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# Environmental risk perceptions, attitudes, and behaviors: A study of college students living in a risk society

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Environmental Risk Perceptions, Attitudes, and Behaviors:  
A Study of College Students Living in a Risk Society

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A Project Presented to  
the Faculty of the Undergraduate  
College of Arts and Letters  
James Madison University

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in Partial Fulfillment of the Requirements  
for the Degree of Bachelor of Sociology

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by Julia Spring Pei

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Accepted by the faculty of the Department of Sociology, James Madison University, in partial fulfillment of the requirements for the Degree of Bachelor of Arts.

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## **Abstract**

This present study examines the relationships between environmental risk perceptions and pro-environmental attitudes and behaviors within the theory of the risk society. This quantitative study was conducted online, with a sample size of 218 undergraduate college students from James Madison University. Environmental risks were measured at the societal and individual levels, as well as within five separate risk categories. As expected, I found positive relationships between these risks and pro-environmental attitudes and behaviors, however the relationships between individual and societal risk perceptions were different than I anticipated. Where I expected individual risk perceptions to drive both pro-environmental behaviors and attitudes, societal risk perceptions actually held a more positive relationship with pro-environmental attitudes. Pro-environmental attitudes appear to partially moderate the relationship between risk perceptions and pro-environmental behaviors, while risk perceptions also partially moderate the relationship between attitudes and behaviors. These results are consistent with previous studies, which suggests that college students are engaged with the risk society, and their future involvement may influence societal practices on recognizing and handling our environmental risks.

## **Introduction**

Throughout the contemporary era, the United States has grown into an increasingly modernized society with stable systems of capitalism, industrialism, and rationalization (Giddens 2002). This modernity comes with a heavy reliance on production technologies that utilize potentially hazardous materials that can degrade our environment and negatively impact our health. Environmental issues that have become associated with these risks have generated concerns among the general public. Our nation has morphed into a risk society, where we organize ourselves around these issues of potential hazard and try to control them through risk management strategies and implementation (Cable 2008).

Conditions that produce a risk society consist of post war societal changes driven by a relentless system of production that accumulates an abundance of capital. However, this surplus in capital enables a surplus of potential harm and dangers to the human health. Our production technologies have incorporated the heavy usage of synthetic chemicals, radioactive compounds, as well as heavy metals since 1945 (Cable 2008). The utilization of these hazardous materials has been linked to human health ailments. These chemicals can also seep into public resources and compromise its quality, such as contaminating waterways, impairing soil quality, and polluting our airways. The sheer complexity of these technologies, compounds, and materials generates a growing gap for understanding these processes for citizens. This gap is also enhanced due to the fact that the public cannot have full access to all of this information due to production and copyright secrecy as well as government restriction due to security reasons (Giddens 2001). Thus, this puts more of reliance onto scientific experts to influence decision-making areas about these environmental risks. As these risks accumulate, they slowly slip through the control

necessary in an industrial society, and thus shape our society to become one centered around risk. Risk analysis experts have demonstrated that modern societies are often aware of these risks. Despite this awareness, societies still take on environmental and health risks for the purpose of capital accumulation, and also because the risk-bearers are often disproportional throughout the public (Cable 2008).

Our society has learned to constantly confront these post-production issues. We have also come to recognize that there may be several more environmental and human health consequences that we may not even be aware of. These issues do not have temporal or spatial limitations. We have recognized that these environmental hazards can cross human-drawn geographic boundaries as well as carry onto the future generations. Within this simple modernization, we were not aware of the hazards and potential hazards that we were creating through our advancement, but as we have come to acknowledge these risks, we have taken the first steps towards achieving reflexive modernization. Though we are a society that engages in reflexive modernization, this does not mean that we have lifestyles that are more conscious. In actuality, we are achieving a heightened awareness that doing so is near impossible (Beck, Bonss and Lau 2003). We are learning to encompass both the known and unknown risks that we are generating through our industrial systems.

As a risk society, we have the abilities to reflect and alternate our current pathways by analyzing our past and learning from the consequences from our previous actions. Societal progress in this respect is achieved through reform and reorganization of systems. Modernity in society has developed through different stages. The first shift in modernity comes from the simple modern society, where social change within this society is still very well defined, predicted, and documented. The success of the first modern society was mainly due to stability

within its economics and its political nation-state. Since there was a finite and clearly distinguished border within the nation-state, there was more certainty and reliability within its institutions. There was also enforced individualization, coupled with the mentality of working and contributing to the economy as part of one's worth (Beck, Bonss and Lau 2008). There was also a fundamental mentality of natural exploitation, where the resources on this planet are outside of the actions and consequences of human manipulation. Thus, industries were operating under the premise that achieving endless growth was possible. Additionally, their concept of rationality places science to be capable of unlocking all possibilities, meaning that perfection of science leads to a perfection of controlling nature (Beck, Bonss and Lau 2008).

However, simple modernity becomes unstable due to several societal and global changes. The first society was assumed to be the final form of a stable society, however with the discovery of unintended environmental consequences that deterred growth as well as other institutional changes, this was reexamined. Globalization also generated more uncertainty about the nation-state, as both cultural influences and economics crossed nation borderlines. People could no longer solely rely on the welfare of their distinct nation state for their stability. Most importantly, society has recognized that our actions alter the earth and affect our quality of life. Limitations of growth have also been recognized due to the planet's finite amount of available resources (Beck, Bonss and Lau 2008).

The term reflexive modernization refers to the shift away from the first modern society. It is founded upon changing modernity to encompass the risks that we discovered we had put onto ourselves. Reflexive modernization enables us to continue modernizing but with the knowledge of our production of environmental and health risks in mind. We have collectively become aware of future consequences that stem from our utilization of certain resources and industrial



practices. Therefore, we have developed institutional management systems for these risks (Beck, Lash and Szerszynski 1996). Reflexive modernization inevitably pushes the simple modern society towards becoming the second modern society, where limitations and risks managements are recognized as strong components and factors that drive the production system.

Beck describes our society as one that has become dependent on ecological modernization. As such, we have become used to a perpetual advancement of technologies that drives a massive production of materials, energy, and products for our daily usage. This modernization is a paradigm that keeps our current economic system of capitalism in place while still holding environmental values of reducing our negative impacts on our resources. Ecological modernization is based on the premise that technology can in essence solve our ecological crisis, given that we are able to consistently have an advancement that will continuously reduce our ecological impact. Our society's modernity, coupled with this ecological modernization, has created a momentum of innovation and production that generates more and more risks to society, its individuals, and its environment (Beck, Lash and Szerszynski 1996).

There are differences in environmental issues that can be categorized into external and manufactured risks. External risks are classified as environmental disasters that are naturally occurring, such as hurricanes, tornados, and tsunamis. Manufactured risks are those that have human origins, as they are largely driven by our interaction with the environment (Beck, Lash and Szerszynski 1996). Our steady development and reliance on materials such as fossil fuels and synthetic compounds has produced tangible environmental harms from our production processes. Manufactured risks that have arose as consequences of poorly executed production and industrial processes include impairments to the quality of resources, such as water and air. Air impairments can cause varying health issues among different population demographics, such

as increased vulnerability to airborne toxins that affect the rest of the public. Water impairment and pollution can also cause a wide variety of ailments that hinder human wellness.

