned with legislature or Congress.

The first part of this response aligns well with the definitions a majority of respondents provided in that it includes probability and consequence. The second part of the definition aligns with the project oriented definitions of risk given, since it focuses on issues that arise as a result of changes in cost or schedule. The third part of the definition gives a personalized response, which was not requested for in the question asked. The final part of this definition highlights an element many did not mention in their definition of risk: the risk that the agency and Congress do not agree or understand one another.

The second respondent who gave a multi-response definition provided the following answer:

- There is risk to a community of experiencing harm from a natural disaster (before or after a project has been implemented).
- There is "risk" of a project not fulfilling its designated purpose - e.g. a flood risk management project protecting only for a 50 year event vice the design of a 100-year event.
- There are decision risks associated with level of analysis, e.g. risk of legal challenge, risk of cost over-run, risk of schedule slippage.

This three-pronged definition is similar to the other respondents' answers in that they similarly discuss a project-focused risk, and the risk of an event that may include components of probability and consequences. However, this respondent focused more on the risk that a project built is not appropriately mitigating the risks.

The third respondent that provided multiple definitions provides similar responses to the two other participants who provided multiple definitions. The responses submitted from this participant included the following:

- Under planning the risk is based on the amount of information that is necessary to make the next decision.
- Under cost engineering, the risk is tied to the amount of contingency that has to be considered when pulling together your costs for construction of a project



- Under risk communication it is the amount of risk that an individual, family or individual is either willing to take or willing to buy down to live and work where they do.

This respondent focuses on planning, engineering and then risk communication. There seem to be themes of uncertainty, acceptable risk and project-oriented risk.

Two other responses were received that did not fit well in the categories outlined thus far. One response focused on public trust and suggested that risk is defined as “any issue, action, event, or communication that jeopardizes public trust, agency reputation, successful project execution, public safety, property, privacy, national security, or the economy.” The other response that seemed like an outlier, defined risk as a “potentially negative impact action that requires observations, assessment, and decision-making processes.” It is possible that this definition fit with others, but the respondent did not use the same terminology that was a primary focus of other respondents.

Table 5: Total Responses Provided to Define Risk

<b>Response Theme</b>	<b>Response Rate</b>
Equation	31
Consequence/Uncertainty	5
Project Oriented	5
Multi-response Definition	3
Outliers	2
<b>Total:</b>	46

### **Risk as a Values or Technical Decision**

The second question in the survey asked respondents to indicate the degree to which they agreed with a given statement. In this case, respondents were asked to indicate to what degree they agreed with the following statement: risk is a technical decision, not a values decision. Respondents were asked to choose whether they strongly agreed, agreed, disagreed, strongly disagreed, or if they were undecided on the topic. Respondents were also given the option to choose “other,” with a textbox for them to explain the response they provided. Although the textbox was intended primarily for respondents who answered, “other,” the textbox was used to explain responses in general by many respondents. A little more than half of respondents indicated they either strongly disagreed or disagreed with the statement that risk is a technical decision, not a values decision. The second most popular response to this question was “other.” Every respondent provided justification or explanation for why they chose this option. Five participants indicated they either agreed or strongly agreed with the statement. One respondent selected undecided in response to the question and provided justification.

Table 6: Total Response Rates to Question 2

<b>Response</b>	<b>Rate</b>	<b>Percent</b>
Strongly Agree/Agree	5	11%
<b>Strongly Disagree/ Disagree</b>	<b>25</b>	<b>54%</b>
Undecided	1	2%
Other	15	33%

Fifty-four percent of respondents indicated they either strongly disagreed or disagreed with the statement that risk is purely technical and is not a values decision. Although respondents were not required to justify their response, many chose to provide details as to why they chose this option, particularly in reference to their answer that they disagreed with the given statement. The justifications provided for choosing “other” are provided in a table. Many of the responses make the distinction that risk is inherently technical, but the decisions made in regard to risk are values driven. Others suggest that risk innately includes a technical and value component. Ultimately, many of the responses provided are based on the concept that risk includes both a value component and technical component; the variation in response seems to be around whether that is the nature of risk, or if it is a result of external factors that cause the risk to be impacted by values of different sorts.

Table 7: Justification Provided for Disagree/Strongly Disagree Responses in Question 2 of the Survey

<b>Disagree</b>
Risk communications is not only a technical decision, but a political one. Our Organizational values do play a part in any decision.
I believe it is both.
Often, due to funding and budget, risk is made on the values of keeping to a budget or schedule; whereas, risk could be better mitigated using technical decisions.

<b>Strongly Disagree</b>
Risk is amenable to a technical approach, but decisions & plans are always value-driven.
Risk has both technical and values components.
It's a combination of both. Human values impact any type of decision-making process.
Risk can be objectively defined in most cases, but still remains a matter of perception and perception is an extension of values.
Risk related to failure is a technical decision. Risk related to failure in the process is a values decision in many cases.
Risk is both a technical and values decision depending on the context of the decision to be made.

The second most popular response to the second question was “other,” with a justification provided as to why this option was chosen. The 15 participants that chose this option each provided a reason as to why this was the answer provided. Five of the respondents that chose “other” explained that they chose this option because they felt that risk was both a technical and values decision. Although these participants did not specify they disagreed with the statement, their justification would imply they believe decisions are both values- and technically-driven. If these responses are taken to mean the participants disagree with the statement, then it could be said that about 30 participants disagreed with the statement, which would be 65 percent of the population that disagreed with the idea that risk is purely a technical decision, not a values decision. The responses

that express the belief that risk is both a technical and values decision are depicted in the following table.

Table 8: Justification for “Other” for Question 2 – Risk is Both a Technical and Values Decision

<b>Other – Both values and technical</b>
It depends on what is being looked at - many times it is technical, but loss of life is a value.
Both, depending on your role and perceptions. For me it is technical, but for many people it is based on subjective perceptions and values transferred/inherited through generations.
It is both to me. One can seek to assign probabilities to an occurrence but it is up to his/hers individual tolerance for risk how that probability impacts their behavior.
It is both. While engineers in China and the U.S. might come up with the same technical answers regarding risk, what each would do with that information can be very different. The U.S. might think that a risk of 10 lives is unacceptable, but that might not be an unacceptable risk in China. Perspectives and values are different.
It's both. Tolerable risk comes to mind. Some thing or action may "feel" too risky without any data to back it up or support it.

There were 10 additional responses that fell into the “other” category, but did not directly specify that risk decisions should be both technical and values driven. Several of these individuals seemed to indicate that risk is inherently technical, and another group believed risk is technical, but that the decisions made are colored by values. These

responses do not necessarily imply that it should be both technical factors and values that drive decisions. These responses are captured in the table below and are categorized by the following themes: mainly technical, and as a compromise between technical and values to make a decision.

Table 9: Justification Provided for Other Response to Question 2 – Mainly Technical

<b>Other – Mainly technical</b>
I don't think risk is a decision. It is an assessment that should be based mostly on technical information, but weight by the degree of a person's aversion to risk.
Risk is not a decision, but a statement of facts as best they are understood. It is necessarily a value based exercise because damages are viewed differently by different people. And money is often used to quantify damages because it is the most unifying form of value and for its ease of tabulation. Any risk estimation does not capture all of the values of an impacted structure, community, economy, lifestyle, etc.
Quantifying risk is a technical decision, determining acceptable risk is a values decision
I believe risk management to be a values based decision. Risk assessment is a technical evaluation, and not really a decision.

Table 10: Table 9: Justification Provided for Other Response to Question 2 – A Compromise

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Risk is normally a technical decision. However, it can be a value-based decision when the risk under consideration is risk of creating or exacerbating a negative public impression. When the consequences that are at stake are purely political and driven by values or the impression of values, the risk decision must be values-driven.

It's a technical decision made within the context of a) societal values, b) organizational values, c) project purposes, d) agency mission/authority, e) entity liability.

Risk is a values decision that is based on technical input as well as judgmental factors such as responses of stakeholders, congressional interest, risk decision precedence, local & regional & national value, etc.

In decision making (i.e. if a project's risk is worth federal investment) risk is a deterministic (technical/analytic) concept (ex. B/C ratio), in reality risk includes consequences that cannot be incorporated in a deterministic/analytical computation (Loss of Life, Sentimental).

Depends on your definition of risk. There is risk aversion. A 1% chance of

One individual responded with "undecided." This respondent provided justification for the response suggesting that decisions about risk are both technical and values driven. The respondent said that "a large degree of technical models" can be used "to determine the likelihood of a failure or what would be damaged if something were to fail, but putting price tags on people's lives and livelihoods, critical infrastructure and historical/cultural items has most of its basis in values." In general, respondents either disagreed with this statement that "risk is a technical decision, not a values decision," or

identified with no response. A few respondents agreed, but gave no explanation for their answer.

### **The Goal of Risk Communication**

For the third question, survey participants were asked to describe what they believed the primary goal of risk communication to be. Respondents were given a text box to provide their answer. Responses fell into several different themes. Some of these themes can be summarized as the goal of risk communication being to educate, to inform, to create understanding, or a mixture of those. Some respondents' answers focused more so on creating a flow of information instead of simply providing information. Responses generally captured the concept that the individuals had information that as part of risk communication should be given to another entity in order to make an informed decision.

Table 11: Responses to Question 3 that Focus on Education as the Goal

<b>To educate</b>
Educating an interested and/or potentially affected audience about the likelihood and negative consequences of an action occurring, and the steps we and the audience should take to mitigate them.
To provide an accurate and thorough assessment of a risk in order to present educated decisions.
To educate the public about dangers that exist to their person and/or property based on their location or participation. Many times these dangers are unsuspected or hidden from everyday view.



Three responses were provided that seemed to focus purely on risk communication as an effort to educate in some way. Several answers provided included education as a primary goal, but did not imply this was the primary goal of the communication.

Table 12: Response to Question 3 that Focus on Informing

<b>To inform</b>
The primary goal should be to diminish the risk communication. The best way to diminish it is to identify all the constituents that need to be informed of the on-going effort and outcome of the project/ product. Reach the right audience with the right amount and type of information at the right time to inform them of potential risk.
To allow people to make informed decisions so that they can adjust their behavior based on the consequences, probability, and their own aversion to risk.
Help affected people make informed, educated choices about where they live and invest.
Inform stakeholders of the degree of risk to their homes, businesses, properties, etc. so they can make sound decisions regarding how to develop, use or dispose of their interests and protect themselves from harm to the extent possible.
The purpose of risk communication is to "effectively" inform everyone involved or affected by an activity on the probability of a particular event occurrence and the magnitude and extent of the resulting consequences. Effective risk communication will also describe the contribution by each stakeholder in creating the risk as well as the amount of consequence burden to be born by each stakeholder should failure occur.
Make the potentially effected party(ies) aware of their exposure to certain risks your agency is responsible for monitoring/controlling. Convey to the potentially effected party(ies) the likely outcomes from a pending agency action and the parties' options to mitigate the impacts.
Provide stakeholders an honest assessment of the risk factors affecting a

certain situation, outcome, or product, the likelihood of the occurrence of the risk factor, the relative negative impact of each risk factor if it occurred, and the aggregate risk potential level of risk.

To communicate the risk. Nothing is certain. A repaired levee or dam still contains residual risk and the public needs aware of that. A repaired lock still is at risk of failing.

Explain the events that affect the risks and how the likelihood of the events change the risk. Show how the value of what may be affected by an event, affects the risk level. Even a low likelihood event could have a very high risk as a result of the potential value loss/gain.

The primary goal of risk communication is to provide information for citizens, business owners, council members, etc to make an informed decision regarding personal risk.

The goal of risk communication is to provide information about a perceived risk, outlining what the risk is, what the consequences of that risk could be and what you can do to mitigate the consequences. It is to provide information and tools to help make an informed decision on actions to take.

The primary goal of risk communication is to inform the target audience, in a manner tailored to that audience, of the knowns and unknowns of any action, along with the likelihood and consequences of each.

It should be to inform the target audience of a specific risk(s) and provide education for the audience to be able to make informed decisions about how this risk will impact their lives.

The primary goal should be to adequately describe the true odds of occurrence and true impact of a potential event. Giving decision-makers a better context for this information in a timely manner will increase the odds of successfully mitigating the impacts of a negative risk.

To inform the public in terms that they are able to understand, meaning not too technical, but also not too doomsday. The messages need to be balanced and believable for the common person. It should also address why the person should care and how it impacts them - make it personal.

Risk communication to the public is based upon informing them of the environmental risks they have to consider in living in a specific area and the unknowns inherent in the design effort. Internal risk communication is related

to the risk of delivering a valuable product. Risks related to technical designs are - do we have sufficient data to design the work product. Environmental compliance risks are do we have sufficient info to making informed decisions.

I heard at a seminar that the purpose of risk communication is to have a safe public, an informed public, and a responsible public. So the primary goal of risk communication is to make sure whoever is receiving the message(s) knows what risk is and can relate to it in their terms. it should be a conversation and not just a message.

Provide information about possibilities/chance and information about consequences and facilitate public understanding of their intersection, along with communicating the choices for mitigating either the possibilities/chance or the consequences. Basically, empower stakeholder/public to become knowledgeable and make their choices in a context that makes sense to them.

To make individuals and communities aware of the threats that may disrupt their lives. By "aware" I don't just mean "notified of..."; it is important that populations-at-risk truly understand the risks involved.

To save lives and make people understand the risks associated with where they live and their lifestyles. To ensure that people are aware of the risks associated with the places they live, work and recreate.

Direct the population to make risk informed decisions. This means:

1. Recognizing they are at risk
2. Understanding that risk
3. Teaching how to mitigate that risk (through Risk Transfer, Risk Reduction, or Risk Acceptance)

Twenty-one responses provided fall into the theme of informing or making an audience aware. There is variation in the answers listed under this theme, but a majority of the responses reflect the concept that the goal of risk communication is to inform or to make aware. Some answers also allude to ideas of understanding and teaching a person what to do in response to the risk.

Table 13: Responses to Question 3 that Focus on Understanding

<b>To understand</b>
To help the audience clearly understand the information that is the basis for the risk determination so that they can make their own decisions about the level of risk they are willing to live with. To ensure that everyone is aware of the risk factors and takes responsibility and appropriate action.
A mutual understanding with the affected persons, institutions, and community of the risk in terms that are meaningful in their lives/responsibilities/and potential coping actions.
To help the audience understand what is being discussed in a fashion that they understand. It's one thing to talk to a professional society; quite another to a group of home owners.
Develop understanding on values that drive risk decisions; USACE is \$ and lives whereas other agencies use much different risk metrics. Although agreement may not be possible, better understanding leads to achievable outcomes.
To provide an understanding of a given risk relative to the experience and perspective of the audience to whom the risk communication is being conveyed. Use of analogies that the audience could relate to is highly encouraged.
A main goal of risk communication is to be honest, frank, and open with regards to risk to facilitate a understanding of the risks and to guide informed decisions.
For people to understand the real potential impact to their lives and property. They need sufficient information to make informed decisions. We often discuss the 100-year flood, or may correctly shift to the 1% flood. But communication needs to take into cumulative probability, what the real risk is over a period of 5, 10 and 20 years.
To ensure that those you are communicating with have an understanding of the risks they face and what they can do to reduce their risk.
To increase the understanding of the technical aspects of risk and make those exposed to risk understand that damaging flood events are possible even though it may not have happened in their memory, and that there is credible technical science to show that.

Clear, consistent messages that continually improve each stakeholder's understand of the system and the benefits/consequences outside their primary area of interest.

There were 10 respondents who provided an answer in regard to the primary goal of risk communication being to improve understanding of the risk. Again, there are some traces of the goal being to inform or educate in these answers; however, the primary theme seems to be that of encouraging understanding of a risk. Fewer of the responses in this theme suggest a secondary part of the goal being to help audiences understand how to act in response to the risk, whereas many of the answering that focus on informing the audience do include a component of actionable information.

Table 14: Responses to Question 3 that Focus on Facilitating Communication

<b>To facilitate relationships/communication</b>
To adequately communicate
To achieve a reasonably understandable transfer of information.
To outline completely the consequences of failure
Build trust and build common understanding. Differences are dealt with at the table.
I believe the goal is to explain the nature of the risk in terms of probability and consequences when it occurs. Once the nature of the risk threat is clarified for both technical and non-technical audiences, communication shifts to what available risk management options there are available. Risk management starts with "tolerating the risk" and proceeds through various mitigation strategies, in

terms of cost, impact, other effects, etc.

The goal of risk communication should be to clearly and transparently discuss the risk of decision-making - using assumptions - to the public, regulatory agencies and other stakeholders. However, the communication should not be one-sided (i.e., USACE telling the stakeholders what the risk is); rather, it should be open communication to discuss the pros and cons of the risks and determine how to make less risky decisions.

Primary goal is to prepare team to react quickly and effectively to events that could upset the team goal. To achieve the primary goal, internal communication sensitizes self, team & stakeholders to risk events. Raising risk to an explicit level allows risks to be defined and rated, with significant risks getting mitigation strategies that all can read. Explicit discussion reduces the chance of blind-side complete failure from even unforeseen risk events.

The primary goal of risk communications is to ensure that the Team /PDT are on the same page as it relates to project status or outcomes. Risk communications must be done at the earliest point in a project as possible.

Provide for the exchange of information between two individuals or groups of individuals. Providing information concerning an action, activity or result of decisions made.

Decision. In analysis risks and uncertainties should be clearly defined to assist decision-making. In some situations, the decision maker should not make a decision on "expected" values, but should consider whether the worst case is acceptable.

Example, the expected value of your nuclear plant being taken out by a earthquake and tsunami may be small, but can you live with the consequence of the extreme event? While the odds may be good in Russian roulette, the consequence would be impossible

The primary goal of risk communication from the government to the public is to explain what assistance a government agency can provide and what will still be a risk to the general public (e.g. the government cannot remove all risk of flooding to a community or some issues raised within a NEPA public comment period may not be able to be addressed by the government).

Another theme in the answers provided focused on internal communication and facilitating further communication or understanding. Many of these responses vary slightly from the primary focus shown in answers that discuss informing or promoting understanding. The majority of respondents indicated this as their goal. Several did discuss the goal being to facilitate two-way communication. A few respondents also focused on internal communication in order to work together or to make decisions. One outlier could be the response that suggests the goal of risk communication should be “to build trust” and a common understanding. This seems different than helping a group to understand. However, these responses fit into the general theme that risk communication strives to inform or to facilitate understanding.

