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# The Effect of Natural Disasters on Climate Change and Sea Level Rise

Nicole Riekers

## ABSTRACT

This study, led by Dr. Daniel Richards and Mrs. Megan McKittrick, with additional assistance from Old Dominion University students enrolled in English 231C Technical Writing, utilizes an approach called “productive usability” in Climate Central’s testing of their most recent technology, *Risk Finder*. The client for this non-profit research study is Dan Rizza, Manager and Research Associate of Climate Central. Climate Central is an independent organization that conducts research on climate change and communicates their findings to the general American public. The *Risk Finder* tool, created in October 2013, is an interactive portion of Climate Central’s “Surging Seas” website that anyone can access to view the vulnerability of their city, county, or state in relation to flooding aggravated by sea level rise (Climate Central, 2014). Undergraduate students from Mrs. McKittrick’s English 231C Technical Writing course use systematic sampling from the Polk directories in the Old Dominion University library to create a list of 8-10 possible participants for testing the *Risk Finder* technology. After the participants are chosen, they go through a process that consists of a pre-test introduction and interview, an observed use with a talk-aloud protocol, and a post-test interview. Following this productive usability testing, each participant’s audio file is transcribed and coded for recurring themes. Through their assistance in making the *Risk Finder* tool more user-friendly, these participants help the community more clearly understand the dangers of sea-level rise. Educating the general public about how climate change directly affects them and their community helps to ensure that risk communication will continue to be an important topic.

Communication is essential to informing the general public on important issues and events. Technology aids this communication progress; news and other information can be easily

spread over a short amount of time. Climate Central, a nonprofit, independent organization that conducts research on climate change, communicates their findings to the general public through a website called Surging Seas. In October 2013, Climate Central launched the *Risk Finder* tool, a new application on their Surging Seas website. With the *Risk Finder* tool, Climate Central can more easily communicate their findings regarding climate change and sea level rise to Surging Seas website users. Having an easily accessible website for all ages is crucial when informing citizens about the dangers of climate change.

Dr. Daniel Richards and Mrs. Megan McKittrick, along with help from Mrs. McKittrick's English 231C Technical Writing class, conducted usability testing on Climate Central's new *Risk Finder* tool to explore its methods for educating the general public on the subject of climate change. Mrs. McKittrick and her students chose potential participants for this usability testing using systematic sampling from multiple telephone directories. Systematic sampling

provides the opportunity for all ages, genders, and races to become involved in the usability testing. In studying the effect of natural disasters on climate change, focus was heavily directed to the communication aspect. Knowledge of the Surging Seas website and the *Risk Finder* tool was used to conduct research.

## **LITERATURE REVIEW**

### **The Effect of Climate Change on Natural Disasters**

When asked about the causes of natural disasters, such as floods, tornadoes, etc., most Americans will not respond by saying “climate change,” though research shows that climate change could be a probable cause (Phillips et al, 2015). In recent years, the media has increased the number of reports on natural disasters, causing more frequent discussions on “the potential connection of climate change and the frequency, intensity, and/or duration of natural disasters” (Phillips et al, 2015, p. 61). Even with the recent publicity, the possible relationship between natural disasters and climate change is not well known among all demographics. Because the percentage

of Americans that are aware of this serious issue is unclear, Kent State University in Kent, Ohio conducted a study using a sample of students (Phillips et al, 2015). A survey asked 455 college-age students attending Kent State if they believe that climate change has a direct effect on various natural disasters, such as hurricanes, tsunamis, and floods (Phillips et al, 2015). The results showed a lack of knowledge in the field of atmospheric-related natural disasters, which include tsunamis and earthquakes, and their causal relationship with climate change (Phillips et al, 2015). The Kent State publication displayed the importance of communication and education. The study discovered the grey area among college-age students regarding climate change and made clear the information on which the public should be educated. According to Phillips (2015), “[o]pinions on climate change and its potential effects on natural disasters are shaped by knowledge of both climate change and natural disasters” (p. 60).