Climate change is a high profile environmental issue in our country, surrounded with controversy on both sides. There are concerns about rising global temperatures, and how they may be driving the recent increases in natural disasters around the world. Additionally, several fragile ecosystems have been and will continue to be impaired and destroyed due to the changing global temperatures (EPA 2011). People are also utilizing alternative food options, such as vegetarianism and organic consumption. This way, they can choose to support more sustainable lifestyle options, whether it is for their own individual health benefits or hoping to achieve a more global impact. Our nation is also researching and investing in alternative energy sources with conventional natural forces such as such as wind, solar, and hydropower, however there has been more concern and controversy with implementing more nuclear power production (UNEP 2012).

As a risk society, we are beginning to evaluate our actions and work around these environmental risks, whether we are fully aware of them or not, and act before they become dangerous to us (Beck and Giddens 1994). Arguably, our society is increasingly engaging in reflexive modernization, which is how we critically analyze our history with environmental issues that have emerged from production technologies, such as pollution, environmental degradation, and health concerns regarding dangerous chemicals and recombinant materials. We are actively thinking about improvements that we can make in these technologies that can help alleviate these concerns (Beck, Giddens, and Lash 1994). Having this knowledge has enabled us to develop regulatory agencies and systems to try and control these risks.

As people living in a risk society, we have to live with the environmental and health risks that we produce through our industrial production, whose growth is driven by our system of capitalism. As our need for growth increases, our production speeds up to meet these needs, as so do the environmental ailments that stem from such industrial processes. Though reflexive modernization takes the form of institutional management of the risks that we produce, our risk society is still partially driven by the concerns of the public given the democratic system we live in. Awareness and understanding environmental risk has been shown to influence attitudes and behaviors about environmental issues (O'Conner and Fisher 1999).

However, disparate segments of society can perceive these environmental risks differently. There is a general consensus among the scientific community that climate change and other environmental issues are problems that need to be addressed (Anderegg, Prall, and Harold 2010). However, this sense of agreement and urgency has become lost in the public, but there are groups of people that are equally as concerned about these environmental issues as the scientific communities. Therefore, studying the attitudes and behaviors of different segments of the public can help indicate the process of how the risk society is shaping, given that our society is operating under democracy. Looking at the individual levels of society's actors will tap into how people perceive the risks produced by their society. There have been several studies that analyze the relationship between environmental risk perceptions and pro-environmental attitudes, as well as behavior. These studies often analyze the effects these have on opinions regarding environmental risk management.

College students in particular are rarely studied, despite being in institutions of higher learning and being in their critical stages of intellectual development. Undergraduate college students are trained to critically analyze information and formulate their own opinions about

national and international issues, yet there has been limited research on how their risk perceptions impact their environmental attitudes and behavior. This study is focused on understanding whether risk perceptions have a relationship with their pro-environmental attitudes and behavior. It is particularly important to study this demographic because they will be the future leaders of our world. People with college degrees are more likely to vote and participate in public policy discourse when they want institutional changes (Hillygus 2005). Their values and social concerns will drive the global issues that our society will dedicate its time and resources towards. Their voices and opinions matter since we are operating under a democratic setting. Analyzing college students can be predictor of how our modern risk society will change in the future.

## **Literature Review**

The concept of the “Risk Society” emerged in the 1980’s and has since created a paradigm for environmental sociologists to further examine its effects on people’s attitudes and behaviors regarding the environment. However, there have been limited studies that specifically analyze pro-environmental attitudes and behavior among college students, as well what may be the causes that are driving them. A “green” mentality has developed from common consumer advertisement slogans and through environmental awareness campaigns that is aimed to motivate environmental attitudes and behaviors. These environmental attitudes are founded on the importance of practicing and investing in sustainable practices, and engaging in environmental behaviors, which ranges from individual actions such as recycling and limiting energy usage, which can then expand towards institutional demands such as advocating for changes in our policies and legislature. According to Beck and Giddens (1992), living within a risk society means that we are perpetually concerned for our future and how our actions may impact it, even if we are unsure about the extent of the potential damage.

Environmental risk has been established as a factor that can influence environmental behaviors and attitudes. There have been several studies that analyze the impact these risk perceptions have on pro-environmental attitudes and behavior. Studying risk perceptions can lead to discovering the intentions behind both these factors. This can be seen in O’Conner and Fisher’s (1999) study that analyzed the effect that risk perceptions have on climate change beliefs. They discovered that the perceived cause of climate change is the leading indicator of behavioral intentions. When people believed that the cause of environmental damage is anthropocentric, they were more likely to engage in green behavior, believing that their actions

could create a difference towards reducing their risks. These findings are important because specific risk perceptions indicate stronger green attitudes and better predictors of green behavior.

There have also been studies that focus on the uncertainty that exists in the gaps of knowledge in risk perception. Professors Viscusi and Zeckhauser (2005) performed a study on climate change attitudes in law and public policy students and analyzed their effect on choices in environmental policies. This study used a demographic of graduate students and mainly focused on the effect of having an uncertain audience who were skeptical about climate change and on climate change policies. They discovered a phenomenon called ambiguity aversion, where even though people were uncertain about the scientist findings, they still voted for aggressive politics rather than stand idle and have a “wait and see approach” (Viscusi and Zeckhauser 2005). This coincides with the concept of living in a risk society, with the precautionary principle. People are more likely to be more cautious and stay safe within their realms than risk hazards towards themselves if they are unsure of possible environmental impacts.

It has also been theorized that worldviews play a significant role in the way that environmental risks are perceived and dealt with. Dake (1991) discussed two dominant opposing worldviews that affect that way people think about these risks within his study. The “cornucopian” position has fundamental values about economic growth, where people are meant to take nature’s resources and make the most of them in order to develop their interests. The other “catastrophic” position calls these values into questions, as it challenges the man-over-nature doctrine. People who hold this worldview challenge industrial capitalism, as they see the dangers from pollution, resource shortages, and population growth as inevitable from this process. They believe people are only putting themselves and their environment into more danger by ignoring these hazards. He analyzed factors of cultural worldviews, societal,

individual concerns, and contemporary worldviews in his study. He found that egalitarianism and individualism and cultural biases had a relationship with pro-environmental attitudes and behaviors. On the political orientation scale, he found that conservatives had more pro-risk stances on technology while liberals were more risk-adverse (Dake 1991). These factors definitely affected people's risk perceptions and pro-environmental attitudes and behaviors.

There are also studies that examine the linkage of factors associated with a risk society. Matthews and Kid (1998) examined the relationship of risk and trust with environmental degradation and health risks. Despite theories of reflexive modernization within the risk society and expert knowledge, they found moderately weak relationships with environmental risk perceptions and declining trust within the scientific community of environmental experts as well as governing agencies. They concluded that perceptions of individual health risk in particular, as opposed to general environmental risk, drive the distrust in government agencies and scientific communities.