### **Accounting for Personal Values in Risk Communication**

The fourth question in the survey asked respondents to indicate the degree to which they agreed with a given statement. In this case, respondents were asked to indicate to what degree they agreed with the following statement: personal values should be accounted for in all risk communication. Respondents were asked to choose whether they strongly agreed, agreed, disagreed, strongly disagreed, or if they were undecided on the topic. Respondents were also given the option to choose “other,” with a textbox for them to explain the response they provided. Although the textbox was intended primarily for respondents who answered, “other,” the textbox was used to explain responses in general by many respondents.

Table 15: Total Response Rates in Response to Question 4

<b>Response</b>	<b>Rate</b>	<b>Percent</b>
<b>Strongly Agree/Agree</b>	<b>27</b>	<b>59%</b>
Strongly Disagree/ Disagree	7	15%
Undecided	5	11%
Other	7	15%

Fifty-nine percent of respondents either strongly agreed or agreed that personal values should be accounted for in all risk communication. Much fewer respondents provided explanations for their responses for this question than the first three. Five of the 27 respondents that agreed with the statement provided additional clarifications. Their additional responses captured a similar concept that it is important to understand an audience's personal values and how those "influence their perception of risk." Most agree that personal values are learned and "impact how humans perceive their world, including risks and how this information is communicated." There was also recognition that perceptions are not the same person to person, and that considering how individuals make decisions can be key for communication.

The remaining responses, strongly disagree/disagree, other and undecided, received a relatively comparable response rate that ranged from five to seven respondents. It is worth noting that five respondents indicated they were undecided whether personal values should be accounted for in risk communication. Two of the five individuals that chose this response provided explanation. One respondent indicated that "individual government employee's personal values should not be accounted for in the



risk communication, but the personal values of the target audience/community member should be.” The second respondent that provided explanation suggested that personal values should be communicated to the public, but that personal values “cannot be incorporated in the federal decision making process.”

Seven individuals either disagreed or strongly disagreed with the concept that personal values should be accounted for in risk communication. Three explanations were provided with the response. One respondent suggested that the focus should be societal values, but that personal values are always a part of risk communication. An explanation provided with a “strongly disagree” response said that personal values may differ from the goals “we are trying to accomplish.” Another explanation provided focuses on the fact that not all risks evaluated include personal values. This individual identified the risk of breaching a levee or dam as examples where risk is purely mathematically calculated and includes no values. However, the risk that such an event may pose to a community downstream of a levee or dam would include personal values in this person’s opinion.

There were seven individuals that chose “other” as their option. There were no evident themes in the responses provided for “other.” Responses seemed to include confusion about the question, or indecisiveness about the topic.

Table 16: Justification Provided for Other to Question 4

Other
Hard to know how to answer this. Hard to actually completely separate personal values from such communication.
Personal values being what? Some do not weigh risk correctly, as a personal value

might be that nuclear power is too risky but drunk driving is OK. Personal values can be influenced by unfounded fears, by an individual or a group. So personal values cannot but be involved in risk communication, but they have to be evaluated carefully.

The values of the presenter, and more importantly, the audience, must be considered when presenting risk.

Yours? No. To those who are subject to the risk? Yes. (the question is ambiguous.)

Trust is the norm do I trust all that I am working with to have the same high standards

It would be nice if it were possible, but other than recognizing that personal values are important, individual differences in risk tolerance is impossible to account for.

Analyst or stakeholder personal values? Communication should be on things that stakeholders (including Government policy & bill payers) are interested in.

### **Why Risk Communication Fails**

Respondents were asked to specify what they believed the primary reason is when risk communication fails. All participants included their response using the text box provided. A majority of respondents reported that risk communication failure was related to the message sender, and frequently as a result of focusing too much on technical information. Twenty of 46 respondents included this concept that risk communication failure was a result of the communicator using too much technical information, or not considering what information or approach would be most conducive to the audience. A sample of responses is provided in Table 17.

Several respondents seemed to be process oriented suggesting that failure is due to a “lack of transparency and/or stakeholder disagreement,” which is typically a result of

conflicting policies. The confusion of policies identified seem to relate to internal policies, but there were suggestions in the responses received that failure can result from factors the communicators do not necessarily have control over. Another respondent suggested that depending on when communication fails, it could be that “sensitivities toward audiences...may not have been considered appropriately.” However, if the failure occurs after “due diligence, people’s perceptions of the issue and their own denial of the risks can influence ‘succuss.’” This response seems to imply more control, but focuses on the concept that depending on where the communication is occurring in the process, failure can result from different factors. Other respondents that focus on failure as a result of process suggested it could be a result of the lack of an advocate for risk communication, lack of planning, or insufficient funding or value placed on risk communication. Two respondents indicated failure is a result of failure in executing a step in the analytical process for evaluating the risk.

Table 17: Sample of Responses to Question 5 that Focus on Sender Failure

<b>Sender failure</b>
Failure to properly read the receiver or be familiar with the receiver(s) of the communication as it is presented.
As an agency we tend to not listen to others. We have our minds made up based upon the way we have done it before or the way I am going to do it. Communication failure is the biggest reason for projects/studies exceeding funds and schedules, in my opinion.
Communication is one directional, too technical, and not made relevant to the audience.

Generally, it's because we've failed to adequately and simply explain the likelihood and/or consequences of an action, and/or failed to provide an understandable and executable mitigation strategy. This leaves the audience feeling confused and helpless.

The message may not be specific enough to the target audiences, so audiences do not know that the warnings apply to them. 2) The audiences do not find the descriptions of the consequences or the probability of a threat to be very compelling. 3) The messages go out through channels that are not accessed or trusted. 4) The messages may not tell the audiences how they should respond to the threat or get more information. 5) The messages are not timely. 6) The messages are not consistent.

Failure to be honest, frank, and open and to listen to the stakeholders specific concerns.

Techno-speak is one and a failure to equate risks with other known commonly accepted risks is another.

Too much techno-speak. Craft a message specific to the audience.

Failure by the risk communicator to fully understand the audience and their specific issues. We (USACE) are often overly technical in our explanations of issues or risk drivers. This can cause many audiences to "tune-out" because they don't share our technical background.

Lack of understanding on how to communicate to the public and how to craft a message that is easily understood. Too much talking at people and not enough having a conversation with them to ensure they understand what is trying to be communicated and that their concerns are addressed.

A group of respondents indicated that risk communication failure was due to the message receiver's inability to understand the message as it was received, or that they choose to ignore the message for whatever reason. Many of these responses focus on similar

characteristics that cause risk communication failure. There were seven respondents that focused on failure in risk communication as a result of the receiver's failure.

Table 18: Sample of Responses to Question 5 that Focus on Receiver Failure

<b>Receiver failure</b>
People don't want to think it could happen to them.
The audience did not receive or understand the information presented or did not want to accept the information presented.
Lack of comprehension.
The person communicating the risk is usually trying their best to convey the message, and often, in different contexts. The primary reason is disinterest in the <b>recipient</b> of the message.
A decade or more ago, the failure was usually caused by the activity (project) owner or design professional failing to communicate the risk. This omission may have been caused by a perception such communication was not required or the owner's responsibility or to limit public opposition. Today, the failure is more likely caused by the stakeholder choosing to not want to be aware of negative consequences or not willing to take the time to understand the message.
Absent knowing what "fails" means, risk communication fails when the audience doesn't understand the technical information, or applies lousy notions of probability to technical information. The "100-yr flood" is a huge problem to overcome. People also have incredibly distorted notions of probability, which interferes with the communication.
Humans are notoriously bad at understanding probability. People have biases that disable their ability to truly understand the frequency of occurrence of an event. Communicators who do not place these odds in the proper context can run afoul of these biases and will be unsuccessful in communicating the true risk.

Lack of comprehension or a choice to not be aware of the negative consequences seems to be common responses among this group. Another small group of participants identified the failure of risk communication to be due to a lack of trust between the sender and receiver, or a lack of trust between the “audience and the agency.” One respondent that indicated trust as a part of risk communication failures also highlighted the fact that there are often competing priorities and that an “undesirable value trade off” occurs. However, all four of these respondents believed that the failure was due to a lack of trust in the sender of the message.

Six respondents of 46 identified the cause of failure as somehow shared between the sender and receiver, whereas many of the other respondents seem to place the burden of blame on one part of the communication relationship: either the sender or the receiver. In this case, many respondents identified the sender as being at fault. The responses that focus on failure being a result of general communication problems indicate that both the sender and receiver could be at fault for the failure in risk communication. The burden of the blame does not rely on one party in these responses, but is attributed to general errors and challenges that result from communication issues in any scenario. These responses are shown in the table below for reference.

Table 19: Responses to Question 5 that Refer to General Causes of Failure

<b>General communication failure</b>
Generally, it's the lack of communication between parties.

The parties start from different perspectives / levels of understanding and message content has one meaning to the sender and another to the receiver. If the issues haven't been discussed in a non-crisis setting, it's difficult to get on the same page in an emergency.

Either, the risk communicator failed to convey the risk relative to the experience and perspective of those whom are subject to the risk, or the subject of the risk refused to listen (hear) the risk message being told them (for whatever reason).

Like any communication failure, either failure to transmit the message OR failure to receive/understand the message.

Either it was inadequately communicated or it was not completely understood.

- Excess Noise in the communication model, primarily from other agencies
- HILF - high impact low frequency events are difficult for humans to understand
- Poor personalization of message, we provide an overly technical or analytical mess

Communications obviously. A study was done quantifying the value of stuff built from the traffic through the project. Leadership is saying that's the value of the project which could be lost if the project fails. False. Value of project is not same as value of stuff produced from the commodity. The project only supplies transportation, it doesn't supply construction of the stuff. If your salary is \$100K and you drive a car to work ... your car isn't worth \$100K ...

Although a majority of the responses focus on either the sender or the receiver being at fault, one respondent did identify the media as a primary cause of risk communication failures. This respondent indicated that some media outlets “intentionally distort risk communication to create sensationalism.” This was the only response that pointed to a third party being at fault, whereas other responses were sender/receiver, process, or trust oriented.

### **Improvements in the Publics’ Ability to Understand Risk**

The sixth question in the survey asked respondents to indicate the degree to which they agreed with a given statement. In this case, respondents were asked to indicate to what degree they agreed with the following statement: the public understands risk better today than it did 10 years ago. Respondents were asked to choose whether they strongly agreed, agreed, disagreed, strongly disagreed, or if they were undecided on the topic.

Respondents were also given the option to choose “other,” with a textbox for them to explain the response they provided.

Table 20: Total Response Rates in Response to Question 6

<b>Response</b>	<b>Rate</b>	<b>Percent</b>
<b>Strongly Agree/Agree</b>	<b>20</b>	<b>44%</b>
Strongly Disagree/ Disagree	13	28%
Undecided	7	15%
Other	6	13%

About 44 percent of respondents suggested they agreed with the statement that the public understands risk better than it did 10 years ago. Five of the 20 respondents that agreed with the statement provided additional justification and explanation for why that answer was chosen. The explanations provided vary, but several state that general understanding of risk has improved, but there is still room for improvement.

Table 21: Justification Provided for Strongly Agree/Agree in Response to Question 6



<b>Strongly agree/agree</b>
Recent experiences with natural disasters such as Sandy and Katrina have helped the public better understand risk.
With many floods, fires, hurricanes, earthquakes, etc. in recent years, I opine that people are thinking about risk more and are informing themselves about risk and seeking information about risk, in addition to the better (not great, just better) job that the Corps of Engineers and other agencies are doing at communicating risk.
"Better": Risk understanding is cultural, and cultural change is slow. People around me understand it better because I understand it better, discuss risk with some confidence, and lay off when people don't want to hear (and don't have to hear).
" Some of the public better understands, but still not a majority.
I think that technology has evolved today to the point where humans are provided better tools to potentially to communicate risk situations better. But, "human" understanding or knowledge is a personal decision or choice. I guess I would have to say that the public is given more opportunities to understand risk from this perspective.
But consequences are still largely perceived as someone else's fault.
Yes, but we must continue to remind them that we can reduce risk, but there is still a chance of a flood.

The second choice chosen most frequently was disagree/strongly disagree with 13 respondents and 28 percent of the total response. There were no explanations provided in response to either option of “disagree” or “strongly disagree.” Seven respondents indicated they are “undecided” as to whether the public understands risk better now than it did 10 years ago, making up 15 percent of the total response. One of these respondents provided explanation indicating that the “public is too big to construct to evaluate.” There

were six responses that chose “other,” but only five of these respondents provided a justification or explanation of their chosen response. Participants that chose this option had a high variance of justification or explanation as to why this best depicted their opinion on the topic.

Table 22: Justification Provided for Other in Response to Question 6

Other
I believe the public considers risk a rather ethereal concept; something that can happen but not likely to themselves.
Risk understanding has neither improved nor declined, although the use of anecdotal evidence is increasing, vaccines, climate change etc . (The plural of anecdote is not data.)
We talk the game, but I am not convinced the public under stands the problem. Failure was not an option 20- 30 years ago in my belief. To day \$\$ rules and stealing is the norm if the job last 5 years watered concrete may never show and that is the risk. We give up quality for the minimum required. I give you this example the original Lake Washington floating bridge built in the 40'? the wear surface was still going strong long after they were forced to resurface the new bridge. Risk vs \$\$
I agree but this can be very situational. For instance, my father-in-law is highly sensitized to each new virus or health risk that comes out on the news or in the newspaper but pays little attention to flood or burglary risks, even though both may have a higher risk for him than a scary virus.
Don't know. Not aware of any studies examining this.

## Why the Public is Unable to Understand Risk

The seventh question participants were asked to respond to asked individuals to identify the primary reason for the publics' inability to understand risk. Participants provided their responses using the textbox provided. One respondent indicated that the question assumes the public is not always able to understand risk; however, the other 45 participants provided what they believed to be the primary cause of a lack of understanding. About 16 of the 46 respondents provided a response that indicated an inability to understand risk was the result of poor messaging, too much technical information, a lack of context provided with messages, and more generally a lack of frequency of messaging and effective messaging when it does occur. Several participants brought up the concept that risk is complex, while others suggested risk is simple and frequently encountered.

There were several participants that indicated the primary reason for the publics' inability to understand risk is the difficulty imagining an event could happen to them that they have not already experienced; for example, a person may not believe there is the potential their house could flood if it has not already flooded before. The eight responses provided that relate to this theme are depicted in the following table.

Table 23: Responses to Question 7 that Relate to an Inability to Imagine Future Events

<b>Responses related to in inability to understand</b>
It doesn't matter, it will happen to someone else, not me! They will flood, not me! I will win the lottery. Our belief that nothing bad will happen to us. They also believe that someone will bail them out for their bad decisions. FEMA will pay for me to rebuild right where I was flooded out.
The answer is not a simple, clear answer. Each person filters information based on experience, environment, etc. Some people can perceive an immediate threat - such as flooding from a storm event, but may have greater

difficulty appreciating the potential for a possible future event - for instance, flooding from sea level rise.

An unwillingness to believe that anything "bad" can happen to them or their community. It is also my opinion that in certain regions of the US (Appalachia primarily, but also other economically disadvantaged areas) a general defeatism and unwillingness to take measures to prepare fully for disasters may also play a part.

There will always be a problem convincing people that something will happen that hasn't happened yet. Seeing is believing, and if it hasn't been seen many will not believe. Especially if they do not understand the science behind it, and not many people do.

Primary reason public, in general, has trouble understanding risk is the inherent belief that bad things happen to "the other guy". Maybe this is because every day we hear news about bad things happening all over to other people while our own lives continue in a relatively uneventful fashion?

Human nature. Risks, as we speak of them, are often very rare events with large consequences. Humans have difficulty assessing risks with low probabilities and are more driven by recent experiences ("I've lived here for 30 years and have never been flooded out!" etc.).

In my region - the public understands risk when it is a reoccurring threat and there are monuments to that threat (e.g. tsunamis in Hawaii). The public doesn't understand the risk when the threat is not as frequent or they do not see the direct impacts of that threat (e.g. areas that haven't flooded recently or potential changes to the environment far into the future).

Lack of personal experience with the risks that are being discussed; floods occur rather infrequently and most people have not personally experience a damaging flood event.

Responses provided that focus on an understanding that the public is unable to imagine the future are closely related to the answers provided that focus on a general lack of understanding, or choosing to believe the risk is possible based on personal values. There

were 14 responses provided that focus on this concept of not understanding risk technically and only hearing what individuals want to hear. This theme of responses loosely includes submittals that suggest the public perceives risks differently than a technical expert might; however, these answers do not focus on the ability to imagine future events as heavily as others.

Table 24: Responses to Question 7 that Relate to Differing Risk Perceptions

<b>General lack of understanding</b>
Not taking time to comprehend the impact.
= Explanation of risks is too technical. = Issue is very emotional for public.
The public is looking for black and white. Risk defines the shades of grey.
Everything is black or white to a large percentage of the population; either you are protected or you are not.
The public's inability to understand risk is they may develop a risk tolerance or they may try to shift risk (risk avoidance). We were considering a levee in a community that actively campaigned against a levee. Local community succeeded in not getting the levee built (obstructed their view of the beautiful river). 20 years later, the river flooded the community. Now community is asking, why did you listen to us, you should have done the right thing, build the levee.
"What's in it for me" attitude of many of the public's dealt with in today's society. Selfishness and narrow minded public that seek only to satisfy their needs and not the needs of the whole. In this, the public only hear what they want to hear, excluding all the rest of the information presented.
The majority of the public is not listening to risk communications. for example, in New Orleans we had public meetings that probably reached 5,000 attendees. Out of a population of 600,000 this is less than 1% of an informed public.
Not understanding probability, for example independence of events. Not trusting experts. Personal biases, such as disbelief due to inconvenience.

I am not sure that the public doesn't understand risk. The problem is both a lack of willingness to believe that a certain decision puts people in harms way and our ability to communicate the impacts." It hasn't happened yet, so why should I care". We are unable to explain to people and clearly demonstrate how vulnerable they are to a certain risk. We can't easily answer question like 'how deep with the water be/' how fast will it be moving?' what is the likelihood that this will ever happen?'

Until a specific risk event occurs, it doesn't count, emotionally. Those who understand statistics may plan mitigation ahead of time based on a calculation; those with a significant emotional event may find mitigation planning truly satisfying. Cognitive dissonance; some don't want to think about unpleasant possibilities because it's personally unsettling; others want to avoid money discussions. Basically, one must be prepared for many individual reasons to avoid thinking about risk.