## **STUDY METHODS**

### **The Importance of Education and Communication**

Another academic journal entitled “Is Education a Key to Reducing Vulnerability to Natural Disasters and hence Unavoidable Climate Change?” is a literature review answering the title’s question. According to the article, “the papers will contribute to testing the hypothesis that education is a key factor in reducing vulnerability as compared to other potentially relevant factors” (Muttarak, R. and W. Lutz, 2014, p. 41). The journal aided this study by displaying the importance of education and communication. For example, the studies included in this journal show that highly educated societies are reported to have greater awareness and response to natural disasters, depicting the positive impact of education and proper communication on societies (Muttarak, R. and W. Lutz, 2014).

## **Communication and Education in Other Locations**

Another study helps to view the effects of climate change in places outside of the United States. The article, "Assessment of climate change impacts on flooding vulnerability for lowland management in southwestern Taiwan," focuses on solutions to the massive flooding crisis that occurs each year in Taiwan (Wang, H., Kuo, P., & Shiau, J., 2013). This article demonstrates two areas of research, climate change effects and the communication of climate change. Efforts can be made either to educate the public about the dangers and effects of climate change, or to fix the disasters caused by climate change for more positive communication. According to J. Rademaekers and R. Johnson-Sheehan (2014), "climate change scientists and communicators need to move away from traditional environmentalist frames that often put them at odds with broader social frames that the public finds more familiar. They should speak positively within social frames of progress, science, ethics, truth, problem-solving, and adaptation" (p. 19). J. Rademaekers and R.

Johnson-Sheehan believe, along with Wang, Kuo, and Shiau, that it is better to educate the public on climate change by using problem-solving, like in Taiwan, rather than through only lecturing about the issues of climate change (Radmaekers, J., & Johnson-Sheehan, R., 2014). However, there are many other ways to approach climate change communication. For example, Nick Pidgeon (2012) mentions another strategic climate change approach “which comprises both ‘strategic listening’ and ‘strategic organization’” (p.953).

## **SUMMARY**

The research study on Climate Central’s *Risk Finder* tool is loosely based upon the relationship between natural disasters and climate change; it focuses specifically on educating the general public by means of communication. Programs such as the Surging Seas website’s *Risk Finder* tool help to educate the public on the importance of risk communication in regard to sea level rise.



By utilizing usability testing on Climate Central's website, the study will help inform citizens about the dangers of sea level rise and climate change. There are multiple strategies to climate change communication, and usability testing should be conducted using each of them to determine the best communication method. More websites like Surging Seas should be created and tested until the grey area between what the public knows about climate change and what they should know is erased.

## **METHODS**

To study Climate Central's Surging Seas website's newest tool, the *Risk Finder*, eight to ten participants were recruited using systematic sampling. Names were collected from the population of the greater Hampton Roads area by using the Polk Directories in the Old Dominion University library. Letters were sent to ask these individuals to take part as a sample in the productive usability test of the *Risk Finder* tool. Four responses were received. Pre-test and post-test interviews were conducted on all participants. During the

usability testing, each participant was asked to use the think-aloud protocol and speak throughout their testing. After each session, the audio was transcribed and these transcriptions were then coded for recurring themes. Through their assistance in making *Risk Finder* more user-friendly, these participants help the community understand the dangers of sea-level rise more clearly, making this a client-based service learning study.