There have been studies that test specific demographics factors with environmental risks to see if there are differences in the levels of environment attitudes. Bord and O'Conner (1999) analyzed the concept of a "gender gap" in environmental attitudes by cross-examining two multinational surveys that measured attitudes surrounding the environmental issues of hazardous chemical waste sites as well as global warming. They discovered that perceived vulnerability is a key factor in predicting environmental concern or risk, and women overall had a higher sense of vulnerability to environmental issues than men. They scored higher on both the health risk perceptions and the ecological risk perceptions. Women also have a higher "sensitivity to risk" to other non-environmental risks as well, mainly violent crime, even though men are more likely to be victims. They discovered a statistically significant gender gap in environmental risk

perceptions and attitudes, where women were more environmentally concerned and thus held stronger pro-environmental attitudes than men (Bord and O'Conner, 1999).

Individual risk perceptions of the environment have been theorized to influence pro-environmental attitudes and behaviors about the environment, and so several studies have been designed to test what sort of relationship exists. Levy-Leboyer and Bonnes (1996) conducted a cross-cultural study on individual risk perceptions from five different countries, examining the relationship that environmental cultural contexts have on pro-environmental behaviors. In their analysis, they saw that across all five countries, attitudes proved to be the strongest indicator for higher individual risk perceptions. They conclude that these risk perceptions are strong motivators to engage in pro-environmental behavior.

Outside of strictly analyzing how risk perceptions factor into people's environmental values, there are several studies that examine the relationship between environmental attitudes and behaviors while looking at other social factors. Social identity has been observed to influence pro-environmental attitudes and behaviors (Aoyagi, Vinken and Kuribayashi 2003). The level of connectedness that individuals feel with their environment, due to physical attachment or social involvement, is a strong indicator of pro-environmental attitudes. Since social identity is highly connected to values, Aoyaji, Vinken and Karubayashi (2003) found that those who identified as being more sustainable reportedly engaged in ways to improve their environment. Since people hold their identities close to them, their actions and behaviors become extensions of who they are.

There has also been some research that has specifically looked at the relationship between environmental attitudes and behaviors. Despite having pro-environmental attitudes and understanding ecological concerns, Scott and Willits (1994) discovered in their study that there



was not a very strong linkage between the two. They attributed this to the different levels of attitudes. They did however find that those who held stronger pro-environmental attitudes were more inclined to engage in pro-environmental behaviors (Scott and Willits 1994). Therefore, there is still a range of different levels of pro-environmental behaviors depending on how strong those environmental attitudes are.

Schultz and Zelezny performed a multinational study on undergraduate college students measuring their values and their awareness of environmental issues and degradation with their behaviors (1995). They attribute norm activation values to pro-environmental behavior. They looked at values such as altruism, self-enhancement, egotism, and openness and analyzed their relationships with environmental behavior. They also attribute self-reported pro-environmental behavior to factors such as awareness of consequences, ascribed responsibility, and a threefold concern for the self, others, and other living things. They found that pro-environmental behavioral intention is best predicted by social-altruistic and biospheric values as well as having egotistic values. They also found that those with the awareness for environmental consequences also had the most intentions to act environmentally. They found small inconsistencies where understanding anthropogenic causes were linked to biospheric-altruistic values, but not to more personal core values like egotism. This shows that there are some value relationships that are linked to pro-environmental behaviors, by the link between some values and attitudes may not be as clear.

However, other studies have shown that there can be issues with attempting to examine these environmental attitudes and behaviors. There has been growing evidence indicating that people have a heightened awareness for various environmental issues as well as a better understanding about negative environmental consequences. However, just having these attitudes

is not enough, as there is a discrepancy between understanding these concerns and engaging in green behaviors. This discrepancy is called the “value-action gap” (Flynn, Bellaby and Ricci 2010). Their study deals with looking intently at the hydrogen energy sector as a sustainable form of energy. Despite showing pro-environmental attitudes towards hydrogen energy, participants still did not have high environmental behaviors. They discovered that having a lack of urgency prevents people from reforming their behaviors. They also discovered that there is a disconnection from local and global problems, putting the responsibility and blame on other people. They generally did not want to take a personal responsibility for the environment (Flynn, Bellaby and Ricci 2010).

There are also different approaches to measuring pro-environmental actions or behavior. Gatersleben (2002) looks at the differences between intent-oriented measures for environmental behavior and impact-oriented environmental behavior. The intent-oriented is self-reported and focuses on environmental significant actions from the individual’s standpoint, i.e. recycling, buying organic foods. These results typically cannot accurately predict the environmental impact of these respondents. Impact-oriented measures are focused on quantitative measures of environmental impact of these individuals and thus the behavioral actions become the main focus of measure (Gatersleben 2002).

Though the intent-oriented measures may not be able to measure an individual’s carbon footprint, or ecological damage to the environment, as effectively as impact-oriented measures do, they do however explain how deliberately these individuals took their actions. An example Gatersleben (2002) uses to examine this is by comparing the different actions of environmentally friendly non-environmental people. Hypothetically, Person A purchases a hybrid vehicle and new energy efficient washing machines with the purpose of saving energy, while Person B has

old appliances that are not energy efficient and rides a bike due to financial strains and no environmental intent. Since Person B does not drive and is technically using older, thus recycled, machines, B's impact is much lower than A's since A drives and has a much larger carbon footprint. Though it seems ironic that there are cases where non-environmental individuals perform more environmentally friendly actions than pro-environmental individuals, it is still important to analyze the intentions of the performance of these actions.

Self-reported surveys also have hindrances that need to be addressed and understood. Respondents may be affected by factors such as social desirability bias. This bias finds that people tend to over-report socially constructed "good" behaviors while under-report "bad" behaviors, in order to be looked upon more favorably by others. Olson and Stern (1999) found that even with respondents who know that they are anonymous, they still hold small biases in their reporting. These biases may skew results and cause relationships to be more significant than they actually are.

There have been some studies that specifically analyze undergraduate college students' environmental attitudes and behaviors. Der-Kapabetian and Stephenson (1996) studied cognitive and emotional risk perceptions and how those perceptions determined environmental actions within British and American college students. They found that for both nationalities, students that perceived higher personal harm had stronger emotions towards environmental issues and therefore reported engaging in more pro-environmental behaviors. Though there are some differences within the groups, such as British students still being more pro-environmental despite having some lower risks than American Students. This multi-national study is one of many that compare environmental attitudes and behaviors across borders, as environmental issues are transnational.

There are additional studies that examine environmental attitudinal differences among different cultures. Duan (2005) performed a cross-cultural study, which focused on the attitudinal differences regarding environmental risk between Chinese and American college students. There was a significance difference in reports of risk experiences, with the Americans reporting much lower experiences, and the Chinese report higher levels of risk knowledge. These combinations of direct experiences with environmental risks and risk education pointed towards more pro-environmental mentalities. This study indicates a relationship between risk perceptions and its attitudinal and behavioral impact among both Chinese and American college students, particularly in becoming more involved and advocating for more environmental risk management strategies.

Jewell and Humphrey (1978) performed a study in this field that discovered that outdoor exposure was positively correlated with environmental beliefs. They compared the environmental attitudes of students in a social problems course with students in a hiking organization. They discovered that even though the students in the social problems class were aware of environmental issues, they did not develop environmental concerns that were as strong as the hiking students. Differences in demographics and development were emphasized in this study, such as the impact that scouting activities and parental involvement had on their behaviors, and again the results were positively related to pro-environmental attitudes and behaviors. Intentions to go to graduate school and parental occupations had no impact on their environmental concerns. Though risk perceptions were not involved, it is important to understand causes of environmental values and beliefs.