Humans make an individual choice to either understand or not. To me it's not a matter of inability it is a personal choice.

The public usually prefers to not want to hear bad news. Contributors to this view are 1) few viable alternatives for individuals affected (e.g., economic & cultural/social considerations), 2) lack of understanding of STEM related issues (e.g., wx, topography, etc), 3) perception involvement is not an individual responsibility (i.e., gov't responsibility), & 4) individuals do not have time for such involvement. It does not help that design professionals are poor communicators as a group.

The primary reason is personality -- in my experience, most often it comes down to ignorance or stubbornness. If we are able to reach people and they come away not understanding, it either because risk wasn't explained to them in a way they could understand, or it's something they just didn't want to (or refused to) hear.

Denial & ego. For high-risk things (high frequency/high consequence) in which we have a choice (smoking, drinking, skydiving, etc), we feel control and responsible. For those lower risk things (floods, earthquakes, etc) over which we have no control, we feel helpless and not responsible. We don't allow ourselves to embrace or understand them. We can blame others and not take responsibility. In modern terms, full of high risk, fully voluntary actions younger generations are numb to risk concepts.

Because they do not receive a clear message about the risk. There is always another expert that vocalizes a different message about the risk. People tend to

believe or listen to the expert that best aligns with their personal beliefs.

There were several answers that discussed the impacts Hurricane Katrina and the events in New Orleans served to exemplify misunderstanding, or provide reasoning as to why the public is not always willing to accept risk messages. One respondent specifically stated there is in fact “less understanding because public trust has eroded significantly since Katrina.” Another respondent echoes the theme of a lack of trust by suggesting the primary reason for lack of understanding as a result of lack of transparency, lack of agency trust, and conflicting statutes, regulations and policies. According to another respondent, New Orleans is in fact an example of the “push and pull of risk and the desire to fund project needs.” It is unclear whether the respondent is referring to the events during Hurricane Katrina, or the levee projects constructed after the event in New Orleans. The participant added that this is “the true mess of risk and the inability to get a basin-wide explanation of the consequences.”

Four respondents provided answers that reflected on the role of the media and the issues that result from messages coming from multiple channels as a cause of confusion about risk. According to one response, it is human nature to distort probability. This is evident in behaviors such as “buying more than one lottery ticket, or playing calendar dates in the lottery.” This participant also suggests that news media further “distorts public perception of risk by exaggerating rare events disproportionately.” In the same vein of responses, a participant suggested that the media distorts and there is a “lack of critical thinking.” Another participant indicated that “although we encounter and adjust

for risk every day, it remains an abstract concept that lacks a vernacular and is not approached with logic and temperance by the mass media.” One other participant did not specifically suggest the media as a source of distortion, but did highlight that there are “too many sources of information,” and that many of these sources do not provide “accurate information in proper context.”

There was one participant in particular that seemed to highlight multiple themes present in the responses received in Question 7. This response first suggests that the media “has turned innocuous events into crises,” similar to other responses received. The participant then identifies the concept of magical thinking as a source of inability to understand. Magical thinking is the concept that “it won’t happen to me.” The respondent also suggested “technical risks statistically significant are often orders of magnitude less than what the public can grasp.” Two examples provided with the response included the concept that a person lives near an airport and is afraid an airport will crash into their house, but this same person also rides a motorcycle 100 miles per hour. A second example provided: elevated air pollution concern from an individual that smokes.

### **Suggestions to Improve USACE Risk Communication**

The eighth question participants were asked to respond to asked participants to suggest ways to improve U.S. Army Corps of Engineers (USACE) risk communication. This question drew responses that could be broken down into a few themes: message-centered improvements, agency specific programmatic changes, and suggestions to involve a third party. The responses that focused internally on programs and projects suggested areas of



improvement such as the way projects are planned, budgeting for communication efforts, and training, to name a few. These responses are recorded in the following table.

Table 25: Responses to Question 8 that Suggest Programmatic-focused Improvements to Risk Communication

<b>Programmatic focused</b>
Get leadership to outline analysis layout to include consistent risk description.
Have open communication for the budget process concerning risk to enable projects to be properly funded with attached DM for Risk.
Flood Risk communication must happen at all stages of a project. We need to be out there even when we don't have a project in flood prone areas. We also need to understand that talking in technical engineering terms is not what is best and we don't always have the best solutions. We need to develop more communication materials that address risks that are not solely focused on our needs but on the needs of the communities we serve.
USACE officials must somehow reach out to the population before a disaster and make clear that projects can be overtaken or overtopped by natural events. Also, in most cases what was considered safe in the past is not necessary safe today or in the future due to climate change.
More public meetings where the public can ask questions. Reading a pamphlet on flooding does not have the same impact as showing a hydraulic model of neighborhood that can show the impact at each home, school or place of business.
USACE should hire more communication specialists and engage them on every project in all stages of project development.
As our layers of protection should be duplicative, so should our layers of communication.
1) Host an Open House - have personal conversations 2) Have reference materials that citizens can refer to including website links 3) Have a contact that citizens can call

#### 4) Have materials in multiple physical locations

Ensure the people who are communicating the risk are fantastic communicators - regardless of their level of technical expertise. Engineers attempting to communicate on potentially evocative subjects frequently come across as uncaring and mechanical.

Fund the attendance of town hall meetings to discuss risk in every county, town and city -- reach out to communities, put an ad in the paper, invite appropriate local officials and residents and business owners, and take an hour or so in each location to make a quick presentation about risk management and answer any questions they may have. Doesn't have to be done in one year even -- do one every couple of weeks and put it on a 10-year cycle and we could save untold lives and property.

Assign risk prep to an individual, hand out a model & checklists, check that each team did analysis, rating & plan, then do After-Action Reviews for risk events using plan as baseline to ingrain the process.

Early implementation of risk communication strategy with stakeholders and public.

More use of public high water marks and characterizations of past floods. As I said, seeing is believing. Especially if pictures are available. Often audiences say "That wouldn't happen now because of all the dams." To answer that we can use modeling to show what we think would happen if that 1913, 1927, or 1937 rainfall happened today.

My suggestion to improve USACE risk communication is to start developing a training that explains why it is important to understand this concept. The majority of USACE employees deal with risk on a daily base but when it is time to explain the expectation / outcome of any endeavor USACE is performing it needs to be part of the presentation.

Brief but formal training to all relevant employees (engineers and planners not PAO) with slide templates and easy to apply risk communication guidance.

Internally, we need to start listening to our SME's and get out of the stance that this is the way it is done (so we don't learn from the past) or environmental compliance is an obstacle (versus a valuable duty).

Externally, we need to do more to integrate directly into the local neighborhoods with our message. This is not easy given our budgets and potential conflict with sponsors messages.

The results of traditional deterministic analysis is more understandable to the public. The USACE risk based assessments presently being conducted just overwhelm the public.

Several respondents indicated that involving a third party of some sort would help to improve risk communication efforts. One respondent suggested that the U.S. Army Corps of Engineers should work with state and local governments to get the knowledge out to the community about the risks that they face and how they can address them. Another respondent indicated it would be beneficial to “solicit advice from at risk populations on media methods and risk messages that would resonate with them.” Two respondents suggested using private sector consultants, but for varying reasons. One suggested using a public relations firm, while the other respondent suggested using the private sector to define risk. The respondent added that currently communities that “want to disagree with the Corps message can find or hire an engineer to assist.”

A series of respondents provided answers that are very message-centric, and suggest the primary way the USACE can improve risk communication is to simplify messaging. These suggestions range from removing technical information and knowing your audience to the need to develop tools or use analogies. There were 22 responses that fall under this theme.

Table 26: Responses to Question 8 that Relate to Message

**Agency/message specific**

Engage your audience, relate to their circumstances and their experience/life view of the risk topic.

Make the effort and investment necessary to ensure that risk information is accurate, descriptive, and geographically specific.

Assess the audiences and understand their perspectives when designing the communication plans. Don't assume we know their history with risk. Interview them; ask them to tell you what form/method of communication works best. What are they most afraid of? What values do they hold most important? Formulate around reality, not around our egos and assumptions.

Get rid of all the technical terminology and speak in plain English. Yes, I recognize that the engineers may feel like we're not \*completely\* accurately describing things when we do that -- but are we describing them accurately \*enough\*?

Explain it in as simple of terms as possible; use of analogies and relationships is always helpful. We often don't do enough trust building either.

Clarity and alignment on messaging that is attuned to stakeholder perceptions and interests.

As an organization, be sure to provide and communicate any new risk issues both internally and externally.

Make messages understandable to the layperson w/o tech jargon.

Explain the base condition and the consequence of the current threat.

Realize that explaining the consequences of the extreme event is what people respond to and ultimately remember.

Use of more analogies. If the Corps is explaining to an audience the residual risk of a project that will protect them from flooding up to a 1.0% exceedence flooding event. Do they realize that over a 30-year mortgage, the residual risk of the project being exceeded is greater than 1 in 4. You could illustrate this by randomly assigning 1 in 4 people in the room explaining that if this was 30 years from now, those people could have been the ones, which experienced residual flooding damage.

Try to provide an image of the risk of occurrence in terms that the listening audience can relate to. For example, the risk of different frequency flood events occurring with a graduated degree of car problems (running out of gas, engine stall, mechanical problems, auto accident). Basically, simplify.

Risk have to be related to other known and accepted risks.

Better explain the life safety risks involved if households do not evacuate. It's not enough to tell people, "Flood a-comin'!" people have to know whether they may be at serious risk of losing their lives if they choose to not heed warnings. Some of the later NWS warnings during Hurricane Katrina were very explicit about this and may have increased evacuation rates.

Emphasize potential impacts over probability of occurrence, as the uncertainties in the impact assessment are likely much lower than those in the estimation of probability. (Don't waste time trying to describe the confidence intervals around the water surface elevation of a 1 in 100 year flood, describe the potential impacts of floods of that magnitude.)

Put risk in terms that people can understand such as if you have a 30-year mortgage you have a 1 in 4 chance of having a 100-year flood impact you. Also minimize the technical jargon and get someone to deliver the message who is a good public speaker.

Don't use the standard flood risk equation EVER! Use metaphors to describe concepts.

Develop a collaborative national risk communication message and a strategy to convey that message to the public.

We should continue to improve our risk communications, always have a plan and make sure we keep it simple. Always ensure that the message is clear and understood.

Clearly communicating when trade-offs are occurring based on constraints such as funding. People understand that budgets constrain solutions

Build desktop demonstrations of how a flood will affect a certain community and share this information with them. Show them the simulations and explain in lay terms the impacts to homes, businesses, etc.

Interactive tools (web?) to give people a hands-on experience of how decisions influence risk.

There were a few responses that encompass several of the themes in responses. One of these respondents suggested the USACE should make sure information is targeted directly to the community of concern. In doing so, tools should be used that “demonstrate both what an action will do and what it won’t do.” Another respondent suggested that communicators should “have a better understanding of those who are the ‘receivers’ of information” and to stop providing wicket information and “talking over those who are being presented information.” Additionally, the same respondent suggested the USACE stop “talking down to those individuals who are in attendance of the presentations.” Similarly, a third respondent suggested that risk be approached in a more personal manner. The respondent suggested that USACE conducts public meetings where the individuals leading the meeting “come across as technical experts who are far removed from the people impacted by our projects.” The respondent also suggested that USACE should improve its ability to recognize the “specific issues of most concern within the target audience and integrate our risk communication activities to address those concerns.”

There were two additional responses that are similar to the others provided, but seem to focus a bit more on correcting, or on improving the public’s trust. Two respondents specifically state that improved public trust is needed. One of these respondents further suggested that it is difficult for the public to trust a “slow, fumbling, shadow agency. Part of trust is about our public image.” This respondent believes USACE may have a bad reputation.

A response that seems to be a bit of an outlier suggested that the USACE should preface much risk communication with the idea that much of what people know about probability is wrong. This respondent suggests that the Internet and social media provide information and factoids that are accepted as fact. The respondent perceives USACE as a source that can elevate understanding and should “get ahead of much reporting of risk by warning the public how media coverage will invariably distort reality.”

### **Frequency that Personal Values Should be a Part of Risk Communication**

The ninth question in the survey asked respondents to indicate the frequency to which personal values should be included in risk communication. Respondents were given the following options for response: always, frequently, occasionally, rarely, very rarely, never, or other. Participants who selected other were asked to provide an explanation in the textbox provided. However, for this particular question, no participant chose “other.” The textbox was used nonetheless in order to provide some explanations for responses chosen. The frequency with which respondents provided additional explanation was much lower in these final few questions.

Table 27: Total Response Rates in Response to Question 9

<i>Never</i>	12	26%
Other	0	0%
<b>Frequently</b>	<b>13</b>	28%
Occasionally	5	11%
Rarely	3	7%
Very Rarely	1	2%

As evident in the table above, there were no answers that a majority of respondents found to be acceptable in this case. Thirteen respondents indicated that personal values should frequently be a part of risk communication. Twelve respondents reported they thought personal values should always be included in risk communication. In total, 54 percent believe that personal values should either always, or frequently be included in risk communication. Some responses provided as explanation are detailed in the table below.

Table 28: Justification Provided for Always/Frequently in Response to Question 9

Response	Explanation
Always	We are human therefore personal (human) values impact how we define the concept of risk communication. Personal values are criteria to be considered in the overall process.
Frequently	Totally depends on the audience and their needs. Don't assume we know.
Frequently	It's important because it's important to someone, and that someone must champion risk planning to the team in terms the team will understand - that's personal values, top to bottom. (But 'Always'? Too much, that will guarantee message won't be heard.)
Frequently	The public needs to know we considered the right things in our analysis. Plus it makes a better connection/relationship.



There were five respondents that said they believed personal values should occasionally be a part of risk communication. The respondent indicated that although there are a lot of objective truths in risk management and risk communications, “the evaluation of overall risk and what should be done to manage it should always be a local decision.” The respondent said that decisions may be very clear at times, but others may not be and include value components such as considering whether to “build a levee to protect this residential neighborhood, or do I buy them out, move them to high ground, and build a park in the floodplain instead?” Although it seems overall respondents believe values should be a part of risk communication in some shape or form, there were 12 that indicated it that values should never be a part of risk communication. There were also exactly 12 respondents that said “always” in response to the question. Many explanations for those that answered with “never,” indicate that their response is context specific. Only one respondent indicated that risk is purely technical.

Table 29: Justification Provided for Never in Response to Question 9

<b>Never responses</b>
Never by the government. Stakeholders will choose to apply personal values, as they deem appropriate. This is why approaches such as Shared Vision Planning are necessary
Yours: never, theirs: always.
Only to the degree that you have commonality with the audience your are trying to reach. You must have a way to connect in relationship in order for them to buy into and understand your personal value of risk factors, etc.
Need to establish a more common metric, not just personal (individual) values.

Otherwise, whose values decides.
Not that values should or shouldn't be part of the risk measurement; the fact that risk measurement usually incorporates values through the elicitation process - this must always be communicated to the public.
Risk should be quantitatively addressed
I would include them in the context that they apply
I think it really depends on the audience. Personal values can be used to reinforce some aspects of our risk communication policy, but must be used in a conscientious manner to prevent the appearance of seeming "fake" or forced.
The more the better I suppose but I need to know how this is to be accomplished.
Always, but by this I mean the range of personal values always needs to be considered. Risk communication is really about translating from the technical aspects to the personal aspects, and the personal aspects are often grounded in values. Mitigation is also grounded in values ( sometimes in the form of political views).
I assume you mean personal values of the analyst.

### Participant Male to Female Ratio

The final question participants were asked was to specify their gender. Respondents were given the following options: male, female, and unspecified. Seventy-two percent of the respondents that participated in the survey were male, while 26 percent were female. One individual chose to not specify their gender.

Table 30: Rate of Male and Female Participation in Survey

Unspecified	1	2%
Male	33	72%
<b>Female</b>	<b>12</b>	26%



## **INTERVIEW DATA**

Discourse-based interviews were conducted as a second phase of this study. Participants volunteered based on availability, and suggested other colleagues for participation.

Interviews were conducted with individuals working in the Baltimore District, the Norfolk District and several interviews were conducted with individuals who work at Headquarters in Washington, D.C. Twelve individuals were able to participate in the study. Five were located in Baltimore, three were in Norfolk, and four participants worked at the Headquarters office. Half of the interview participants were male, and half were female.

Table 31: Location and Number of Participants

Office	Number of Participants
Baltimore District	5
Norfolk District	3
Headquarters	4
<b>Total:</b>	12

## **Job Descriptions and Background**

Interview participants were asked a series of questions on various topics. The first question of 10 participants were asked was to describe their job responsibilities and detail any tasks that relate to risk or risk communication. Interview participants hold a variety

of positions including positions in the Public Affairs Office (3 participants), planning positions (2 participants), project managers (1 participant), policy positions (2 participants), emergency management (1 participant), and floodplain management services positions (3 participants). Although only one individual self-identified as a project manager, many of the participants have duties or roles that could be described as project management. This is the case for the three individuals that identified with the floodplain management services positions. Participants' duties and how they relate to risk and risk communication vary from person to person.

The three public affairs officers work in different levels of the organization. One participant works at the Headquarters level and supports certain USACE programs nationwide. A different public affairs officer that participated is primarily responsible for District level programs and focuses on communications, media relations and community relations using social media and websites. The third participant that self-identified as a public affairs officer worked at the District level as well and supported both civil and military projects, while also responding to media queries.

The individuals working in project management and planning roles work on a variety of projects and programs. Those that are planners are often involved in the early stages of projects prior to being constructed. Planners are typically involved in public meetings as well. The project manager typically oversees the project and manages funding and progress. USACE has project managers for projects that have yet to be constructed, as well as for projects that are under construction, and in later phases of the project lifecycle through operations and maintenance in some cases of infrastructure. The

planners and project managers that participated in this study oversee programs at the District level such as activities under Public Law (PL) 84 99 under which projects that meet certain criteria can be rebuilt or repaired after damages during hazard events. Another project manager that participated works on Civil Works projects among a variety areas including environmental restoration, flood risk management, and coastal storm damage reduction. The third person planner or project manager is chief of the planning division and responsible for a study that includes multiple states and coastal areas.