## RESULTS

Generalizations and trends in the collected data sets can be recognized. In *Figure 1* each participant is listed with his or her age, gender, occupation, and the number of years he or she has lived in Hampton Roads. Each of these individuals is over the age of 50, and has been a long-time citizen of Hampton Roads. Illustrated in *Figure 2* are the most prevalent themes that were identified by Mrs. McKittrick's English 231C class while coding each transcript. The numbers inside the pie chart represent the number of times that a particular theme was seen in all of the transcripts. The most

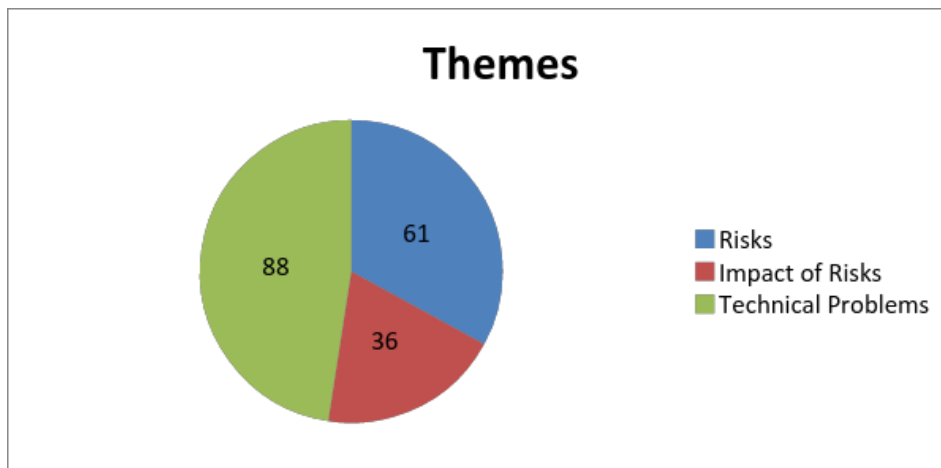
prevalent issue among the participants were technical problems, where users articulated difficulties or questions about the usability of the tool. The number of technical problems that the participants faced could largely influence their decisions of whether or not they would feel able to use the *Risk Finder* tool.

**Figure 1:**

Name**	Age	Gender	Time lived in	Occupation
Mary	65	Female	10+ years	Corporate
Matthew	64	Male	10+ years	Government
Thomas	55	Male	10+ years	Federal/Civil
Charles	68	Male	10+ years	Electric Technician

\*HR is Hampton Roads \*\*Names are altered to guarantee anonymity

**Figure 2:**



\*Each number depicts the number of times the idea came up in the transcripts (aka instances)

## **DISCUSSION**

The other two major identifiable themes in the broad category of “Risk Perceptions” were “Risks” and “Impact of Risks.” Considering that each of the participants has been a member of the Hampton Roads community for over ten years, the safety of the area is very important to them. Many of the participants were concerned about infrastructure damage and transportation issues in regard to flooding and sea-level rise. Some were more interested in locating their home to observe the extent to which it would be affected, while others enjoyed looking at the numerical data offered by the site.

## **CONCLUSION**

Because ENGL 231C is an undergraduate course, there were some limitations to the methods employed in the study. The range of resources available was not as extensive as the range that some larger graduate programs/companies would have to bring participants in and conduct a massive study. This research included only four individuals, meaning that there was not as much data to

review. On the other hand, one major advantage to the study was that all of the participants had lived in Hampton Roads for an extended amount of time and truly cared about the safety of the area. Many of the participants took the study very seriously and tried their best to understand the data shown to them.

Further investigation of the Surging Seas website and more specifically, the *Risk Finder* tool, will increase the community's knowledge regarding the dangers of sea-level rise, ultimately changing citizens' views on climate change. The data from this study makes it apparent that most of the participants were worried about the flooding aspect of sea-level rise and climate change, relating back to the original angle on natural disasters. Mr. Thomas Bolt (pseudonym), using the think-aloud protocol, voiced his interest in the flooding angle of sea-level rise by observing that, "you can look at the annual flood risk versus the different levels." He then continued to interact with the different levels and their flood risks, which deeply intrigued him. Many questions still remain in this area

of research, but if other groups continue to use productive usability testing to allow the *Risk Finder* tool to be even more accessible in the future, more individuals will have a better chance of understanding sea-level rise, climate change, and the effects of these two phenomena.

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