Despite these numerous studies, there are still gaps in understanding our risk society, as we have limited research that studies specific risks and levels of environmental risks within

college students. I am interested in analyzing how important environmental risk perceptions are in influencing and impacting green attitudes and behaviors in these undergraduate students. I am hoping to contribute to this limited research by analyzing how much of an impact different levels of risk perceptions have on its relationship with pro-environmental attitudes and behaviors within college students. Considering the potential impact that young adults with college degrees have on the future, analyzing their attitudes and behaviors is very important in better understanding our risk society. This demographic is significant because they are the rising young adults who will be among the most educated in our nation and their values and social concerns will drive the global issues that our society will dedicate its time and resources towards. They will be the ones who will hold significant upcoming roles in deciding which issues are worth our nation's time and effort.

## **Research Design/Methodology**

### Hypotheses

I hypothesize that the higher an individual's environmental risk perceptions are, the more pro-environmental both his/her attitudes and behaviors will be. It is important to analyze these risk perceptions at both the societal and individual levels, as previous studies indicate differences in pro-environmental attitudes and behaviors at these levels (Der-Kapabetian and Stephenson 1996). I hypothesize that individual environmental risk perceptions will have a stronger relationship to both attitudes and behaviors, as opposed to societal environmental risk perceptions (Levy-Leboyer and Bonnes 1996). I also hypothesize that though there may be a relationship between pro-environmental attitudes and pro-environmental behaviors (Flynn, Bellaby and Ricci 2010, Scott and Willits 1994).

### Overview

This is a quantitative study where voluntary participants were asked to complete an online survey examining their environmental risk perceptions, pro-environmental attitudes, and pro-environmental behaviors. The New Ecological Paradigm (NEP) Scale was used to measure pro-environmental attitudes (Dunlap and Liere 2000). Measures of pro-environmental behaviors were derived from environmental behavioral scales that focused their measure on conscious and environmentally purposeful action. All of these results were self-reported by the respondents.

This study was based online, using the survey program Qualtrics, a private research company that is easily accessible from their website, <http://qualtrics.com/>. The survey link was sent along with explicit instructions, disclaimers, and risks regarding this study in the form of a

mass e-mail targeted to all current JMU undergraduate students. Participation was voluntary and participants could withdraw at any point during the survey without any penalty. All respondents were assigned an anonymous mixture of numbers and letters generated through Qualtrics, and they were not asked any personal information that could be used to identify them. The survey collected results over a period of 11 days, starting from April 19, 2013, to April 30, 2013. In total, I received 254 responses. However, I did not factor incomplete surveys into my analysis, so I excluded 37 surveys and ended up with 218 final responses.

The survey first collected basic demographic data. These questions asked them to identify their age, gender, years in college, major, race, political party, political ideologies, and hometown geography. Scaled questions, running from 1-6, were then asked regarding their religious beliefs, their religious activities, political ideologies, and political party identifications. Additional information gathered included household income, mother's highest education, and father's education. These questions were necessary in identifying the composition of my sample, in order to determine sample bias later.

### Environmental Risk Perceptions

Environmental risk perception is the independent variable in this study. Risk perception measures were subdivided into five categories of environmental risks: general, water/air pollution, food production/agriculture, climate change, and nuclear/sustainable energy. These categories were selected because these are among the most highly profiled environmental concerns of our nation and around the globe (UNEP 2012). These were also the most prominent issues that several environmental studies courses at JMU have focused on within their coursework. These five categories also contained questions that were targeted towards both

societal and individual risks. By looking at these risks from different categories and at different levels, I aimed towards using a more nuanced approach towards measuring these environmental risk perceptions and testing my hypotheses. These environmental questions asked respondents to classify how strongly at risk they felt from these issues, examining them at both the societal and individual levels for potential negative health and environmental damages. Questions followed a series of statements such as “Water that has already gone through a water treatment facility can still cause negative consequences to its local ecosystem”. Respondents could answer how they felt based on a scale from 1-6, ranging from strongly disagree to strongly agree and unsure/cannot answer.

I created several of these questions, though some were derived from other studies. General societal risk questions were adapted from Dake’s (1991) study, while several air and water pollution questions and some climate change questions were pulled from O’Conner and Bard’s (1997) study. Lastly, agricultural food and energy questions were mainly pulled from studies performed by Frey (1993) and Hall and Moran (2006). For my original questions, I wanted to mainly examine ecological impacts on the societal scale, so I made either resource or general health specific statements. For the individual level, I made statements about personal adverse health effects.

### Pro-Environmental Attitudes

I constructed my attitude scale by extracting several questions from the revised NEP scales released by Dunlap and Liere. Dunlap and Van Liere created the original NEP scale in 1978, as a different way to measure the world’s shifting paradigm about human interaction with the environment. As opposed to the Dominant Social Paradigm that emerged during this time



period, the New Ecological Paradigm focuses on environmental protection, and recognizes and works with the limitations of natural resources the earth has to offer. While the DSP encourages the advancement of technology to slow and control our environmental degradation while still being able to sustain economic growth as usual, the NEP is centered on the notions that humans have created such large environmental issues with their systems of industrial growth, that there needs to be radical change within society that reexamines our interaction with the environment, and thus has more of an “ecological worldview” (Dunlap 2000). This NEP scale is representative of the inner core of people’s belief scales and targets innate beliefs and social realities about society and the environment (Dunlap 2000).

This next part of the survey contained questions measuring their environmental attitudes, utilizing the NEP scale. Respondents were asked to rate themselves on the same six-point scale. The representative values are the same as the ones used for the risk perceptions portion of the survey. Some specific questions that I utilized from the revised NEP scale asked about resource limitations, human’s threat to the balance of nature, human’s right to nature, the causes of environmental damage, (whether they are anthropogenic or not) and opinions on approaching ecological catastrophes. These values were reflected in my survey from Appendix A item question 21, E, H, F, I, J. While E, H, I were directly from the NEP scale, F and J were modified to include costs to conserving and preserving the environment. Though typically the average person would not be opposed to protecting the environment, giving them the option of a trade-off between material livings cost for conservation of resources, can provide more insight on how strong their environmental values are.

Continuing on, Items A and B reflected the DSP scale, which I also took into consideration. Other attitudinal questions were centered on the level of support for a greener

society, which taps into American values, and opinions on risk management strategies, which measure what respondents are currently satisfied or dissatisfied with. Items C, G, and K were created on my own to measure these values. Item C was meant to analyze the satisfaction of our environmental progress as a nation, while Item G focused on international collaboration, and Item K focused on how important environmental issues were to the participant in comparison to other national and international issues.