Two individuals that participated in the study work primarily on policy related topics. Their responsibilities and backgrounds differ. One of the interview participants spends significant time working with other federal agencies to develop policy that relate to the flood risk management business activities. The second participant supports the policy office and reviews planning reports to determine whether risk remaining after a project is implemented is adequately explained, among other factors. One interview participant works primarily in emergency management, which requires very different activities from others that participated, but deals heavily with how to manage risk during an event. Three participants are a part of the flood risk management program and manage projects, or guide programs related to flood risks. These three participants hold positions at different levels in the organization as a whole, but draw from a similar set of responsibilities and understanding of the flood risk management program area.

### **Greatest Challenges when Communicating Risk**

The second question participants were asked to respond to out of 10 total questions was to describe what they believed to be the greatest challenge when communicating risk. One participant, who indicated he has significant experience with being interviewed by the media, said the greatest challenge when communicating risk is to get “people to say what they know, instead of what they think.” The example provided was in reference to storm surge, which is an abnormal rise of water generated by a storm, where the media asked him whether their community could withstand a large storm. In cases like these, he suggests it is best to say what is known about the risk

At least four respondents suggested that the greatest challenge when communicating risk centered on the concept of translating the “engineer-speak to English.” Another respondent brought up the issue that laypeople do not always understand hydrology and statistics, and that although it is easy for engineers at USACE to understand the one percent flood or a one in 100 chance, that is not as easily understood by others. A suggested alternative to using the one in 100-year flood event phrase is to instead discuss risk in reference to something people understand such as the chance of flooding during the lifetime of their mortgage. Another individual indicated that the greatest challenge is to use terminology or to speak at the level of the audience. This participant indicated that flood risk and related concepts are lived and breathed by experts, but to the audience, “it is one very small piece of their overall lives.” Another respondent identified the greatest challenge as being the complexity of communicating risk. He suggests that when talking about risk, people should talk about what they know, what they do not know, and what actions are being taken in response.

The last response discussed is related to another theme evident in several answers, that being to make risk communication actionable. One respondent indicated the greatest challenge when communicating risk is making the risk personal enough so that individuals believe it, understand it, and take action. A second respondent highlighted a similar concept, but suggests the difficulty is alerting the community or group to the risk without frightening them. In these cases, the goal is to “educate people to the best of their abilities, but not to scare them into paralysis.” A third respondent suggested the greatest challenge is trying to make communication meaningful and to have an impact “without generating so much concern that it is actually going to draw our attention away from handling the task at hand.” Another participant suggested that the greatest challenge is overcoming one perception of risk.

Two respondents suggested that greatest challenge when communicating risk is when the communication is in relation to something USACE does not have a control over. Similarly, a second respondent highlighted a challenge being when people come “to the table expecting the federal government to have a solution and then they are asked for their contribution as part of a shared responsibility.” This participant added that there is a difference in understanding of what the federal government should be providing and a difficulty in meeting the needs due to resourcing issues. These programmatic concerns are related to another respondent’s suggestion that the greatest challenge is the uncertainty involved in risk; there is difficulty since there is so much uncertainty about risk more generally.



### Confidence in the Publics' Abilities to Understand USACE Messaging

The third question participants were asked to respond to was as follows: on a scale of one to 10 (10 being highly confident), how confident are you in the public's ability to understand risk communication messages put out by the Army Corps of Engineers? One respondent did not specify a number about the general public. However, he did provide a rating based on his community of practice's ability to understand risk messages put out by USACE. This data is captured in the following table.

Table 32: Responses to Question 3 on the Publics' Ability to Understand USACE Messages

	Rating (1-10)	Justification
1	8	"Very confident that they understand. However, when just talking to the average public who is reading a newspaper, not certain that our message gets across."
2	7	"USACE is a very technical agency; and so I think we do a good job knowing when we need to communicate things and how we need to communicate things. But I think there still is some difficulty sometimes in a non-technical way and really breaking it down so that the average person can understand it. "
3	6	Example provided from hurricane evacuation where people did not leave, but luckily remained largely unharmed.
4	6.5-7	We're not great at it, we have a lot to learn; we're not really poor at it. I think we're a little above average. So I give it about a C, C-. Risk communication world it is not just about the public it is also about your partners.
5	7	Every district, every division, every person does it differently. I think there is room for improvement, I imagine. I was having a meeting yesterday with the national park service on an FPMS project on their land. The guy really just did not understand storm surge and we actually, the Corps and the County, decided we are going to develop a graphic to show him and the public how storm surge comes up and is going to wipe out and will cover this community.
6	2-3	I just think it is very, very low and the Corps in general presumes too much understanding on the publics' part.

7	8.5	It isn't the ability to understand, it is more how we are communicating it so they can understand - that is a lot of it. If we go out there and start talking about residual risk and incremental risk, tolerability of risk – all those scientific things and we say, your risk is 1.1 to the minus 3, they are not going to get it. Why don't we just tell them what we know, what we don't know and what we are going to do that and then people will say okay I got it.
8	2-3	That is very low confidence. The Corps is an extremely technical group and they have strong reservations in simplifying the highly technical field of risk. Have very strong reservations to simplifying it because then it is not exactly correct. I disagree with that concept, but even if we tell the public and even if they assume – knew they could get it and understand us exactly, it is not that important. They just need to know the very basic substance of what we are trying to communicate.
9	5	We have a wide range of educational levels out there and the ability to understand technical information varies from one person to the next, so I don't think there is a complete lack of ability to understand, but I don't think there is a widespread understanding. Having that personal experience is probably going to help.
10	3-4	I wouldn't say it is the publics' ability – I think they have a high ability to understand. I think it's if they get the message as it was intended to be communicated, I have a high level of confidence in the publics' ability to understand. I don't have confidence that the message is always being communicated by that third party intermediate source.
11	7-8	I think we're better than we used to. But I still think that there's, there's room for improvement. For instance, in terms of floodplain, I think we're doing u certainly doing a better job.
12	NA	My counterparts—and what I mean by counterparts, the emergency managers at the localities - which more often than not is the fire chief, we have 100 percent risk communication right there; we all know each other. And work with each other for years. Same thing with Virginia Beach Department of Emergency Management folks; it's just you know a 10 on that scale of 0 to 10

### **The One Thing the Public Does Not Know**

The fourth interview question asked participants to specify what the one thing is the public does not know and they wish they did; and how would they tell them? Few responses actually detailed how they would tell the public. There was not a strong

common answer found in what was provided. However, several responses do echo one another. One individual said the one thing the public does not know is that “they have a very important role in their own personal safety, and their own person risk.” This participant highlighted the fact that during a hurricane, she would not wait for someone to tell her to leave; she has already made that risk assessment and would be evacuating.

Another respondent brought up the idea that federal employees are still individuals impacted by flood risks and often familiar with or a part of communities they work with. She wishes the public knew that USACE employees are still individuals who are impacted by these same risks at times; they are not always just outsiders from Washington, D.C. coming in to fix the problem. In addition, the participant said there is an “importance to a physical presence in communities to take home the fact that we are there and we are trying to help, but also aware of the impacts and personalizing the response.”

Two interview participants indicated they wished the public knew that there is a chance they will be flooded, and that even if you have been flooded, it can still happen again. One participants clarified by saying she wished “people full understood the risk,” and added that this requires communicators to “keep going back to them as often as possible, as clear as possible, giving examples, and showing them it did happen or it happened to their next door neighbor.” Similarly, a second participant highlighted that people do not always know that “just because you are not in a FEMA mapped 100-year floodplain, does not mean you are never going to flood.” She attributed this challenge to the way agencies talk about the floodplain, and throw around the term “100-year or the

500 year; that is not something that makes a lot of sense to other people, but it is ingrained in us.”

A second group provided answers comparable to the theme of knowing that you will flood by suggesting they wished the public knew that they were building in a floodplain. This participant suggested there needs to be full disclosure of risk for people who are investing in floodplain locations, both coastal and riverine. He suggests that the USACE tends to communicate more about riverine environments and less about how shore protection projects work. Another respondent provided a similar response in that he would want people who live downstream or near a levee or dam know that they live in the shadow of one of these structures. He added that he wanted the public to “be prepared to take some action for [themselves] and [their] local authorities.” Awareness of living near a dam or levee is done at a local level, according to the respondent. A third individual provided a response suggesting that he wished the public knew more about “what is their general risk level of flood risk where they live.” He indicated he would tell people this by equating the risk of the community to other cities in the United States that are high, medium, or low risk.

One individual focused more so on physical structures that the USACE builds. He believes the public is much smarter than they are given credit for, but he still would want to emphasize with the public that every bit of infrastructure is going to fail at some point in time. He suggests that there is disbelief that this is the case, or that the 100-year event can actually occur multiple times in 100 years. This is a result of cognitive dissonance in his opinion. Another respondent did not focus on the structures in particular, but did

focus on the concept that she wishes the public knew that the results of USACE studies may not result in what communities are anticipating. She suggests that while a project may reduce the risk, there is a lack of understanding that the risk is not completely eliminated. She added that the public might not understand that “all the levels of government and agencies have a role to play; there is a role of the federal government and there are many different goals that can take.” However, all of the responsibility cannot be federal. She highlighted the notion of trust as well, and that it may be beneficial to not have total and complete trust from communities. This concept was echoed by a second interview participant.

The three other participants focused on the concept that the public may not know how USACE is funded, or fully understand how USACE projects and programs are authorized. One of these participants said the public may not understand how “USACE is funded and how receive funds.” She added that sometimes just because USACE has an authorization for a project, it does not mean there will be an appropriation. Additionally, there is a lack of understanding that USACE is project funded; she added that there is sometimes a perception created by the budget that the USACE is responsible or it is their job to do something that may not be the case. A second respondent brought up the idea that many want USACE to be doing work for their community, but do not understand that UACE does not necessarily decide where it will be completing work. Projects are justified using a cost to benefit ratio focused on the federal interest. He added he wished the public understood that it is a “science and math-based decision” and largely a-political. The participant added that the Administration should be reminded, “ultimately

you can't control mother nature"; he added that he wished the public understood the panacea for all their flooding problems may not a USACE project. The third participant who highlighted a programmatic issue they wished the public understood said he specifically wanted the public to know that "flood risk management projects are approved and funded by Congress, and that what we design and build is not what we always want to do, but it's because of the Congressional authority."

### **Positive and Challenging Risk Communication Experiences**

The fifth question interview participants were asked was to provide examples of a positive risk communication experience, and a more challenging risk communication challenge. Ten of the 12 participants provided both a positive risk communication experience or story, and a more challenging experience or story. One participant chose to not provide a response since there were no personal experiences to speak to necessarily. Another respondent focused primarily on Emergency Management provided a challenging story relating to fully understanding a problem in order to determine a solution. In the example provided, there was no quick fix for the problem, so the suggestion made to the community was to reach out to Congress in order to encourage a basin-wide study, instead of simply trying to fix one problem area in one section of the city. The responses provided by other participants are depicted in the following table. These statements are taken from a larger response to represent the general theme of the participants' response.

Table 33: Response to Question 4 on Positive and Challenging Risk Communication Experiences

	Examples of Positive Experiences	Examples of Challenging Experiences
1	We have lots of projects that we cost share with sponsors, but in any given year we might not get money to continue work to complete it. We have to convey to our sponsors the risk of that project not continuing.	Communication about the flood reduction benefits that they think they are going to get from certain projects and that really are technically possible. Living shorelines can certainly reduce wave energies in smaller storms, but I have seen so much come out recent disasters about their benefits in during storms, but in large storms like Sandy, those types of projects get flooded. They actually don't dampen anything. They just become flooded with feet of water.
2	Hurricane Irene came up the Atlantic coast, and then three days later, Tropical Storm Lee came up from the Gulf of Mexico. We did a really good job of getting our face out there, of letting the community know that here's the Corps, who built the levee for you guys and who's upgraded its standards and done a lot of work on it, kept it performing, is here, making sure that it doesn't fail. And I think that's a really positive message	There's a very stringent accreditation and certification process to accredit and certify a levee; and we work hand-in-hand on this with FEMA. Based on that accreditation, it determines how much people pay in flood insurance. Levees that are functional cannot be accredited for whatever reason. People forget their levee is there because all of a sudden they've got to pay flood insurance. The levee is still there and is going to protect you from potential flooding. It's just always important to have that flood insurance as well. But just because a levee's there doesn't mean you're never going to flood.
3	Communicating the results of levee screenings. We are going to be going out there and talking about these things as though we have some kind of new greater insight, whereas we were told do this because Congress told you to do it and now we are going to go	For a brief period of time when we started giving unacceptable ratings on some of our projects related to the periodic inspections, people were actually reading newspaper articles about it and people were actually visiting our website. That were set up for putting this information out and we

	out and faithfully execute our mission. But people that have a memory for it and even trying to explain that – we don't have a good consolidated way of doing it.	really did get a very positive outcome for a lot of projects where more people were paying attention to it.
4	We tell people to go to the park to recognize, retreat and report if they see munitions. There was a news clip that ran on all three major news stations related to one area with a little 12 year old girl saying the 3 Rs (recognize, retreat, report). I thought that was a really good example because as much as we don't want to admit, the media does carry the day and are our trendsetters. That was a victory and a feel good story where we were able to communicate and get the message across.	Instance where a project manager misspoke during an interview and created alarm and fear. Second example was communicating to a community that we could not build a particular project for them. A third example, an individual tweeted there was a leak in a dam during a hurricane going through and we actually used our very first tweet ever from the district to counter that rumor and kill the rumor. That is where technology helped to mitigate unnecessary risk.
5	The community and county came together and we looked at all kinds of alternatives for them and they are going ahead with the levee project themselves even though the Corps can't fund it. They understood the risk and were willing to pay for a project to protect them. Of course I would love to move everyone out of the floodplain, so I don't know how much that is a positive thing. I would much rather move people out of a floodplain than build a levee to be completely honest. But that was not an option in this case.	Another project where you have three different communities and the national park service all impacted. We have been working on this years and years because everyone feels differently about the project. Some want a wall or levee, some people don't and trying to come up with a solution that will please the majority has been extremely challenging. They don't all understand the risk. Some do, some don't.
6	Most challenging is the driving force behind many of the FRM projects is local development. The city fathers want city to grow, economy to pick up and some cases they are focused purely on what will eliminate flood risk and	When you run into folks that want the project so they can make the community look safer so they can attract more investment, they really don't want to disclose there is substantial risk even with a levee project. Public does not understand that levees work great until



	<p>make people safe. Fargo, ND was a good example of that. The people up there really dug into the risk and did a really good job of sharing it. When they produced a Chief's report for a really big project, and I think everyone in the red river basin had an opportunity to understand the risk and what the project would and would not do for them. The community all the way up to the congressional delegation and the governors office publicly acknowledged that the project would only prevent a certain range of floods and they would still have to deal with those situations when the water is higher than the levees and they cease to function at all.</p>	<p>the water is higher than the levee, and then they don't work at all. If you look at the publics' perception of the Corps since WWII, there is a huge block of people out there that think the Corps is all about development at any cost. We sell the economic benefits and hide the risk particularly induced development. It is in the Corps long-term self interest to be on top of the communication and be forthright and then let the community make the political decision to move forward with the project or not.</p>
7	<p>Back when Sacramento had some levees that were decertified because of some issues with it, and from the public, elective official perspective, they were all about what this did to their tax base, what it did to development and all of that. There was 100 plus blog comments from public folks or just regular residents saying you guys don't get it – this is about our public safety that this deals with the performance and what this means to us, and has nothing to do with us as a tax base. I think people do get it. If we break it down simply enough, and again talk about what we know, what we don't know and what someone, everyone is doing about that, then people will get it.</p>	<p>The bigger challenge is when we are talking with someone in the media – because of the nature of the business now, it is difficult to be able to get into all the nuances to have people understand. Back when a couple reporters called in about inspection we do on levees and trying to explain what that means and that it is an operation maintenance perspective, not necessarily the overall performance. They would make the leap to the certification for the NFIP. It came off as though this is your total risk and you should be aware, but that was not the case. That was not risk communication. One of the biggest challenges we have is all those components within flood risk and trying to separate them out to what they do and don't mean and that is probably the biggest thing is saying what this doesn't do for you – because a lot of people make that leap in logic of here is what it does. The omission can sometimes be the sin.</p>
8	<p>There is a federally authorized levee that protects my neighborhood. They were doing a</p>	<p>During a public meeting led by the USACE, the questions got so bad that the president of the Reclamation Board</p>

	<p>media event for know your high water mark that FEMA is involved in and a lot of other agencies. This sign is out in the parking lot to show where the high flooding has been in previous years. To me, that was great in terms of a simple way to communicate risk to the public and it was done in a very collaborative fashion with so many players. One very small negative thing in the back of my mind was I was disappointed to see that they did that 100 yards from the river, it would have been more effective in downtown Sacramento with all the buildings and businesses around versus sitting in a parking lot that is located in a park.</p>	<p>told the Corps to stop and for me (not a USACE employee at the time) to talk to the public and finish this off – even though the Corps and board were partnering, it was the Corps’ show. I got up there and started talking plain English on what we were doing, and what we needed from the locals. The key was to talk in a language they could understand in terms of a potential project that could come into their area to help reduce their flood risk. Standard process for doing public meetings to check the box off for NEPA purposes and feasibility study. The Corps has really changed, but we are still not there. A second challenge is getting the public to pay attention when communities are also bombarded with messages from multiple agencies on different topics.</p>
9	<p>A positive one would be with the a project that when we were going through the lack of availability of dredges, we communicated that risk with the sponsor and with the project delivery team, and our leadership and what we were able to do was restructure our bid schedule to include options that allowed us to mitigate the risk of us busting our bids by including everything in the base bid.</p>	<p>Most challenging is work in kind and this is more environmental restoration focused. The issue with cost sharing environmental restoration work is that sponsors have a list of priorities and generally environmental restoration is in the top of those priorities. It is important to them and they want to be a good steward, but flooding of their public buildings or flooding of their private residences will always take priority over restoring wetlands. It is hard to get willing cost share partners for environmental restoration because they have other priorities where they want to put their money generally.</p>
10	<p>There are people sometimes that you talk to and, any way you try and twist it, for some reason, they’re just not able to visualize something so remote as a chance of flooding. That tells me a lot about your real estate, or house, or other things, but that communication is not being had.</p>	<p>Sometimes, a belief gets so engrained in the person, they’re absolutely convinced that a situation is causing a certain amount of flooding. A development has gone and now they’re seeing flooding. That’s perception of risk, their personal risk, and their view of the way the world works. That can be challenging to convince them that there are other</p>

	<p>And when you're sitting down to close on the house, that's not the time to find out that you're, you're in a risk area.</p> <p>I saw a complete 180 when I was individually sitting down with somebody. And identifying their property in terms of the risk. What I have experienced is that a personal conversation, that visual conversation, seems to lend itself better to risk as opposed to just in the abstract. If I have a map that shows you where your house is in comparison to the floodplain, that's one level. But if I can show you what I estimate the flooding to be at your structure, if I can tell you I think there's going to be 3 feet of water at your house, that's more effective.</p>	<p>reasons why they're flooding.</p>
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### **Examining a Risk Communication Sample**

Mid-way through the interview, respondents were asked to look at two-page communication sample from a media outlet, the Kent Reporter. The Kent Reporter is a local news source for the community in Green River Valley near Seattle, Washington. The news story, available in the Appendices section, discusses measures taken to improve the safety of the Howard A. Hanson Dam. Some participants were very familiar with the actual project and USACE employee that was featured in the article. Many had not heard of the specific project, or the individual that was speaking and quoted in the article. Participants were asked to summarize the purpose and goal of the article, and suggest how they might change it to make it more effective. The overwhelming response from

most of the participants was that it would be helpful to use fewer technical details, less probability and more simple language that clearly states what is the risk, and what is being done. The responses provided in summary in this section are taken to represent the thematic component of each participant's response.