### Pro-Environmental Behaviors

The behavior scale I constructed mainly fell within the lines of intentional environmental actions. It should be noted that while these actions may be intentionally green, there might not be a strong relationship between these actions and their actual environmental impact. I derived most of my behavioral questions from a pro-environmental behavior scale created by Schultz and Zelezny in 1998. They also utilized factors from the NEP scale into their research. In this last part of the survey, respondents were asked about the frequency of their environmental behaviors. These questions included typical green actions such as engaging in green consumption, i.e. buying local, buying environmentally-friendly products, recycling, staying engaged with environmental issues, and taking part in alternative transportation. The key element to measuring these behaviors is that they are intentional. These questions measured how dedicated they were to performing environmental actions. For these behavioral questions, statements were generated about these activities, such as “I am very conscious about turning off lights and appliances when they are not in use” (Appendix, 22-F). Participants responded their frequency of their engagement levels on a scale from 1-6, ranging from never, always, and unsure/cannot answer.

Almost all of these targeted questions are derived from Shultz and Zelezny's pro-environmental behavior scale. Within my Appendix question 22, items D, G, M, N was directly derived from their scale, while all other items were modified. The modified statements were created specifically to emphasize environmental intention. Items C, E, G, H, J, and L reflected these intentions with statements that highlighted conscious pro-environmental mentality behind these actions. These questions reflected the desire of reducing one's carbon footprint by recycling, reusing, reducing, and using alternate energy sources. Items A, B, M, N, and I dealt with another dimension to pro-environmental behavior. These dealt more with political and social engagement with environmental issue awareness and policy reform. Other questions included targeted family, peer, organizational, and political engagement with modern environmental issues to measure how involved these individuals were with their pro-environmental behaviors outside of their own individual actions, i.e. "I actively participate in pro-environmental political activities, such as being involved with grassroots organizations" (Appendix, 22-N).

## Data Analysis

Qualtrics exported my data collection into SPSS and Microsoft Excel. I primarily used SPSS Statistics for data manipulation, organization, and statistical analysis.

Before variables could be created from the set, some data needed to be classified as missing. One of the answer options was "Unsure/Cannot Answer", which does not actually give any information for those variables. In order to reduce biased or skewing by these lack of results, these responses were counted as missing and not be factored into my calculations. There were

also few questions that were scaled the opposite way, so I reverse coded them in Excel and replaced them in SPSS.

In total, I manipulated my data into ten new variables of interest. They are as follows; risk perceptions, attitudes, behaviors, individual risks, societal risks, general risks, water/air pollution, food consumption/production, climate change, and energy. These variables were created by combining relevant questions from the study.

**Table 1: Creation of Variables ( See Appendix for more details)**

Variable	Questions
Risk Perceptions	15a,b,c, 16a,b,c, d,e,f, 18a,b,c, 19a,b,c,20a,b,21a,b,c,d
Attitudes	22a,b,c,d,e,f,d,h,i,j,k,
Behaviors	23a,b,c,d,e,f,g,h,I,j,k,l,m,n,
Individual Risks	16b,e,18b,19c,20b,21d
Societal Risks	15a,b,c, 16a,c,d,f,18a,c,19a,b,20a,b,21a,b,c
General Risks	15a,b,c,
Water/Air Pollution	16a,b,c,d,e,f
Food Consumption/Production	18a,b,c,
Climate	19a,b,c
Energy	20a,b,21a,b,c,d,

I then computed the overall mean of these variables and ran linear correlation analysis in SPSS, using Pearson’s correlation. In order to facilitate the analysis of data using cross-tabulations, I dichotomized relevant variables, which were risk perceptions, attitudes, behaviors, individual risks, and societal risks. I created my dichotomized high/low variables, by splitting them off at the mean. Values below the mean were considered low risk or labeled “1”, while values above the mean were considered high risk, or labeled “2”. I kept the means for all of them to the hundredths place because that was what SPSS specified the decimal placement to be. Once I created these new variables, I utilized cross tabulations to analyze these different relationships.

I would like to point out that I am not working with a representative sample. Since my participants were voluntary and self-selected, this does not constitute as a random sample. They

are also a part of a small sample of the university. Therefore, those who chose to participate more than likely had stronger opinions about these topics. I used Pearson's Correlations, which were significant at the .01 level, and cross tabulations for my dichotomized variables. After I ran my cross-tabulations analysis, I used Chi Square to measure whether the distribution observed was due to chance and not an actual relationship. Although all of my cross-tabulations tables indicate that there is less than 1% chance that these correlation relationships are due to chance, the chances can actually be much higher considering the biases of my unrepresentative participation sample. Though I may be able to understand and analyze the data I have to describe how my sample works, I cannot extrapolate to the whole JMU population because my sample does not look like an accurate random sample of the student body.

## Data Results/Analysis

The descriptive stats for the survey demographics and main variables are shown as below. For specific questions and what each number represented, see appendix A.

**Table 2: Coding, Mean, Standard Deviation**

Variable	Coding	Mean	SD
Age	1 (18) to 8 (25 or older)	3.50	1.63
Sex	1 (male), 2 (female)	1.76	0.43
College Year	1 (first year) to 5 (fifth year +)	2.74	1.23
Religious Beliefs	1 (not at all) to 5 (very)	2.72	1.42
Religious Activities	1 (not at all) to 5 (very)	2.35	1.45
Political Orientation	1 (very conservative) to 5 (very liberal)	3.28	1.11
Political Party	1 (republican), 2 (democrat), 3 (independent)	2.28	0.94
Hometown Geography	1 (urban), 2 (suburban), 3 (rural)	2.30	0.60
Parental Income	1 (less than 50K) to 6 (more than 200K)	4.10	2.02
Father's Education	1 (less than HS) to 5 (Post-B.A.)	3.81	1.13
Mother's Education	1 (less than HS) to 5 (Post-B.A.)	3.74	1.06
Risk Perceptions	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.97	0.60
Attitudes	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.62	0.45
Behaviors	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.26	0.80
Societal Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	4.23	0.56
Individual Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.14	0.86
General Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	4.46	0.58
Air/Water Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.99	0.62
Climate Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.92	0.92
Food/Agricultural Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	4.13	0.85
Energy Risks	1 (Strongly Disagree) to 5 ( Strongly Agree)	3.93	0.83

The average age of my participants was between 20 and 21, and within their third year of university. When looking closer at the age distribution, the rest of the ages seem relatively equally distributed, except for those over the age of 24. The same distribution is seen for college

years. Most of these participants have been in college for at least a few years and have therefore been exposed to the higher level of critical and analytical thinking that a university education aims to develop.

However, when looking at the sex and race of my participants, the consistency seen with age does not extend to these categories. An overwhelming 81% of my participants identify as being Caucasian, while 8% of the rest identify as Asian, 2% Black/African, and 8% multiracial (Appendix B). This lack of racial diversity is more or less representative of the JMU student population. It should be noted that 75% of my participants are female (Appendix B). Given that James Madison University has an approximate 60:40 female to male ratio, these results are not surprising. However, this could have produced biased findings as females have been shown to show greater concern for the environment as a whole, which has been reflected in their environmental attitudes, behaviors, and overall consciousness (Bard and O'Conner 1997, Hunter, Hatch and Johnson 2004).

The spectrum of religiosity and political ideologies were measured, as both can be influential factors to this study. Regarding religious beliefs, participants on average replied that they are somewhat religious, with fairly equal distributions for each of the five scaled choices given, though 28% say they are not at all religious. However, 48% of participants responded that they describe themselves as being not at all active with religious activities, with the rest of the responses equally distributed along the rest of the scale.

The average participant in my study puts her/himself in the middle of the political orientation scale, however, a significant portion of my participants, 33% of them, report themselves to be slightly more liberal, or a "4" out of my "1-5" scale. This could also bias my data slightly, as people who have more liberal ideologies also tend to have higher concerns for

environmental issues and/or are more pro-environmental with their attitudes and actions (Dake 1991). Regarding political party identification, my participants are fairly equally distributed; 24% of them identify as Republicans, 34% are Democrats, 32% are Independents, and 10% are other.

I also wanted to look at their hometown geography and found that my average participant comes from a suburban area, at 61%. I also discovered that there is an equal distribution of parental/household income for my participants. Since 22% of them are unsure of what their household income is, using the mean to draw information from my participants would surely skew my analysis. About 40% of them fall between the incomes levels of 75,000-149,999, which are middle-upper class standards. The education of their mothers and fathers are pretty similar to each other. Around 65% of these participants have at least one parent that has at least a Bachelor’s Degree, whether that is their mothers or fathers.

The correlation matrix in table 2 begins to explore the relationship between my main variables, which are listed below.

**Table 3: Linear Relationship between Variables, Pearson’s Correlation**

	Risk Perceptions	Attitudes	Behaviors	Societal	Individual	General	Air/Water	Climate	Food	Energy
Risk Perceptions	1									
Attitudes	.713**	1								
Behaviors	.647**	.514**	1							
Societal	.968**	.681**	.595**	1						
Individual	.872**	.642**	.617**	.725**	1					
General	.736**	.538**	.545**	.793**	.482**	1				
Air/Water	.859**	.621**	.579**	.793**	.806**	.593**	1			
Climate	.796**	.602**	.593**	.771**	.689**	.606**	.661**	1		
Food	.796**	.564**	.512**	.753**	.721**	.450**	.611*	.493**	1	
Energy	.814**	.549**	.443**	.787**	.718**	.338**	.460**	.394**	.557**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).



All the observed relationships are positive. Environmental risk perceptions and environmental attitudes are strongly correlated at .71, while the correlation coefficient between risk perceptions and behaviors is slightly lower at .65. Both of these findings are consistent of the literature regarding environmental risk perceptions and pro-environmental attitudes and behaviors (Bard and O'Conner 1999, Duan 2005, O'Conner and Fisher 1999). There is also a moderately positive relationship between attitudes and behaviors at .51. It is not surprising that this coefficient is not as strong, considering the inconsistent literature on the relationship between environmental attitudes and behaviors (Scott and Willits 1994).

When looking into specific levels of environmental risk perceptions, there are a few interesting findings. Looking at societal risks and attitudes, there is a moderately strong relationship at .681. This is generally similar to the strength of the correlation coefficient between individual risks and attitudes, which is at .642. However, when looking at these levels of risks and how they compare with pro-environmental behaviors, this pattern does not hold true. The strength in relationship drops for both the individual and societal risk levels. For individual-behaviors, it drops slightly from .642 to .617. However the coefficient drops significantly more for societal-behaviors, which goes from .681 to .595. Thus, individual risk perceptions have a higher relationship with pro-environmental behaviors than societal risk perceptions do. This points to possibilities that there are other factors in play.

When looking into specific forms of environmental risk perceptions, they have very similar correlation coefficients. Except for the general risks variable, all other subcategories show a decrease in the strength of the relationship from attitudes to behaviors. Both air/water

risks and climate change risks are moderately correlated to pro-environmental attitudes at .621 and .602. They again have a moderate relationship with pro-environmental behaviors at .579 and .593. Food and energy risks have a moderate relationship to these attitudes at .564 and .549 and have a slightly weaker moderate relationship with environmental behaviors at .512 and .443. The relationships with general risks are the most different here. First, there is a very slight increase from their environmental attitudes to behaviors relationship from .538 to .545, though the numbers still fall within the moderately correlated range. However, while all other variables have consistent correlation coefficients between .7 to .8 with both societal and individual risks, general risks has only a .482 coefficient with individual risks. This abnormality is most likely because I did not include individual risk questions for this category.

For my main variables of interest, I used cross-tabulation to look at their distributions and relationships more intensely. My results are in the following tables.

**Table 4: Risk Perceptions x Attitudes Cross Tabulation**

		Risk Perceptions		Total	
		1.00	2.00		
Attitudes	1.00	Count	55	13	68
		% within RP	65.5%	9.9%	31.6%
	2.00	Count	29	118	147
		% within RP	34.5%	90.1%	68.4%
Total		Count	84	131	215
		% within RP	100.0%	100.0%	100.0%

When looking at this cross-tabulation table of low/high risk perceptions and attitudes, the statistics show a positive relationship between these two factors. For participants who had high environmental risk perceptions, 90.1% also had high attitudes. Only 34.5% of those with low environmental risk perceptions had high attitudes. These comparisons show that participants with

high environmental risk perceptions tend to have high pro-environmental attitudes, which supports my initial hypothesis.

**Table 5: Risk Perceptions x Behaviors Cross Tabulation**

			Risk Perceptions		Total
			1.00	2.00	
Behaviors	1.00	Count	64	40	104
		% within RP	75.3%	30.1%	47.7%
	2.00	Count	21	93	114
		% within RP	24.7%	69.9%	52.3%
Total		Count	85	133	218
		% within RP	100.0%	100.0%	100.0%

Analyzing risk perceptions and pro-environmental behaviors yields similar results as the previous table. 69.9% of those with high risk perceptions tended to have high pro-environmental behaviors, in comparison to only 24.7% of low risk perceptions respondents who also reported high pro-environmental behaviors. The relationship between risk perceptions and pro-environmental behaviors is not as positive as the one between risk perceptions and pro-environmental attitudes shown in Table 4, nonetheless it is still positive and worth noting. This distribution provides further support for my hypothesis that environmental risk perceptions matter and affect environmental behaviors.

**Table 6: Attitudes x Behaviors Cross Tabulation**

		Attitudes		Total	
		1.00	2.00		
Behaviors	1.00	Count	55	46	101
		% within A	80.9%	31.3%	47.0%
	2.00	Count	13	101	114
		% within A	19.1%	68.7%	53.0%
Total		Count	68	147	215
		% within A	100.0%	100.0%	100.0%

Table 6 looks more closely at the relationship between environmental attitudes and behaviors. For these participants, 68.7% of those with high pro-environmental attitudes also had high pro-environmental behaviors, compared to only 19.1% of those with low pro-environmental attitudes. Interestingly even though the linear relationship is moderate, there are noticeable differences in pro-environmental behavior between those with high and low pro-environmental attitudes. These patterns are consistent with previous studies about different levels of environmental attitudes and its effect on environmental behavior (Scott and Willits 1994).

**Table 7: Societal Risks x Attitudes Cross Tabulation**

		Societal		Total	
		1.00	2.00		
Attitudes	1.00	Count	56	12	68
		% within S	69.1%	9.0%	31.6%
	2.00	Count	25	122	147
		% within S	30.9%	91.0%	68.4%
Total		Count	81	134	215
		% within S	100.0%	100.0%	100.0%

Table 7 begins to look at the different layers to risk perceptions by analyzing the cross tabs relationship between societal risk perceptions and environmental attitudes. 91% of participants with high societal risk perceptions also had high pro-environmental attitudes, compared to only 31% of respondents of low societal risk perceptions. These findings are not surprising given the strong patterns in risk perceptions and attitudes analyzed in table 4. The overall positive pattern supports my hypothesis that societal risks help determine environmental attitudes.