While some participants were largely unclear as to what the purpose of the piece was, one suggested summary was that the piece and work to repair the dam does not alleviate all concerns. This participant said the piece focuses on the idea that "we are not out of the woods, but we are working on it." The summary is based on the probabilities provided in the news story. Many noted the fact the communication sample uses a lot of numbers and technical information. Several indicated they needed to do math in order to understand the article. One detail that was called out was the detail about pumping 4000,000 gallons of cement to form a grout curtain abutment. The individual suggested that this is not easily grasped and suggested using an equivalency such as 14 Olympic swimming pools, or the size of a full Ravens' stadium. The participant suggested that this is a situation where it is beneficial to break down the information and suggests the reporter may have been working from a fact sheet as an explanation as to why so many specific, technical details were included.

Another participant suggested making the piece shorter. This participant indicated that while the probability language is easy to understand for him, it might not be for others. He suggested there are times where it is appropriate to make the information simpler, and times where the audience should be expected to make an effort to better understand. He suggested that discussing the storage capacity behind the dam may not be

the detail to focus on, and that the point that should be taken home is that the dam has gone from bad, to not so bad. This captures the concept there is still a high level of flood risk. The participant also brought up the fact that he was surprised how many numbers were a part of this piece. He indicated that he often is working with imperfect numbers and calculations and is not able to communicate using numbers, as he does not have a high enough degree of confidence in those numbers to speak from them. Three other participants suggested that the piece should be simplified significantly.

One of these three indicated that as an engineer, he had difficulty following the piece, particularly with all of the differing probabilities provided. He also brought up the fact that the audience may not need to know, or care to know about how many cubic feet per second the water is flowing. Similarly, he suggested that talking about the amount of concrete needed to form the abutment might be a detail the public would not really care about. He added that he has been a USACE employee for 33 years, is a civil engineer with a background in hydraulics and hydrology and still found the piece to be hard to follow. While it may have been interesting to an engineering audience, he suggests it may not be successful with the average Joe unless it is made simpler. Another participant presented the idea that the piece would be better if simplified, focusing on how bad the risk is and what the individual should do about it. He also brought up that from the public's perspective, it might be disconcerting that 400,000 gallons of cement and 8.9 million dollars were spent for a temporary fix. These may not be the details the public would or should want to know. This participant also brought up what he believes to be an issue with USACE "talking points," suggesting that they are often designed with what we

want to tell the public in mind instead of putting the public in front of our needs. This puts us on the defensive in many cases, he added.

The goal of the piece was evident, but it was not easy to understand, according to another participant. The participant brought up the frequency at which the article used probabilities, often switching the overall numbers, but not providing indication as to what those numbers really meant. There were echoes of the sentiment that details such as how much cement was used, and the capacity behind the dam perhaps should not have been at the forefront of the article message. She suggests the public may not really pick up on the key messages, and may not realize that the dam impacts them. The discussion of what the public should do if water is released does not occur until the end of the article; this could be beneficial because it is more memorable as the last detail, or detrimental if people are not interested enough to read through the entire article. The remaining six participants focused on similar aspects: the use of probability and talking about risk in a public friendly way. Suggestions were made to use more visual aids, and to use numbers when it is appropriate to do so. A respondent also highlighted the need to discuss what is being done to reduce the risk, and to have a communication plan in place if the problem worsens or becomes more damaging to impacted communities.

Generally, respondents seemed to suggest that the use of probability might have not been ideal. One participant suggested that it might be beneficial to discuss the probability in terms of the risk that can occur during the lifetime of a mortgage. It was believed that this may be easier to understand and more relatable for most. Another suggestion for improving discussion of the amount of water is to use something people

can visualize such as saying, “if you are on the river bed looking up, the water is 300 feet from the top of the dam,” or, “if you are on top of the dam, the water is 30 feet from the top.” One of the participants spent time describing the way people actually think about probability. The 100-year flood is like saying there is one blue marble and 99 red marbles, and each year you draw one. He suggests that people forget that even after you draw the one blue marble, you are still dealing with the same probability; the marble goes back into the group. A key point made about the use of probabilities is that the communication should consider audience and their sensitivity to the issue as well. The community in New Orleans was used as an example, where people who lost their house would respond to communication differently than someone who has not experienced that, or only smaller risks.

### **Employee Training**

One of the questions people were asked during their interviews was whether they had any training and if any of the training related to risk or risk communication. Some of the training reported by participants was dependent on their position within the organization. For example, participants who were public affairs officers had specific training that all public affairs officers take, such as courses on working with the media, social media, communication planning and similar courses offered through the U.S. Army. Many of these trainings are specific to communication, but not specific to risk communication. One of the three individuals that self-identified as a public affairs officer had not had risk communication training through USACE, but had been exposed to it through her job

responsibilities and graduate course work. A second public affairs employee indicated he took a two-hour risk communication course, and the third public affairs participant took part in the USACE weeklong training course on risk communication.

Two project managers/planners indicated they had training relating to interacting with the media, and conflict management, but had not taken a specific course on risk communication. One of the project managers indicated that in lieu of training, she often tries to use community liaisons from other organizations to champion a message since they often have a working relationship with the local community. She brought up a fear that USACE is not equipped to conduct door-to-door campaigns since USACE does not always necessarily have boots on the ground in the community, or the funding stream since programs are funded at a project level that does not always include ongoing communication about risks.

There were two participants that said they have had communication training and attempt to either use information they have learned on the job, apply general communication skills for risk communication, or attempt to use resources within the agency. Four participants said they have had no formal training on risk communication or communication, but have listened to webinars that discuss how risk communication should be approached. Most of the information referenced by these individuals is provided by external entities or agencies, and not USACE itself. Some of these participants also indicated they would be interested in more formal training. One participant indicated there was little to no training offered for individuals in his particular field. He was able to develop a training course that was specific to his community and



prepared employees for interviews, working with the media and how to manage responses to events.

## Defining Risk

As part of the interview, respondents were asked to define risk. This question was also asked as part of the survey; however, it was not assumed that all participants in the interviews also participated in the survey. The responses are summarized in the following table.

Table 34: Response to Question 8 Defining Risk

<b>1</b>	Consequences. That's the number one thing. What are the consequences? Compare that to what the benefits are. Consequences on what it does to the mission that you've been given. We're all about emergency management. All that is, is preparing the district to respond to events.
<b>2</b>	The hazard times the vulnerability, but in simpler terms I would put it as anything that threatens something you value. And, if you think about it in terms of you know if you valued your car you would spend more time protecting and doing the things that are important to maintain a car.
<b>3</b>	Anything that has a probability of becoming an issue at a later date, and issue is something certain to happen or anticipated to happen. It is identifying what problems could be in the future that aren't certain to happen but could happen and then mitigating for those potentials.
<b>4</b>	Probability x vulnerability x consequences. Different people group them differently. Vulnerability is sometimes broken out to have an exposure factor, but that is how I learned it. Probability is likelihood of occurrence of a hazard event. The vulnerability is system performance and system doesn't necessarily mean the infrastructure system. The easy set of consequences is economic damage, but there are considerations for environmental and social, which are harder to include in a mathematical equation. Since the average person doesn't think in terms of mathematical equations, the simpler equation I have seen a lot that I

	think we have evolved a little past is just probability x consequences.
<b>5</b>	I am purposefully avoiding the technical definition and focus on one part that is important to me. It is the consequences. Yes there is a probability of it happening and what can you do to prevent it, but primarily risk targets the consequences and that is what is important.
<b>6</b>	I won't use the formula, because I don't remember it. I used it once and no one even got it. In the case of flood risk, it deals with how we think the infrastructure is going to perform, what is the likelihood that it is going to be put under some sort of test and then what are the consequences if it doesn't do what it is supposed to do.
<b>7</b>	I tend to lump the probability and the consequences together. It is a combination of the adverse consequences and the connotation of risk is adverse consequences. Coin flip is 50/50, but if you talk about flipping a coin, you know automatically if you flip it once. But when you talk about flipping it once a year over a 100-year period it becomes a bit more difficult to describe. Some people have this idea that if a coin comes up heads three times in a row, that in a corrupted law of probability it has to come up tails the next three times. Past events influence probability of future events and it is tough to get people past that.
<b>8</b>	It is a chance of having something negatively impact me, or having negative impacts. Chance of something having negative impacts.
<b>9</b>	Risk is any time the public is in danger above the normal level of risk they voluntarily take on. Whether the public knows it or not, they take on tremendous risk every day. When they drive a car, or buy a house under a tree. There is a perceived level of control. Yesterday, they thought there was no problem, no risk communication required, but today we know there might be a potential for 50 munitions under the house. The risk is not higher, but the perceived is higher. Public perception and there is fact in some of those perceptions. We have to address those perceptions. Risk is a decrease in certainty of the health and safety of the public. Perceived or otherwise.
<b>10</b>	Mathematical product of probability times consequences. If I were to define it, I always say depending on the person I am talking to in some form or fashion; it is that combination of probability and consequences.
<b>11</b>	Those things that are important to me as a citizen and or how it would be damaged. Threat to something you value.
<b>12</b>	If there is a chance that something could impact my or someone else's community or livelihood. With any activity, where that risk falls on a scale of low to high, the scale is different to different people, but it's how it impacts that community as a whole, or that individual or myself.

## The Greatest Risk to Public Safety

Interview participants were asked to consider what they believed to be the greatest risk and threat to public safety. One participant felt he could not specify one risk in particular and thought there were too many to begin to discuss. The answers provided differ greatly. Summaries of each participant's opinions are provided in the following table.

Table 35: Responses to Question 9 on the Greatest Risk to Public Safety

<b>1</b>	We don't as a nation incentivize the nonstructural solutions enough. The cheapest and best way is to get people out of harms way. We don't offer enough incentives for communities to have strong evacuation planning and evacuation planning drills regularly, to have warning and models and warning systems in place, or that we incentivize enough that people start to move their homes and infrastructure out of these low lying areas.
<b>2</b>	An uninformed community is a really great risk. I think information, education and knowledge is very powerful and only does communities good. If they are in the dark, or they're ignorant—or they don't want to listen to information—I think that's where you start to have problems
<b>3</b>	You have passive listeners that read the headlines and that is it. That is the story – they read the first section, or a few words in the newscast and they lock them in as the truth. They know just enough to be credible and this gives them the ability to alarm in social media without context. There is a big 20% of the truth they don't know or they don't believe it. It is the access and conveyance of information. You have people that are 75% right, but also 25% wrong.
<b>4</b>	Flooding and natural disasters. Flooding is up there, maybe not number one but it is in the top field. If I could wrap flooding in with other natural disasters, then I would say that is the greatest threat.
<b>5</b>	Not knowing about it probably. Again I think that is where either the federal, state or whoever has responsibility to let people know what that risk is. There are certain things your parents teach you. Don't drink, don't smoke, but if they didn't tell you that and you went out and did those types of things while driving they would feel poorly. Same if you never told children not to play in the street and then they go play in the street. It is again what you didn't say. That is one of the

	things – not know about it.
<b>6</b>	The greatest risk to public safety is our high technology.
<b>7</b>	Probably flooding behind levees in poor conditions particularly when the condition isn't well known. That leads to complacency that the levee is protecting.
<b>8</b>	Not getting the features in time or in place before they become an issue. Our own processes. As soon as we identify a problem, or something that needs to be corrected or fixed, I think the time between that point and when it is actually done or when something is put in the ground to fix it there is a lot of time in there that could pose a risk.
<b>9</b>	The distrust of messaging that comes out as, if for whatever reason the community doesn't trust the message. If they don't believe the message they are less likely to respond to what's coming out.
<b>10</b>	It's not listening to the state and local government officials when told to evacuate of an area. Storm surges is what gets people, not flood waters and not the wind. You know when it's coming, and you're told to evacuate, and you don't.
<b>11</b>	I think in this country it is just simply a lack of understanding of risk from flooding and coastal storms in low elevation areas. As a society, we are making profound investments that we are going to have to rebuild at some point down the road. In the back of my mind, I always think about something I heard 40 years ago about the difference between American and Chinese planning. Americans plan for the next fiscal year and the immediate cash return, and the Chinese plan for the next 100 or 1000 years.

## Responsibility for Risk and Risk Management

The final question participants were asked during the interview was to indicate who they believed was responsible for managing risk. All respondents referred to the concept of shared responsibility, suggesting that each level of government has a responsibility when managing risk. According to one respondent, “it is our responsibility to do everything within our power to make sure levees are built solid, maintained as best as possible, that

if they are damaged we repair them in a responsible way.” He added that at the same time, homeowners living in the floodplain are accepting a level of responsibility, and that as an agency; it is still our responsibility to communicate risk and what it really means to the public. He concluded that it is the public’s responsibility to assume or accept the risk, or to choose to live in an alternate location if the risk is not acceptable. Another respondent clarified that the whole team is responsible, again highlighting that the public is responsible for how they choose to lead their lives, while the government is responsible to managing risk to the extent possible. Two respondents indicated they agreed with the concept of shared responsibility and highlighted the need for the USACE to get better at risk communication, but provided no indication for what specifically should improve in the context of the question asked.

Although all participants suggested that risk is a shared responsibility, seven respondents seemed to focus more closely on the individual and local responsibility for managing risk. Everyone is responsible to a point, but it starts at the local level, according to one participant. Another person indicated that individuals should not just look to the federal government to solve the problem because there are parts that may not be in the federal government’s purview. She suggests that everyone who has a responsibility should be held accountable, and that it is not just the federal responsibility. One participant suggested that everyone should take a responsibility for himself or herself and that risk management begins at the individual level as opposed to the federal or local government. Four respondents suggest that local government in particular has a responsibility since zoning and floodplain usage decisions are made at the local level.

One participant that made this suggestion also said that USACE is limited by its “authorities and appropriations,” but will help where it can. Individuals are also responsible, but he said he saw the local government as holding responsibility in areas the federal government does not necessarily have a say in. Another participant suggested that communication and informing is a federal responsibility, but the decision for managing the risk is a local responsibility. One participant said it is the local government’s job to own the risk, again pointing out that the federal government has a piece, but that zoning and building codes are implemented at the local level. The implications of these data will be discussed in detail in the following chapter.

## **CHAPTER FIVE: STUDY FINDINGS AND IMPLICATIONS FOR RISK COMMUNICATION**

### **KEY THEMES**

This research study was designed to examine the U.S. Army Corps of Engineers' (USACE) risk communication practice in order to consider to what degree technical experts take publics' perceptions of risk into consideration when developing and crafting flood risk management messages. The study also considered how the inclusion or exclusion of the publics' perceptions affects rhetorical practices more generally. After receiving 46 responses to surveys and conducting 12 interviews, several themes and implications relating to these key study questions emerged that will be discussed in more detail in this chapter.

### **Risk Definitions**

Much research conducted prior to this study suggested that the way an organization defines risk impacts the way the organization conducts communication. Historically, it has been suggested that there are disagreements about risks despite the fact that values are inherent in risk assessment. Researchers suggest that these disagreements about the degree or level of risk often reflect differences in how risk is defined (Fischhoff, 1995). A

key question asked of both participants in the surveys as well as the interviews is how risk was defined in the context of their work activity. Of the 46 survey respondents, 31 used a technical equation to define risk while many other respondents relied heavily on technical components to define risk. The equation focused survey responses expressed risk in terms of probability, likelihood or frequency of an event occurring and the consequences or negative impacts of that event occurring. Some survey respondents indicated that consequences could in fact be positive or negative, but most suggested consequences included an element of harm or damage. One interviewee did provide a purely technical response, in which risk was defined as “probability x vulnerability x consequences.” She defined probability as the likelihood of occurrence of a hazard event; vulnerability as system performance; and consequences as impacts that could result in a range of things, from economic damages to social and environmental damages. Some recognition of audience was evident in responses received for both interviews and surveys as well as an assertion that consequences impact stakeholders differently and can be seen as more critical dependent upon individual perceptions.

While it was overwhelmingly the case that experts participating in the survey considered risk in terms of this equation, it was not so for a majority of the interview participants. Many participants acknowledged the technical definition but, typically, also provided a non-technical definition that expressed risk as something that could potentially harm something valued. One participant in particular provided an example of owning and taking care of a car. Someone who values his or her car views certain things as riskier than other people might because of the high value that the particular individual



places on the car. Similarly, she indicated that she views certain risks as higher when they impact one of her children because she values her children. This demonstrates the way risk can be subjective and based on what a person considers to be intrinsically valuable. The non-technical examples provided still included the concept of consequences, such as considering what the negative impacts or repercussions are if she did not watch her child closely while playing outside. The parallel use of consequences in technical and non-technical risk definitions suggested that the issue may not entirely be definitional, and could instead be as a result of difference in terminology. Study participants also identified overuse of technical jargon and terminology as major issues that arose during communication.

Study participants reported general reliance on a technically based risk definition, sometimes supplemented by a colloquial definition. This is important for considering how a definition has the ability to impact practice: technical definitions of risk lead organizations to rely on communication methods that assume the technical definition is correct and that divergent definitions of risk need to be corrected. Assumptions that publics' definitions are incorrect drive goals of risk communication to focus on informing, educating or enhancing understanding. The technical nature of the majority of definitions evident in this context could imply that risk communication focuses on relaying technical information in order to inform at-risk individuals. This does not necessarily mean that the practice is poor. However, it does not align with symmetrical communication models and does not demonstrate that public perceptions informed practice.