**Table 8: Individual Risks x Attitudes Cross Tabulation**

		Individual		Total	
		1.00	2.00		
Attitudes	1.00	Count	49	19	68
		% within I	55.1%	15.1%	31.6%
	2.00	Count	40	107	147
		% within I	44.9%	84.9%	68.4%
Total		Count	89	126	215
		% within I	100.0%	100.0%	100.0%

Table 8 now looks at the other layer of risk perceptions being studied, by looking at the patterns and distributions those individual risk perceptions and attitudes have. As expected, the patterns are more or less similar. For those who have high individual risk perceptions, 84.9% of them also had high pro-environmental attitudes, compared to 45% of those who had low individual risk perceptions and still had high pro-environmental attitudes. These results still support my hypothesis nonetheless, but I expected to find more positive patterns between individual risk perceptions and pro-environmental attitudes. It is surprising that compared to Table 7, the distinction for high attitudes are stronger for societal risk perceptions, which is what I expected to find within individual risk perceptions.

**Table 9: Societal Risks x Behaviors Cross Tabulation**

		Societal		Total	
		1.00	2.00		
Behaviors	1.00	Count	59	45	104
		% within S	72.0%	33.1%	47.7%
	2.00	Count	23	91	114
		% within S	28.0%	66.9%	52.3%
Total		Count	82	136	218
		% within S	100.0%	100.0%	100.0%

These tables looked at the relationships between dichotomized societal risk perceptions and pro-environmental behaviors. 67% of those with high societal risks also reported high pro-environmental behaviors, while only 28% of those with low societal risk perceptions reported high pro-environmental behaviors. These patterns were expected and show that those who have higher societal risk perceptions tend to also have higher pro-environmental behaviors, as I hypothesized.

**Table 10: Individual Risks x Behaviors Cross Tabulation**

		Individual		Total	
		1.00	2.00		
Behaviors	1.00	Count	66	38	104
		% within Individual	72.5%	29.9%	47.7%
	2.00	Count	25	89	114
		% within Individual	27.5%	70.1%	52.3%
Total		Count	91	127	218
		% within Individual	100.0%	100.0%	100.0%

This table analyzes the relationship between individual risk perceptions and behaviors. Looking at high individual risk perceptions show that 70.1% of these participants also had high pro-environmental behaviors, in comparison to only 27.5% of those with low individual risk

perceptions who had low behaviors. In comparison to Table 9, individual risk perceptions have a more positive relationship with environmental behavior than societal risk perceptions, which is congruent to my hypotheses. These findings are not surprising, considering other studies have shown that environmental actions are largely driven by intentions derived on the individual level, i.e. social identities (Matthews and Kid 1998).

I also wanted to examine the relationship between risk perceptions, attitudes, and behaviors even more closely. The strong relationship between risks and behaviors may be moderated by attitudes, while the relationship between environmental attitudes and behaviors may or may not actually be impacted by environmental risk perceptions. In order to analyze these relationships, 3-way cross tabulations were used to pull these factors apart individually

<b>Table 11: Risk Perceptions x Behaviors x Attitudes Cross Tabulation</b>						
Attitudes			Risk Perceptions		Total	
			1	2		
1	Behaviors	1	Count	46	9	55
			% within RP	83.6%	69.2%	80.9%
		2	Count	9	4	13
			% within RP	16.4%	30.8%	19.1%
	Total		Count	55	13	68
			% within RP	1	1	1
2	Behaviors	1	Count	17	29	46
			% within RP	58.6%	24.6%	31.3%
		2	Count	12	89	101
			% within RP	41.4%	75.4%	68.7%
	Total		Count	29	118	147
			% within RP	1	1	1
Total	Behaviors	1	Count	63	38	101
			% within RP	75%	29%	47%
		2	Count	21	93	114
			% within RP	25%	71%	53%
	Total		Count	84	131	215
			% within RP	1	1	1

This 3-way cross tabulations table looks at the dichotomized relationships between risk perceptions and behaviors, and controls for environmental attitudes. The purpose is to analyze to what extent the relationship between environmental risk perceptions and pro-environmental behaviors may depend on pro-environmental attitudes. Controlling for attitudes can help better examine this, as I am examining the behaviors within both the high and low categories of attitudes. Among the low attitudes category, 30.8% of participants who have high risk perceptions report high pro-environmental behaviors, while only 16.4% of those with low risk perceptions report such behaviors.

Analyzing the high attitudes category also yields similar findings. Under the high attitudes part of the table, looking at participants with high risk perceptions shows that 75.4% of them also report high pro-environmental behavior, while 41.4% of those with low risk perceptions also report high pro-environmental behavior. The distribution of 16.4%/30.8% in low environmental attitudes, and 41.4%/75.4% in high environmental attitudes show that the relationship between these two variables are stronger among certain participants. The relationship between risk perceptions and environmental behaviors exists regardless of attitudes however. Looking at these findings holistically show that low environmental attitudes do, in part, moderate the relationship between risk perceptions and low behaviors.



<b>Table 12: Attitudes x Behaviors X Risk Perceptions Cross Tabulation</b>						
Risk Perceptions				Attitudes		Total
				1	2	
1	Behaviors	1	Count	46	17	63
			% within A	83.6%	58.6%	75%
		2	Count	9	12	21
			% within A	16.4%	41.4%	25%
	Total		Count	55	29	84
			% within A	1	1	1
2	Behaviors	1	Count	9	29	38
			% within A	69.2%	24.6%	29%
		2	Count	4	89	93
			% within A	30.8%	75.4%	71%
	Total		Count	13	118	131
			% within A	1	1	1
Total	Behaviors	1	Count	55	46	101
			% within A	80.9%	31.3%	47%
		2	Count	13	101	114
			% within A	19.1%	68.7%	53%
	Total		Count	68	147	215
			% within A	1	1	1

This last cross tabulations table looks at the 3-way intersection of attitudes, behavior, and risk perceptions. This table is meant to analyze whether risk perceptions have any sort of impact on the relationship between pro-environmental attitudes and pro-environmental behaviors. This table controls for high and low levels of risk perceptions. Within the low risk perceptions section of the table, 41.4% of those with high attitudes also had high pro-environmental behaviors. Meanwhile, only 16.4% of those with low attitudes still had high pro-environmental behaviors.

When looking specifically at the high-risk perceptions part of the tabulations table, 75.4% of those who had high environmental attitudes also had high pro-environmental behaviors. Within those same high risk perceptions variable, 30.8% of them had low pro-environmental attitudes but still had high pro-environmental behaviors. The distribution of 16.4%/41.4% in low environmental risk perceptions, and 41.4%/75.4% in high environmental risk perceptions show

that again, this relationship is stronger for certain participants. Regardless of risk perceptions, environmental attitudes affect environmental behaviors. Analyzing these relationships show that environmental risk perceptions are also partially moderating the relationship between environmental attitudes and behaviors.