If audiences are defining risk differently and have differing sets of expectations based on their respective assumptions, issues can arise when experts do not use these perceptions to inform practice. In fact, many respondents mentioned the fact they believed audiences to have understandings of risks that do not align well with technical measurements. The explicit discussion of audience showed that experts were aware that the individuals to whom they communicate risk rely on a different set of enthymemes and values, but no assertions can be made based on the study findings that the recognition of audience in fact informs practice. The issue of using technical terminology was proof that communicators were in fact not totally using publics risk perceptions and definitions so to better design communication.

### **Publics Perceptions**

When considering the technical nature and definition of risk, it is interesting to see both how participants perceived the publics' ability to understand risk and how they ranked the publics' ability to understand USACE's risk communication messages. Survey participants were asked to consider whether they believed publics understood risk better today than 10 years ago. About 44 percent of respondents agreed that the public does understand risk better today. However, many of the explanations provided expressed an uncertainty or suggested that better understanding is situational. When asked what the primary reason was that publics were unable to understand risk, many pointed to the concept that it is difficult for non-technical individuals to imagine future events, understand probability, or consider that the risk could indeed impact them. A large group

also focused on the fact that risk communication failure is more frequently a result of using technical language or information and not making the risk relatable for an individual. Identifying the use of technical information as a challenge or cause of failure shows that USACE personnel in this context perceive the public as having an alternate risk understanding, but this perception of the publics' risk understandings seems mostly to exclude negative connotations.

Interview participants were asked a similar question to rank the publics' understanding of risk messages on a scale from one (low confidence) to 10 (high confidence). The responses varied significantly, ranging from two to 8.5. Seven participants ranked the publics' understanding of USACE risk messages as a six or higher. There was general agreement that the organization is doing well but could do better. It was interesting that while many indicated a higher level of confidence in USACE messaging, the responses given in explanation of their ratings often undermined the ratings. Frequently, interview participants would suggest communication has been successful but then add a blanket statement that things need to improve. This ambivalence evident in the dialogue is perhaps suggestive of waning confidence in USACE messaging or distrust in the publics' abilities to appropriately accept and respond to those messages appropriately. This concept of distrust that publics are willing to accept the risk messages was prevalent when discussing the main goal of risk communication. Many survey respondents felt that the public makes a choice to ignore the facts and only selectively listen to risk communication. Suggesting that risk understanding is a choice does not suggest publics are viewed as being incapable of understanding but more so,

demonstrated a perception that publics create their own realities apart from objective truth. This concept implied publics' defined version of the truth is in disagreement with the technical truth.

Many respondents argued that issues with understanding USACE risk communication were not actually a result of an inability of publics to understand technical information. They suggested that if the information is presented clearly and simply, then the public was capable of comprehending the risk. Interview participants similarly highlighted the fact the USACE is a highly technical organization and that communication often uses too many technical details, does not make the information relatable for the audience, and is not simple enough. In fact, a majority of suggestions for ways to improve risk communication were to make the information simpler and to translate risk information out of technical jargon into language that is easier to understand. The primary suggestions for improving risk messages hinged on removing technical jargon. This goal for improvement again suggests USACE should recognize that it ought to consider the way publics perceive risks and be aware of differences in audience. However, there is an inherent challenge in a largely technical organization attempting to talk about risks in a non-technical manner particularly since audiences are not a monolithic group.

Many participants in the study brought up the fact that risk is in fact inherently difficult to talk about because of the way it is defined, the nuances, and the way in which it seems to be an imperfect science. While risk can be technically calculated, decisions are not always made purely based on the science. Participants gave no specific reason

why it is fundamentally challenging to discuss risk, but their discussion of whether risk is a technical or values decision brought to light the difficulty a technical organization may have when there is a feeling that technical information is being compromised to accommodate publics' perceptions and values. It was evident through survey responses to questions on this topic of values versus technical measurement that it was unclear whether personal values should be a part of risk. Most agreed that risk decisions are both technical and values-driven, but did not imply that this should be the case. There was agreement that personal values should be considered more generally since they are believed to impact decisions made in communities. There was also ambivalence toward whether more value should be granted to a technical risk measurement or a risk measurement that is dependent on varying stakeholder and public values.

Given participants' faithfulness to the technical definition of risk, it is unsurprising that they may be reluctant to validate individualized values, particularly in the context of a federal agency that bases decisions on benefits to the nation as opposed to benefits to each individual community. Many highlighted this concept and that the values tradeoff USACE makes, as a federal agency, is not always preferable based on local values. It then seems as though the agency is persistently defending the science while trying to accommodate the public. This type of relationship can put an organization in a defensive position as opposed to one in which it partners with public entities or focuses on co-measuring and -understanding risk.

It is worth noting that some participants did suggest that the public is capable of understanding risk; however, it was interesting that a majority of participants in the

survey focused on risk communication being an effort to inform or educate the public. Many also used the word “understand,” and suggested that the primary goal of risk communication should be to make people understand their risk. This may reflect how technical experts perceived the public in the context of the study. It was interesting that there was such a heavy focus on educating or informing the public, particularly since most survey participants suggested that risk communication failures often lie with the message sender as opposed to the receiver. Forming risk communication on the assumption message receivers need to be informed could mean failures result from sender error, noise along the way, or receiver error. It was expected communicators in this context would blame the message receiver.

A primary observation made by nearly all participants was the difficulty in both communicating and understanding probability. This again demonstrated how those who participated perceived the public. Publics were perceived as not understanding probability, not being able to imagine future events, and not being willing to accept that flood events could in fact occur in their communities in many cases. Such responses actually suggested risk communication failures were a result of the message receiver. Message receivers unable to understand probability would also then be unable to appreciate the technical USACE definition of risk. Given this perception of publics’ abilities to understand risk, study findings implied message receivers might in fact be more to blame despite study participants’ admittance of an overuse of technical jargon. Findings from this study suggested that there is cognizance that publics’ perceptions

differ, but this did not suggest differing perceptions were acceptable or considered equal to a technical measurement of risk.

### **Understanding Technical Details**

A key theme throughout the study was the difficulty of communicating technical information, such as residual risk, uncertainty and probability. Discussions about understanding and explaining probability came up most frequently in the interviews. Multiple participants discussed the fact that the public has an imperfect or illogical understanding of probability. The examples provided discussed the idea of picking marbles out of a hat. If there is one red marble, and there are 99 blue marbles, your chances remain the same each time you draw, whereas the participant felt the public tends to think the chances of drawing that one red marble reduce each time a marble is drawn. The same concept was explained using the comparison of flipping a coin. Inability to understand probabilities implies a message receiver error during communication. However, the participant also explained during his interview the use of the “100-year flood” event, calling it a misnomer. He said it is often taken to mean that if a flood occurs in a 100-year period, then it will not occur again during that 100-year period. In reality, the phrase “100-year flood” refers to the frequency of flood events and the likelihood that a community would be subject to a risk event of a specific magnitude. This example pointed to a message sender error since language was used that was not most conducive to audience understanding.

Multiple participants suggested methods to make probabilities simpler, or to make the risk more relevant to address the message sender errors. One example was to discuss the chance of flooding in terms of a person's mortgage. The feeling was that if it were made clear to members of a public that there is a high likelihood their homes would be flooded in the lifetime of their mortgages, this would be easier to understand than a number given with no context or relatable information. Participants in both the interviews and the surveys suggested that making the risk relatable and actionable was key, which seems to demonstrate an awareness of audience and an exigency for communicating. Similar sentiments were expressed about the use of numbers or technical details, particularly in reference to the risk communication sample discussed during the interviews. The article used for discussion during the discourse-based interviews was heavily focused on probabilities and provided multiple expressions of probability, but did not equate the numbers to what they would mean to the individual. There was also a significant usage of numbers to discuss the concrete used to repair part of a dam and to discuss the storage capacity behind the dam. These were all details that interview participants agreed were technically sound but ineffective in conveying the message. Several indicated they needed to do math in order to understand the article. They also noted that it was difficult for them to understand despite having backgrounds in engineering and, in some cases, hydrology.

In addition to the perception that the public has difficulty understanding probability, there was a general agreement that residual risk is also difficult to talk about so that audiences could understand. Residual risk was described as the risk that remains



after measures have been put in place to reduce the overall risk. When asked to identify the main thing the public does not know, one respondent said that he wished the public knew that every piece of infrastructure USACE and the country have will not last forever, and may eventually fail. This comment highlighted the concept of residual risk – that although there is a flood risk management project in place, a chance still exists that the project could fail and not function as it was intended. Many suggest that people are more easily able to imagine or understand risk and residual risk when they have experienced it. A community that has experienced a levee being breached is more likely to find risk communication relatable, believable and actionable. This suggested that an individual who has observed or experienced critical infrastructure failure is more likely to believe the risk is real. However, experiencing an event also makes communities more sensitive to risk communication more generally, as several participants suggested has occurred in New Orleans.

Another participant in the interviews brought up the documentation of residual risk. As a reviewer of USACE project planning documents, he felt that residual risk is not always appropriately recognized. He said he believed it was crucial for individuals and communities to understand there is still a risk as long as they are located in a floodplain. This example demonstrated the importance of documentation and identified a potential area for future studies to address: the treatment of residual risk in USACE communication and reports. An example provided as a residual risk communication success was Fargo, North Dakota, where leaders up and down the chain of command understood and publicly acknowledged that even with a flood risk management project in

place, there was still going to be a risk that flooding would occur. This to him was a successful risk communication scenario since those impacted by the risk understood, accepted and took responsibility for the residual risk. This reflected what may be considered the goal for risk communication – that is, understanding and taking action in relationship to risk.

Uncertainty was another technical concept brought up during an interview and in several survey responses as something publics and audiences have difficulty with. The discussion of uncertainty was not as prominent as probability and residual risk; however, it seemed to be a concept embedded in many responses despite the exact term not always being used. Technical experts considered uncertainty a part of the technical definition of risk in many cases. Uncertainty was considered to be the information not known that should be accounted for in risk assessments. During one of the interviews, a participant said the greatest challenge in communicating risk was dealing with uncertainty since it is embedded in every decision made. All potential outcomes are never known, which created challenges when communicating since it is an imprecise and rather abstract idea, contrary to some suggested risk communication best practices such as making communication relatable and actionable. Discussions of uncertainty speak to innate difficulties communicating a technical topic to a largely disinterested or non-technical audience.

The way an agency and projects are meant to function is a concept that links all of the technical details, such as uncertainty and residual risk, mentioned thus far. Agencies cannot perfectly account for all risk; likewise, projects can be built to a level of protection

but ultimately never provide full protection from flood risks. Another concept underlying each of these terms is the idea that people do not wholly understand how floodplains are defined, how risk is actually managed, and how the agency functions within this context. The concept of residual risk is typically considered when a project is in place. The way the term was discussed in responses suggested there was an implication that if people do not understand residual risk, they do not understand the way a levee or dam works. There seemed to be an assumption from the technical standpoint that there is never certainty in a project's functionality, particularly in storm events the project is not built to withstand. Certain projects are built to what USACE terms "a level of protection." This means the project is built to withstand a certain threshold, and if a storm or flood surpasses that, the levee, dam or other structure may no longer serve its purpose. During an interview, one participant brought up the fact that when the water is higher than the levee, the levee ceases to function and then becomes a problem instead of a risk management structure. Technical experts seemed to think this was not clear to the public in many cases and that in addition to not understanding they are vulnerable to flooding, they also are not understanding that projects are built to function only in certain ways.

This linked concept of residual risk and project function implied two misunderstandings: misunderstanding flooding and misunderstanding agency functions. These concepts not only capture the nuances of conducting flood risk communication, but also reflect how technical experts perceive public understanding of these technical details. Publics are perceived as not fully understanding or acknowledging residual risk, uncertainty and agency functions. This demonstrates a lack of understanding of core

USACE missions and practices. If publics do not perceive the meaning of residual risk or the concept of building to a level of protection, unrealistic expectations about flood risk management may arise and impact the way audiences receive the communication message. Although there is recognition that there is not a clear understanding of these components on the publics' behalf, there is not a demonstrated strategy or approach to use this information to inform communication practice. For example, many study participants recognized that USACE does not always convey technical details well to an audience with varying levels of education and capacities to consider technical information. He suggested that sometimes it is more beneficial for USACE to keep it simple instead of getting caught up in the idea that translating technical jargon somehow reduces the truthfulness of the information. This suggestion implies some sense of audience analysis and altering practice to account for audience, but such an approach does not seem to be widely adopted. Further, in these anecdotes provided by participants, a certain ambiguity as to where the message sender was communicating in a faulty way or that message receivers were incapable or unwilling to consider the message and, therefore, at fault.

### **Goals and Responsibility for Risk Communication**

As previously mentioned, survey participants were asked to consider what the goal of risk communication is. The general themes evident in responses were that risk communication should educate the public, inform the public, increase understanding or facilitate relationships or communication more generally. Some responses categorized as

facilitating relationships still reflect the goal of risk communication being to inform publics. For example, one participant suggested the government should be informing the public about what assistance can be provided, what residual risk remains, and that certain legal requirements for review periods may not be long enough for a community and the federal government to put all risks at bay. This discussion of requirements of public meetings was mentioned in reference to compliance with the National Environmental Protection Act's mandate for a certain number of public meetings. Some suggested the goal of risk communication should be to explain the risk and decision making to the public and other affected agencies. These responses seemed to reflect a certain defensiveness to risk communication practice whereby employees felt the agencies' actions were not understood, which made the decision making seem unmerited or unjustifiable from the publics' perspectives. The goal of informing then suggests informing in defense of missions and actions.

Others suggested the goal of risk communication is to explain the nature of risk in terms of probability and consequences when the risk occurs. One participant in particular suggested that once the nature of the risk is clarified for both parties, the communication shifts to what available risk management options there are available. This description of the goal implied that all parties needed to be brought to the same level of understanding of the risk in order to mitigate it effectively. This implies that technical and non-technical communities do not always perceive risk in the same way and that they must first have the same risk definition before it can be appropriately mitigated. This concept that a mutual understanding was necessary is evident in many responses to the survey.

In fact, many respondents focused on this concept that stakeholders need to be informed. Some suggested the goal of risk communication should simply be to remain open and transparent so that individuals can make informed decisions, while a handful of participants suggested that those impacted by the risk should also be involved in decision making. Involvement in the decision-making process differs from creating shared understanding of risk in that making publics a partner implies shared power, whereas shared understanding does not. Another group of survey respondents suggested that risk communication should build trust so that there is a better relationship among all parties involved. There were multiple people who indicated there remains a lack of trust potentially as a result of previous risk communication failures in communities where decision making about risk was not considered clear or transparent. These responses indicated an understanding of audience and recognition that risk communication is not necessarily all about communicating measurements to populations impacted by natural hazards. However, given the number of individuals who brought up a lack of trust in USACE, it seemed that risk communication practice was not appropriately addressing the audiences and their concerns.

While it did seem that many were aware they should consider audience, it did not seem evident that risk communication also included involving those at risk in a more symmetrical communication relationship. This hesitance to involve the public more readily as partners and consider risk communication more as a partnership instead of passing along information is reflective of Fischhoff's seven stages of risk communication (1995). Fischhoff summarized the seven stages of risk communication as the following:

- All we have to get is the numbers right.
- All we have to do is tell them the numbers.
- All we have to do is explain what we mean by the numbers.
- All we have to do is show them that they've accepted similar risks in the past.
- All we have to do is show them it's a good deal for them.
- All we have to do is treat them nice.
- All we have to do is make them partners.

These stages are described as an evolution; Fischhoff's eighth stage is described as "all of the above," implying an evolution from asymmetrical, top-down communication to symmetrical communication models where messages are sent from and to senders and receivers, respectively. Many responses to the survey aligned with the concept that USACE needs to tell and explain the numbers to people. This concept fell in line with Fischhoff's stage three. Fischhoff suggested that explaining the numbers is the best next step when numbers do not speak for themselves in risk communication. This approach is difficult since it is typically used in front of a largely unprepared audience. Fischhoff makes many leaps in his assumptions and descriptions of risk communication; however, it does seem that USACE participants perceived their audience as unaware, or unwilling to pay attention to the technical truth. The audience also does not readily understand probabilities in participants' opinions, which would lead them to focus on informing or educating as part of risk communication efforts.

However, researchers such as Hayenhjelm would suggest that an understanding of the public as a group that needs to be educated or informed is perhaps an asymmetrical

risk communication relationship (2006). This approach assumes the USACE is the party with privileged knowledge and responsible for disseminating this information. The assumption that the public should be informed results in one-directional flow of information that does not involve the public as an equal party or as a decision maker. Risk communication in this scenario is more similar to the Shannon-Weaver communication model, according to which there is a sender and receiver, and communication flows one way with the goal of having the message travel from sender to receiver with minimal noise. This seems to be the way the participants in this study thought about and approached risk communication, judging USACE to be the party with privileged information publics should be educated to understand.

### **Why Risk Communication Fails**

As part of the survey protocol, respondents were asked what they believed to be the primary reason for failures of risk communication. Responses varied, but generally agreed on certain themes such as the message sender or receiver carrying the burden of the blame for risk communication failures, the overuse of technical information, or the denial of the risk by publics. Twenty respondents of 46 fell into the category of risk communication failures resulting from using too much technical information or not considering the type and how much information should be used in communication. Some respondents voiced recognition that technical experts were not always being sensitive to risk perceptions in risk communication, as was hypothesized prior to conducting the study. One respondent in particular said that, as an agency, USACE does not listen to



others and is often set in its way to do things without necessarily seeking input. However, this was not an opinion widely shared in responses.

While most responses related to the fact that the organization is using too much technical information and ignoring audiences, others suggested the message receiver was more to blame. The phrase or concept that repeatedly came up in survey responses was that the public does not want to accept the information being presented or is disinterested. Interview data also suggested that publics needed to be motivated to pay attention to risk information, whether it is through equating risk to losing money or presenting information in a more action-oriented manner. Additionally, the publics' tendency to distort or misunderstand laws of probability was also pointed to as a reason why risk communication fails. These examples tended toward the belief that message receivers were more at fault for the communication failure.

Several responses to this question acknowledged that both parties can be, or are to blame. The simplest response capturing this concept suggested that risk communication failure is a "lack of communication between parties." Another response goes into detail regarding three primary reasons for risk communication failure. These include excess noise in the communication model, primarily from other agencies; the fact that events that do not happen frequently but have a high impact, and the difficulty humans have in understanding this; and poor personalization of message with too much technical information. This individual's response captured the thematic components of what many participants believed to be the cause of failure: a mixture of messaging, noise, and inability to understand certain concepts readily. A number of respondents pointed to the

communicator as the cause of failure. This was encouraging since it demonstrated recognition that the USACE was not an infallible, technical organization. However, in the context of responses to other questions, it seemed there was still strong evidence experts perceived the publics to be guilty of creating selective truths. Whether or not publics were considered capable of understanding, there was still a belief that publics chose to reject technical truths.

While public trust did not come into play frequently in responses, it was embedded in several surveys and interviews, particularly in reference to large-scale weather events. A key detail interview participants brought up was the fact that as USACE employees, there are baggage individuals bear when walking into a room with that association. A community may have lost trust in the organization because of previous events that impacted the way risk communication is received and responded to. This was brought up in reference to Hurricane Katrina and impacted communities. It was expressed that individuals in those communities were not receptive to USACE messaging immediately following the event. Trust does seem to play a large role in an agency's credibility when communicating risk. One interview participant in particular discussed her feelings that publics forget that USACE employees are also impacted by flooding at times and are still individuals.

Publics' perceptions of the organization itself were identified as factors that impact communication practice. For example, the federal government is perceived as capable of certain actions and, thus, is seen as powerful and authoritative. If the agency is perceived as having full power and authority, publics could be unreceptive to a top-down

communication model and feel it is somehow unfair. While no participant suggested this outright, it was implicit in many of the issues and concepts discussed. Trust as a source of failure is difficult to attribute to a message sender or receiver, since trust implies shared misunderstandings and conflicting values. The variety of responses provided to explain why failures occur brought a similar lack of clarity to mind that both blamed the communicator, as well as the message receiver. Study findings did not demonstrate fully the party at fault and could merit further exploration of the topic of authority and perceived fault in times of communication failures.

### **Programmatic Challenges**

Another topic that arose during interviews and surveys was programmatic challenges that increased difficulty when communicating risks to publics. Discussing stakeholder and public values caused many participants to consider challenges in risk communication that were directly correlated with the agency's structure. The discussion of this concept was threaded through many responses to different questions, including discussions of why risk communication fails and suggestions for how to improve risk communication. The most poignant example of programmatic challenges to risk communication was that of communicating the ratings agencies give to levees. All considerations involved when ratings for the safety of a levee are determined were not discussed. However, several participants brought up the fact that it is difficult to explain to communities why the Federal Emergency Management Agency (FEMA) may not accredit a levee, yet the USACE still considers the levee to be safe. Again, many of the details were not

discussed, but it was evident that difficulties arose from the different missions of the agencies and their definition of what a safe levee is. FEMA's accreditation is related to federal flood insurance, which does not necessarily have similar metrics to the USACE or consider any residual safety provided by a levee that is not up to full performance. This proved to be particularly challenging when communities begin to believe that a lack of FEMA accreditation equated with providing no level of protection from flood risks, according to the participant. Interview participants in particular highlighted the challenge of communicating the rating of levees apart from the issues that ensue when other agencies with additional missions are involved.

In addition to the challenges described as inherent difficulties in risk, there are also issues of a lack of agency support. Several survey participants brought up their feeling that there needed to be a budget line item to support risk communication and that it needed a champion so as to be made a clearer priority suggesting that this was not already the case. An interview participant explained that since the organization is project funded, it is sometimes difficult to launch a full-fledged communication campaign in which USACE employees are knocking door to door to communicate risks. These assertions suggested that creating a programmatic area or focus for risk communication could make it a higher priority or allot more time and funding for employees to complete more risk communication. Providing more funding and time aligns with a suggestion from one interview participant that risk communication should be done as simply as possible, and as often as possible so that it is always on the forefront of at-risk communities' minds.

It is evident that risk communication challenges and failures are impacted by trust, the public's perceptions of agencies, and the programmatic challenges of communicating risk amidst the competing messaging from other agencies. In addition to these challenges, there is also the challenge of internal communication. It is perhaps implied in the suggestions that a specific budget line item be created for risk communication. Some participants believed the agency spends too much time fighting itself instead of focusing on the mission. A project-oriented participant in the interviews discussed the difficulties that arose as a result of a lack of appropriate machinery to dredge channels. Certain realities of the situation were not in USACE control, but the interview participant felt issues were exacerbated by poor internal communication and collaboration, and that the risk of projects getting off-schedule and impacting funding was high. This was considered a risk communication challenge that related to programmatic issues but also demonstrated that the challenges of risk communication are not singular to floodplain environments and, in fact, touch nearly every business activity USACE conducts.

Another issue brought up in interviews was the concept that many actions USACE takes or does not take are a result of Congressional authorizations. Interview participants indicated they believed there was not widespread understanding that projects are authorized and funded by Congress. This does not allow USACE much discretion in every action or investment in all cases. This remained a huge issue for some participants since it resulted in risk communication primarily focusing on explaining how USACE functions, what its authorities are, what it can do for the community and what all of that

really meant. Time and time again, interviewed employees acknowledged there is a lack of understanding of basic USACE processes. This challenge may speak to the goal of risk communication as well. If it is believed most do not understand USACE programs and authorities, then risk communication will necessarily focus on informing or educating rather than partnering. However, there was not a distinction made by participants that the focus of risk communication is to inform because communities do not understand USACE.

While it does seem the notion of the public as a party needing to be educated or brought to understand is reflective of asymmetrical communication tendencies, there are in fact certain realities about the way a federal agency functions that hinder it from using an approach that partners or engages the public as co-decision makers when it comes to risk management. Many interview participants discussed the notion of risk being a shared responsibility, meaning that the individual, local communities and governments and the federal government all have roles in risk management. However, those roles differ, and at times this relationship, as currently structured, does not allow for more multidirectional decision-making. Given the discussion in both interviews and surveys of USACE authorities as mandated by Congress, it seemed risk communication shaped to inform was the preferred approach within the present constraints.

### **Suggestions Provided for Improvement**

Suggestions for ways to improve risk communication were discussed in the surveys as well as the interviews. Survey respondents were asked specifically how they would

recommend improving risk communication. The responses varied and included message-centered approaches and programmatic level changes, as well as suggestions to involve a third party. The programmatic changes suggest getting leadership involved in order to outline consistent risk descriptions. This response in particular implied variance in risk understandings from the technical perspective, in addition to the existing variance in risk understanding with a broader audience. Another participant suggested creating a line in the budget that would allow for communication, but also funding programs appropriately so that projects could be built to manage risk properly. This suggestion applied to certain challenges outside of USACE control, as previously mentioned; USACE in many cases is working under Congressional authorities and does not have as much leeway in decisions as is sometimes believed. Although this may be the case, it drew attention to the realities of performing risk communication within a federal government context, in which it may not realistically be in an organization's authority to empower publics to be co-decision makers on flood risk management projects, for example. This finding brings to mind Hayenhjelm's assertion there is always an underlying inequality in power in risk communication scenarios (2006).

Several suggestions for improvement focused on increased interaction with publics. This was proposed through public meetings where the public would be able to ask questions as opposed to developing an understanding of risk by reading a pamphlet on flooding. Such suggestions implied the importance of one-on-one or more personally focused communication as opposed to decentralized messaging by using brochures or other documents. Similarly, another participant suggested USACE should host open

houses in order to have more of these personal conversations. This participant also advocated for a layered approach: in addition to the open house, there should also be resources available for publics on a website, a point of contact established to which individuals can reach out to, and making this information available in multiple physical locations. A third survey respondent suggested that town hall meetings be fully funded so that risk can be discussed with every county, town and city. This suggestion specified that such an outreach effort could be conducted over multiple years, which would require risk communication to be a primary and priority effort for the organization implying it was not already a priority action.

Several suggestions centered on actual tools, job responsibilities and training. Several survey participants suggested that more tools be developed to help with visualizing flood risk data. The suggestion was also made to have specific products such as brochures and handouts that appropriately explain the risk. These individuals focused on the importance of documenting the risk in a way that is easy to understand and of using products that are familiar to at-risk communities, who are also the target audience. Several participants in the interviews brought up the idea that risks should be made as visual as possible. Using actual graphics, or using descriptors that encouraged an individual to imagine what that risk is like, can accomplish this. This pertained to making risk relatable and actionable. Another group suggested hiring full-time employees within the organization who focused entirely on risk communication efforts. Several participants in the survey also suggested using a third-party for communications support. It was interesting that there were suggestions both to use USACE employees and to use non-



USACE employees to improve risk communication. It demonstrated the differing perceptions of employee capabilities, as well as of what is in the agency's mission purview.

Many suggestions for improvement were heavily focused on the message construction itself. Both survey respondents and interview participants voiced a concern with using technical jargon and making a concerted effort not to focus too heavily on that information when communicating risk. One interview participant suggested there is a time and place for numbers, but they do not belong in every risk communication scenario. This response implied not only that communicators currently rely too heavily on technical information in communication practice but also, a realization that this was not effective in many cases. A suggestion from a survey participant put forth the concept that USACE should develop a collaborative national risk communication message and strategy to convey that message to the public. This suggestion goes beyond simply making communication simpler for the average audience by suggesting USACE consider a broader risk communication campaign. This suggestion for improvement also conveyed the idea that USACE currently lacks a coordinated, organization-wide strategy or message.

Another key topic survey respondents brought up when asked about ways to improve risk communication was training. One respondent in particular suggested the training be a separate course offered to engineers and planners instead of trainings designed for public affairs officers. It was indicated that the course should explain why risk communication should be important to USACE and to aid employees in being able to

explain both risk and risk communication. This suggestion was interesting since it implied no such training exists already. Additionally, interview participants were asked to specify whether they had undergone training related to risk communication. Most had informal or on-the-job training, some had taken formal training, but many had not technically been trained to perform risk communication. This topic area was one of the tertiary questions of this study. A first step to address many of the challenges as they have been outlined would be through formal training that touches on multiple communities of practice within the organization. Establishing such a training program would also signify that risk communication is a vital task and requires key skills to perform effectively. Another benefit would be developing consistent methods for practice, which do not exist currently. However, training alone may not address all concerns discussed and evident in larger trends and findings of this study.

### **LARGER TRENDS AND FINDINGS**

Several key trends and large ideas have emerged upon completion of this study. A large portion of questions asked of participants touched on whether or not personal values have a place in flood risk communication. Participants were asked how often personal values should be included in risk communication, to which most suggested personal values should always or frequently be included. However, a large number of employees said values should not be a part of risk communication and that risk should be quantitatively addressed. In many ways, this question is a microcosm for the overall study and speaks to many of the original study questions in regard to whether the USACE considers risk

perceptions and opinions in its communication practice. This particular question and the associated responses demonstrated the push and pull involved when a technical organization is communicating but does not always feel comfortable or is not always in agreement within itself as to what the ultimate goal is.

Participants in this study understood risk communication as an effort to inform and to make publics understand risk. At times, this meant actionable communication that was conveyed in a one-on-one conversation as part of a relationship. In other scenarios, it was a matter of checking a box that a public meeting was held. There seemed to be competing goals and understandings of what risk communication should be and what desirable outcomes are. Given this uncertainty of ultimate mission, it is then difficult to develop a cohesive approach reflective of any certain guiding principle. Additionally, without clear guidance or a set of clear principles, creating an effective communication practice also remains difficult. Participants in this study primarily defined risk in a technical way. It would seem that in this case the definition of risk did in fact impact the way communication was approached. Defining risk technically while perceiving publics as unwilling to accept technical risk pushed participants within this context to tailor risk communication to inform or education publics so to accept the technical definition. Prioritizing the technical definition of risk as correct also created a tendency to rely on technical jargon, since it was often considered more correct and more comfortable for participants to use.

Although it is evident through discussions of key challenges in this context that risk is communicated technically and perhaps ineffectively, the acknowledgement that

this is an area needing improvement implied recognition of audiences and that communication practice is not as effective as it should be. It was not clear that technical experts were willing to consider or include non-technical risk perspectives fully in communication practice, but it seemed there was awareness that not addressing the values component of risks is a potential shortfall. It was expected that study participants would be highly technical and stay faithful to the science of risk; it was not expected that there would be acknowledgement that audiences should be considered when communicating risk or that there would be such openness to the concept that risk is more value-laden than technical experts sometimes want to believe. Technical experts in the context of the study seemed to think about audiences, but there was evident uncertainty as to the degree to which difference in values were taken into consideration and in effect, informed communication practice.

The data from both the surveys and interviews elucidated this issue to an extent and provided preliminary answers to many of the primary study questions. In short, study results reflected an agency in the midst of transformation. There was top-level understanding of the mission and goal of risk communication as well as awareness of how risk communication was likely performed at different levels of USACE. Many of the participants who understood the challenges, the goals, and the shortfalls best were hierarchically toward the top of the agency. These participants expressed a holistic view of current and previous USACE practice and suggested where USACE should alter its approach to improve risk communication performance. There were traces of slow changes or adaptations in the organization that perhaps have not fully trickled down

throughout the organization as a whole. Considering the stages of risk communication, USACE has shifted, but is not at the step yet where it informs and involves members of the public in all cases, as evident in findings from this study. Communication purely based on education has been defined as one-sided, whereas communication that develops shared definitions and understanding instead of merely telling audiences facts represents some progress toward symmetrical communication practices that include multidirectional information flow and equalized power positions within the context of the communication situation.

Following Hurricane Katrina, the USACE adopted implementation of 12 major action points for applying lessons learned resulting from Hurricanes Katrina and Rita. The overarching themes were to use a comprehensive systems approach, to effectively and transparently communicate risk and reliability of infrastructure with the public, and to improve the dedication to a capable workforce by investing in research and enhancing technical expertise (CG Directive #1). Shortly after the memorandum establishing these actions for change, the USACE issued a memo to provide initial guidance on implementing the National Flood Risk Management Program and to transition from the concept of flood damage reduction to flood risk management (USACE NFRMP Guidance). The initial objectives of the program were outlined in 2009. One priority was to provide the public and decision makers with current and accurate flood risk information in order to improve public awareness and understanding of flood related hazards and risks. This memo established the program from which many of the participants of this study come.

The program guidance suggested the goal of risk communication is informing the public and improving awareness. This terminology matches the responses provided in this study. As an agency metric, it would seem employees within this context are accurately reflecting this particular program's goals of informing and creating awareness based on responses provided. However, it is unclear whether self-reporting this as the goal is indicative of actual communication practice. Given the newness of the program and of the concepts of flood risk management instead of flood control or flood risk reduction, it demonstrates USACE is still evolving and developing strategies for performing risk communication. The issue of terminology comes up through examining this guidance as well, and the way in which referring to something as "flood control" leads audiences to infer that water is controllable. Such language creates unrealistic expectations about project performance and agency capabilities. This was a concern among the participants that there remained inconsistent perceptions of how floods and organizations really work. This may merit the use of an education communication approach; however, such approaches leave the potential for perpetuating misunderstanding or losing public trust. In depth consideration of specific terms during risk communication was not part of this study, but should be pursued by technical communication and rhetoric focused researchers, among other key topic areas.

### **Implications for the Field and Future Studies**

Research on risk communication and rhetoric seemed extremely limited thus far. Much of the research upon which this study was based is rooted in psychology with a

communication lens. While this was not directly problematic, it showed that there are many gaps in rhetorical research, and still a large need for further exploration of topics considered in this study. The examination of risk communicators' tacit knowledge in order to understand the motivations behind their practice was a key, but rather ambitious goal for this study. It is evident in discussing risk communication practice with the flood risk management and technical experts at USACE that there is a desire to inform and protect the public. There is also some evidence that the organization has begun to consider its audience and what sorts of communication practices are best based on an audience analysis. Additional consideration of risk communication in this context is merited to further explore tacit knowledge and the impacts of organization power structures on an employee's ability to communicate risk, for instance.

Technocratic communication has historically been used by technical organizations where the organization is the conveyor of technically correct information and decisions made to largely uninterested or uninformed publics and laypeople. This approach is not considered to be democratic since it allows the technical expert to hold the power in the communication relationship. Much research in the field of technical communication touches on the way organizational context and structure impacts and informs communication practice. Based on this study, it is not entirely clear whether USACE relies on a technocratic communication model from habit, based on authorities and how the organization is actually allowed to involve the public, or because it is believed this is the best communication approach. This is an area for risk communication and professional writing and rhetoric researchers to revisit. A suggested future study would

include an ethnographic-based research effort that would observe and explore communication practice during public meetings. These meetings focus primarily on communicating project planning. Researchers could focus on these events since they are the USACE's primary interaction with publics, using both documentation and observation of individuals leading meetings in order to understand communication as practiced and expand upon issues raised such as public trust.

There are immense opportunities for further examining the degree to which technical experts consider public perceptions of risk. The study could be broadened to include a larger part of USACE and to be more representative of the larger organization. There are flood risk managers nationwide who could have participated, but the study timeframe and design did not allow for them to do so. This would allow a researcher to extrapolate the data in order to understand larger organizational trends. For example, it would have been beneficial to have a fuller understanding of how District, Division and Headquarters all interact with one another and how this has an impact on the ability to communicate, again touching on the technical communication field's interest in organizational context. Additional research opportunities exist within USACE to understand risk and risk communication within communities of practice. For example, this problem could have been considered by only talking to public affairs officials, planners, or engineers. A framing technique for the study could have been specific job title, which would have provided an interesting perspective on how a very particular community of practice functions and performs risk communication within its constraints.



If another study were to be conducted, it would be necessary to observe communication in practice as opposed to discussing it and examining documentation of risk communication. This would require researching a District-level office and observing public meetings in order to comprehend fully how employees' theoretical beliefs about risk actually perform during practice. Conducting a long-term observation of in-person meetings, examining transcripts of public meetings and also finding methods to record and analyze the public's response, would be a reasonable next step in understanding the risk communication from a practical implementation standpoint. Additionally, there are several key questions that could be used in order to further this research. One such consideration for future research that the field of professional writing and rhetoric could take up would be an action-based research study wherein participants become a part of the community and aim to mediate issues and concerns while they are conducting the study. This sort of approach could be productive for risk communication efforts that are largely ineffective or in communities where there are especially low levels of trust in federal officials.

### **FINAL REFLECTIONS**

It is evident that USACE risk communicators in the context of this study earnestly desired to inform publics about risks and to develop understandings of how flooding works and what the federal role is within that domain. A key study question for this effort was to determine how the USACE defines the goal of risk communication. Although conclusions cannot be drawn that speak to the entire agency, findings in this study

implied that goals focus on educating and informing publics that have a different understanding of risks. Such goals reflected efforts to create shared understanding but do perpetuate beliefs that there is a technical risk and a value-laden definition of risk. Where this becomes problematic is if organizations give less value to non-technical risk perceptions.

Findings in this study did demonstrate a perception that publics do not accept technical definitions of risk, but there were no implications that the public was viewed negatively. An implicit goal of informing or bringing communities to understand risk was to develop a shared understanding. Shared understanding may not preclude shared definitions of risk; more so, this underlying focus on shared understanding reflects efforts toward appreciating assumed differences in risk perceptions among experts and laypeople. In this respect, it does seem that experts are taking publics risk perceptions into consideration in regard to issues of risk and risk communication. However, the technical definition is still preferred and potentially creates an unequal power distribution in which message senders have more authority than message receivers. Communication also then seems to be one-directional in that the shared understanding is on the premise that audiences learn to accept the technical definitions of risk. Further studies are needed to understand this correlation fully.

What still remains unclear is whether consideration of differences in perceptions means value is granted to these differing risk perceptions in a way that informs communication practice. It would seem, based on this study, that experts may not have taken this step thus far. This is evident through the challenges identified by participants,

such as inability of publics to understand probability or imagine future events; lack of a broader agency effort or support of risk communication by funding or increasing risk communication specific training opportunities; and the reliance on technical language when working with an extremely varied, and often not necessarily technically savvy audience. Participants most frequently referenced the use of technical jargon in communication as an issue, demonstrating the general reliance on what an organization of scientists, engineers and economists know: technical speak. While experts are cognizant there are different perceptions of risk and ways to define risk beyond probability and consequence, it seems communicators have difficulties in implementing this in communication practice.

To improve risk communication practice, technical experts should pursue training opportunities despite a lack of a completely developed or agency-endorsed training offered through USACE. Although some training exists, without requirements from leadership, it is unlikely the experts interacting with publics most frequently will always be able to pursue those opportunities. A training program that is encouraged by leadership and developed based on agency-defined goals, methods, and techniques could improve communication practice, as well as develop consistency. Additionally, there were perceived benefits to developing program-specific training for risk communication that focus, for example, on the specific methods and challenges associated with flood risk communication. It is encouraging that personnel felt there would be an added benefit of having such a training program as well as leadership support in order to pursue risk communication. Such assertions were slightly surprising since there is some

documentation that points to risk communication as a priority; however, as was mentioned previously in this report, there does not seem to be uniform or required guidance to which employees must adhere.

Study results demonstrate the difficulty of applying theory to practice in some instances of communication. Study participants did not indicate they used a particular theory, training or approach to inform communication practice. In fact, employees largely relied upon on-the-job training and knowledge. This ad hoc information continues to evolve as employees gain new insights through challenging or positive communication experiences, again highlighting the way in which risk communication practice will remain varied until a comprehensive strategy is developed.

Such findings that employees are largely relying on experience to inform their own practice demonstrates the difficulty involved in accommodating audiences who are not just listening to your message, but who are also a part of a taxpayer base the federal government is structured to serve. Such realities were not considered in great detail prior to conducting this research but remain important in that they point to the fact that USACE and many other government agencies may still be very far from achieving symmetrical communication processes where senders and receivers are able to be co-equal. This seems to be a reality that cannot change in every case considering that USACE is an organization that functions based on Congressional authorities. It is important to note for future research the institutional limitations that exist and that impact an individual's ability to engage a member of the public as a co-decision maker, for instance. However, while publics may not always be on equal grounds with the

organization to make decisions, communication practice can still entail efforts to consider the audience, create shared understandings of risks impacting the community, and build trust amongst members of the public.

These general communication practices of considering audience, definitions, documentation, training and organizational structures align well with the focus of technical communication and rhetorical research. Given this alignment, it remains beneficial to consider issues that arise in the context of risk communication, particularly in respect to governing bodies. A similar study frame could be used to consider local government organizational structures, or even other federal agencies, in order to examine how risk communication practice is impacted by factors specific to those contexts. This is the value that rhetorically based research brings to the issues that arise through asymmetric communication of flood risks, or risks more generally, to audiences throughout the nation. It is believed that this study adds such value to a body of research that puts exponentially more focus on the audience itself instead of the entity performing or initiating the communication loop.

Although this specific study did not speak to documentation as well as other studies with rhetorical approaches do, it does identify future questions to consider, such as the relevance of internal agency documentation to practice, the importance of defining flood control as opposed to flood risk management, as well as similar topics. The findings of this study suggest there is a link between a lack of heavy guidance for risk communication, and the nuanced nature of communication practice. In response to individuals calls for improved tools for risk communication, another question identified

in this effort is to what effect do such tools impact risk communication, and how could technical communicators consider this documentation in order to inform further risk communication efforts? In short, the findings of this study demonstrate the immense value a rhetorical approach can bring, as well as a density of information to consider the problem within, and merely provide a modest window of insight into the immense challenge that risk communication can pose within a federal government context.

## **CONCLUSIONS**

Some limited conclusions are suggested through the findings of this research effort.

Within the context of the study, it is evident practice has and continues to evolve for risk communication. Given the newness of the focus to communicate risks to publics as an organization, it is evident the organization has come a long way. Many stigmas exist that suggest audiences perceive the USACE as authoritative and often not granting value to publics' perceptions. Study participants highlighted the remnant impressions of the organization and the baggage employees bring from previous risk communication challenges, successes or failures. Not only do publics' perceptions of risk impact communication practices but publics' definitions of risk as well. Study participants demonstrated overwhelming consistency in their technical definition of risk as well as a recognition that this definition does not align with publics. There was general awareness that this was the case and that it should inform practice in some respect.

At the same time, study participants also strongly voiced belief that publics selectively accept truths and often choose not to accept or understand risk as it is

technically measured. This belief implies a conscious choice on public audiences' behalf and intent to ignore a technical risk definition. Such views lead the agency to focus on informing or educating publics when performing risk communication. Perceptions that publics cannot understand probabilities correctly also suggest a knowledge deficit on the publics' part that could shape communication practice further. While such goals are not incorrect or ineffective in all cases, risk communication researchers suggest that a focus on informing or educating is structured as a one-way communication approach with the expert relaying information to the public. This is considered to be asymmetrical communication by many since technical experts disseminate information to "uninformed" entities that are not perceived to have power. However, this conceptualization of asymmetrical communication may not fully consider organizational constraints in which government agency employees may not have the power to pursue communication that is more symmetrical.

Although traces exist that suggest communication is still being structured to fill a gap or deficit in knowledge, USACE participants did not exhibit attitudes that publics are unable to understand or that their understandings are of no value. There are also power structures that limit the organizations abilities in terms of making publics equal partners or decision makers when making decisions about managing risk. It seems the organization is largely focused on creating a shared understanding of risk that aligns with the technical perspective without completely devaluing variations in understandings of risk. This seems to demonstrate progress from very early risk communication efforts that were conducted in an effort to address the "public-expert disconnect."

Significant efforts are needed to address gaps in communication practice such as improved training, more defined goals for risk communication, expanded consideration of audience and use of common terminology, and determining the degree to which non-experts' risk definitions and perceptions can truly be considered within the given power structures. Such areas could provide grounds for future studies based in rhetorical and technical communication theories that not only provide insight to tacit knowledge and practice within the workplace, but also provide the basis on which scholars can show how particular aspects of organizational paradigms and workplaces shape how audiences and publics are understood. This consideration of audience could in turn inform how risks are assessed and subsequently how those risks are communicated to those impacted. This study provides the basis for continuation of considering the affects of audience consideration on asymmetrical communication practices within a government context.



## **APPENDICES**

### **RISK COMMUNICATION SURVEY CONSENT FORM**

#### **Research Procedures**

This survey aims to investigate the experiences of U.S. government personnel with risk management and communication responsibilities. Research findings will help inform recommendations for ways to improve risk communication. If you agree to participate, you will be asked to respond to a survey that will be sent to you by email. The survey will take no more than 20 minutes. Responses will be submitted by email and will remain confidential.

#### **Risks**

There are no foreseeable risks for participating in this research.

#### **Benefits**

There are no benefits to you as a participant other than to further research in risk communication practice within the U.S. Army Corps of Engineers. Participants may receive a copy of the report following the study upon request.

#### **Confidentiality**

The data in this study will be confidential. All data and findings will be reported in aggregate with no names or identifying information attached to the data. At no time will personally identifiable information be shared with anyone beyond the research team. Data will be coded. Only the researcher will have access to the identification key.

### **Participation**

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

### **Contact**

This research is being conducted by Paul Rogers at George Mason University. He may be reached at [progers2@gmu.edu](mailto:progers2@gmu.edu) for questions or to report a research-related problem. You may contact the George Mason University Office of Research Integrity & Assurance at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research. This research has been reviewed according to George Mason University procedures governing your participation in this research.

### **Consent**

I have read this form and agree to participate in this study. By selecting the “I agree” icon below and continuing to the next page, you have agreed to participate. Directions for submitting your response are located at the end of this survey.

## **SURVEY**

There are 10 questions in this survey. Please respond to each question according to the given direction. (Please note this survey appeared slightly differently in Adobe Forms)

### **Question 1 of 10**

Please answer the following question based on your personal experiences in a narrative format.

1. In the context of your professional activity, how do you define risk?

### **Question 2 of 10**

Please select an answer that best reflects your opinion on the topic.

2. Risk is a technical decision, not a values decision.

Strongly Agree

Agree

Undecided

Disagree

Strongly Disagree

Other: Please expand using the text box below.

### **Question 3 of 10**

Please answer the following question based on your personal experiences in a narrative format.

3. What do you believe the primary goal of risk communication should be?

**Question 4 of 10**

Please select an answer that best reflects your opinion on the topic.

4. Personal values should be accounted for in all risk communication.

Strongly Agree

Agree

Undecided

Disagree

Strongly Disagree

Other: Please expand using the text box below.

**Question 5 of 10**

Please answer the following question based on your personal experiences in a narrative format.

5. When risk communication fails, what do you believe the primary reason is?

**Question 6 of 10**

Please select an answer that best reflects your opinion on the topic.

6. The public understands risk better today than it did 10 years ago.

Strongly Agree

Agree

Undecided

Disagree

Strongly Disagree

Other: Please expand using the text box below.

**Question 7 of 10**

Please answer the following question based on your personal experiences in a narrative format.

7. What is the primary reason for the publics' inability to understand risk?

**Question 8 of 10**

Please answer the following question based on your personal experiences in a narrative format.

8. If you had one suggestion to improve USACE risk communication, what would it be?

**Question 9 of 10**

Please select an answer that best reflects your opinion on the topic.

9. How often should personal values be included in risk communication?

Always

Frequently

Occasionally

Rarely

Very Rarely

Never

Other: Please expand using the text box below.

### Question 10 of 10

Please specify your gender in the following question.

10. What is your gender?

Thank you for taking the time to participate! Please contact us with any questions or concerns. Additional comments can be provided in the space below. To submit this survey, click on the “**Submit Response**” icon below. After clicking on the icon, you will be prompted to agree to send your response by email. If this method does not work, please save the file to your desktop, and email it in an attachment to:

[Katelyn.m.noland@usace.army.mil](mailto:Katelyn.m.noland@usace.army.mil).

## **RISK COMMUNICATION SURVEY INSTRUCTIONS**

### **Response Instructions**

This survey aims to investigate the experiences of U.S. government personnel with risk management and communication responsibilities. Research findings will help inform recommendations for ways to improve risk communication. If you agree to participate, you will be asked to respond to a survey that will be sent to you by email. The survey will take no more than 20 minutes. Responses will be submitted by email and will remain confidential. To fill out the survey, please use the following directions:

- Read the study information located on the first page. At the end of the text, there is an icon that says, “I agree.”
  - By clicking this icon, you are agreeing to participate in the study and will be prompted to save a copy of the survey to your computer.
  - If you do not wish to save the survey to your desktop, press “Cancel” when prompted to save.
- To the right of the “I agree” icon, there is a drop down menu to enter the date. Please select the date on which the survey was completed. Proceed to the next page.
- The survey has 10 questions. Some of these questions require responding by typing a personal response.
  - To respond to these questions, left click your mouse cursor over the purple box. Begin typing. The text box will scroll to accommodate responses and has a 500 word limit.



- There are also questions that ask you to select an answer among a group that best reflects your opinion on the topic.
  - For these questions, please read the statement and select the circle to the left of the choice that best reflects your feeling on the topic. When you click the circle, it will be filled it.
  - You can change your response by clicking on another circle. Additionally, you can use the text box located below the option for “Other” in each question to expand upon your choice. This text box works in the same way as described above.
- For boxes with drop down menus, please click on the arrow icon to the right of the box. After clicking, a list of choices will drop down. Select one of the options by left clicking your mouse.
- The form can be submitted in two ways.
  - The first option is to save the completed form to your computer. You can then attach the form to an email addressed to the email address provided in the form.
  - The second option is to use the “Submit Survey” icon. By left clicking the box, you will be prompted to submit your form using either a Desktop Email Application, such as Microsoft Outlook, or an Internet email service. By selecting the Internet email service option, you will need to save the form to your desktop and email to the appropriate address. Using the Desktop Email Application option will use your Outlook address to submit the form.

Selecting this option and pressing the “Ok” dialogue box will open a draft email to the appropriate email address with the completed survey attached.

## **INTERVIEW PROTOCOL**

1. How would you describe your job? What is a typical day like for you?
2. What do you believe to be the greatest challenge when communicating risk?
3. On a scale of 1-10 (10 being highly confident), how confident are you in the public's ability to understand risk communication messages put out by the Army Corps of Engineers?
4. What is the one thing the public does not know and you wish they did? How would you tell them?
5. Can you tell me about a relatively positive risk communication experience you've had?  
Can you tell me about a challenging risk communication experience?
6. Would you be willing to look at a piece of risk communication with me and talk about what you see?  
  
*6a. How would you change this communication to make it more effective?*
7. What sort of training have you had? Have you had any risk communication training?
8. How do you define risk?
9. What do you believe is the greatest risk and threat to public safety?
10. Who is responsible for risk and managing risk?

## **RISK COMMUNICATION SAMPLE**

### **UPDATED STORY: Flood risk goes down for Hanson Dam; Green River Valley**

*posted Nov 5, 2009 at 1:05 PM— updated Nov 5, 2009 at 4:25 PM*

The repairs at the Howard Hanson Dam have helped, but the risk of flooding remains high this winter in the Green River Valley.

That was the word Thursday at an Army Corps of Engineers press conference in Seattle. The corps had encouraging words about a reduced risk of flooding - a 1-in-32 chance, thanks to measures that have been taken to aid the dam and river levees - but noted that's still a lot less than when the dam's reservoir was fully operational.

A new grout curtain constructed by the U.S. Army Corps of Engineers to slow a leak through a damaged abutment at the Hanson Dam will reduce the risk of flooding this winter in the valley to a 1 in 25 chance. Without that fix, the valley would see a 1 in 3 chance of the winter floods.

And the addition of thousands of giant sandbags along the Green River levees reduces the chance of flooding even more: to 1 in 32 chance, said Col. Anthony Wright, commander of the Seattle district of the Army Corps.

"That may sound like a big reduction," Wright said. "But it is still quite a bit less than the 1 in 140 chance when Howard Hanson Dam is operating at design capacity."

A heavy rainstorm similar to what struck the Green River Valley last January would overtop the levees and cause flooding in the cities of Auburn, Kent, Renton and Tukwila because the corps will not be able to store as much water as normal at the Eagle Gorge reservoir, the pool of stormwater the corps retains behind the dam.

"We've gone from bad to not so bad," Wright said. "There is still a high level of flood risk."

The corps pumped more than 400,000 gallons of cement to form a grout curtain in the abutment as part of its \$8.9 million temporary fix to reduce the risk of flooding. The curtain is about 20 feet wide, 450 feet long and between 90 to 160 feet deep, depending on the location along the abutment.

"We're not out of the woods yet, but we're a little bit closer to getting out of the woods," Wright said. "I'm generally happy with the results. This is not a slam dunk. It's not like this stops all of the water and there is no water that can get around. What we have done is an interim measure that had to be done by flood season."

The corps plans to construct a concrete cutoff wall as a permanent fix within the next three to five years. Crews have started the design process for the concrete wall but the design isn't expected to be completed until next year.

The abutment was formed nearly 10,000 years ago by a landslide. The federal government built the rock-and earth-fill Hanson dam in 1961 next to the abutment to control major flooding in the Green River Valley. The dam is about 25 miles east of Kent.

Problems with water storage behind the dam were discovered by the corps when a 10-foot-wide depression formed on the embankment next to the dam after heavy rain in early January. The corps stored a record amount of water in the reservoir during that storm to prevent flooding.

The full-storage capacity behind the dam is 1,206 feet. The level reached 1,189 feet during the heavy rain last January. Dye testing in June showed that water was moving through the right abutment very fast at pool elevations above 1,155 feet. The level of the reservoir has been lowered to 1,075 feet for the flood season from November through March.

Mike Mactutis, a Kent city environmental engineering manager who has helped to oversee flood preparation work by the city, attended the press conference.

"I agree with Col. Wright that it helps, but it doesn't alleviate all of the concerns," Mactutis said after the briefing. "There is still an elevated risk of flooding. But to go from a 1 in 3 chance to 1 in 32 - that's significant."

Wright praised the work of the cities of Kent, Auburn and Tukwila to place giant sandbags along the levees. The thousands of 3,200-pound sandbags increased the height of the levees to handle a river flow of 13,900 cubic feet per second compared to 12,000 cubic feet per second without the bags.

"I'm really impressed with what the cities have done," Wright said. "There is a tremendous amount of effort going on."

Wright said that extra height could keep the levees from overtopping if he has to release more water than normal from behind the dam during a storm.

"These measures that the cities are doing directly reduced that risk of the levees overtopping and thereby significantly reduced the risk of flooding," Wright said.

If the corps does have to release water that would cause flooding, Wright said a minimum warning of at least eight hours would be given to local emergency officials

who might have to order evacuations. It takes eight hours for water released from the dam to reach Auburn.

For more information, go to [www.kingcounty.gov/floodplans](http://www.kingcounty.gov/floodplans) or [www.nws.usace.army.mil/](http://www.nws.usace.army.mil/).

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