## **Discussion/Conclusion**

The risk society is founded upon change through reflexive modernization. As we become more aware of our negative impact on our environment and on ourselves, the more we will want to manage these impacts and risks to ensure our safety and well-being. As growing leaders of the up-coming generation, young adults with a background in higher education will lead our society on what issues are worth evaluating, understanding, and taking action for. Examining how they perceive environmental issues and how they value pro-environmentalism in attitudes and behaviors can shed light on how our future society will perceive and manage these problems.

My data analysis supports most of my hypothesis by showing that a moderately strong relationship exists with environmental risk perceptions and pro-environmental attitudes and with pro-environmental behaviors. My hypotheses were also focused on digging deeper into these relationships. For both levels, there were positive relationships between both pro-environmental attitudes and behaviors. I hypothesized that differences between individual and societal risk perceptions mattered, and individual risk perceptions would specifically have more positive relationships to both pro-environmental attitudes and behaviors. With my data, I can conclude that there are slight differences between the two risk levels, as they hold slightly different relationships with both pro-environmental attitudes and behaviors.

Regarding specific risk perceptions, across the board, excluding general risks, there were slightly stronger relationships with pro-environmental attitudes compared to pro-environmental behaviors. This is not surprising given that the overall environmental risk perceptions variable has a stronger relationship with pro-environmental attitudes than pro-environmental behaviors. It is also interesting to note that the relationship between general risk perceptions and pro-

environmental attitudes is different from the relationship between other risk perceptions and pro-environmental attitudes. Even though the relationship between risk perceptions and pro-environmental attitudes is moderately strong, there is another factor that I have not analyzed that is making their pro-environmental attitudes lower around general environmental risks. This trend does not hold true for the relationships between the specific risks and pro-environmental behaviors, which are much more scattered.

There were some other interesting discoveries from my study. I had expected individual risk perceptions to hold more positive relationships with both pro-environmental attitudes and pro-environmental behaviors. However, societal risk perceptions had a slightly more positive relationship with pro-environmental attitudes than do individual risk perceptions. Under the risk society theoretical framework, this could be because people are looking outside of themselves and understand that there are other environmental risks that we are producing through our production facilities.

As expected, there is a slightly stronger relationship between individual environmental risk perceptions and pro-environmental behavior than societal environmental risk perceptions. This is probably due to people wanting to make a difference for themselves or their society, especially if they perceive these risks to potentially impact themselves. However, looking closely at the distribution of the high/low risk perceptions, attitudes, and behaviors in Tables 9 & 10 shows that there is essentially no difference among them. This suggests that though environmental risk perceptions do have a relationship with pro-environmental behavior, the minimal differences between the two levels may not impact it too much.

Looking at the relationship between all three of my variables has provided further insight about their relationships. During the beginning inquiries of my study, I was curious about how

they all affected each other, as realistically these factors operate together. They can be studied independently, but it is important to see whether environmental attitudes affect the relationship between risk perceptions and behaviors. It is also important to see if risk perceptions even play a role in the relationship between environmental attitudes and behaviors. Under my three-way cross tabulations table, I discovered that both of these relationships were partially moderated by the third factor. Thus, pro-environmental behaviors are slightly moderated by pro-environmental attitudes, within its relationship with environmental risk perceptions. It is exciting to note that environmental risk perceptions are a factor that affects the relationship between pro-environmental attitudes and pro-environmental behaviors.

There are still biases in my study that should be recognized and examined. Considering that this is a voluntary-based survey, my respondents are not representative of the JMU community. My participants more likely had a more vested interest in environmental issues, and are probably more aware of environmental risks that exist in our society. Additionally, approximately 75% of my participants are females. This may have also affected the relationships that I found, given how several studies support gender biases. Regardless, exploring this information on environmentalism, its perceptions and its attitudes and behaviors, is still useful and still gives us more insight on a demographic that is not studied as often as other parts of the population.

Analyzing my sample indicates that there seems to be an awareness of both national and translational environmental issues that our society is focusing more attention on. These risk perceptions and its relationship with pro-environmental attitudes and pro-environmental behaviors suggest that further education and exposure can be an answer towards having more collective pro-environmental mentalities within our nation. Higher environmental risk

perceptions can lead to a greater sense of urgency, which can drive people to take greater action and effect institutional changes where they see fit. Given that environmental risk perceptions have a positive relationship with pro-environmental attitudes and behavior, this can prove useful for awareness campaigns and efforts towards change within issues surrounding our environment. These patterns of environmental perceptions, attitudes, and behaviors in college students may ensure a future society that will take environmental issues and risks more seriously and may even shift our risk society towards another modernity that takes even further management of our industrial production to contain potential environmental risks.

## **Appendix A**

(Study Survey Questions)

### **1. How old are you?**

- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25 or older

### **2. What is your sex?**

- Male
- Female
- Prefer not to Answer

### **3. How would you describe your race?**

- White/Caucasian
- Black/African-American
- Asian/Hawaii-Native or Pacific Islander
- American Indian or Alaskan Native
- Multiracial/Other Race
- Prefer not to Answer

### **4. Are you of Hispanic or Latino Origin?**

- Yes
- No

**5. What is your first major?**

(Response box to type in)

**6. What is your college year?**

- First Year
- Second Year
- Third Year
- Fourth Year
- Fifth Year +

**7. How would you describe yourself in terms of religious beliefs, on a scale of 1-5?**

(1 being not at all, 5 being very religious)

**8. How would you describe yourself in terms of religious activities, i.e. prayer, church attendance, on a scale of 1-5?**

(1 being not at all active, 5 being very active)

**9. How would you describe yourself politically, on a scale of 1-5?**

(1 being very conservative, 5 being very liberal)

**10. In politics as of today, what do you consider yourself?**

- Republican
- Democrat
- Independent
- Other

**11. How would you describe your hometown?**

- Urban
- Suburban
- Rural

**12. What is your approximate parental income range?**



- Less than \$50,000
- 50,000-74,999
- 75,000-99,999
- 100,000-149,999
- 150,000-199,999
- 200,000+
- Unsure/ No Answer

**13. What is your father's highest level of education?**

- Less than High School
- High School Diploma or Equivalent
- Some College and/or 2 year degree
- Bachelor's Degree
- Post-Bachelor's Degree, i.e. Masters, Doctoral, or Equivalent

**14. What is your mother's highest level of education?**

- Less than High School
- High School Diploma or Equivalent
- Some College and/or 2 year degree
- Bachelor's Degree
- Post-Bachelor's Degree, i.e. Masters, Doctoral, or Equivalent

**15. People have different ideas about how concerned we should be about various things that may threaten our environment and health.**

**How strongly would you agree or disagree with these statements?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree Unsure/ Cannot Answer)

- A. In the United States, our environment is highly threatened by human activities.
- B. Societies around the world are suffering major negative health consequences that stem from environmental issues.
- C. In the United States, the vast majority of our environmental issues are human-caused.

**16. Some people are concerned about air and water pollution. Others are comfortable with current levels of environmental protection.**

**How strongly would you agree or disagree with the following statements about air pollution?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree Unsure/ Cannot Answer)

A. Fossil fuel usage in vehicles can generate air pollution that poses substantial risk to the health of our society.

B. I personally feel at risk for respiratory or other health-related impacts of air pollution.

C. As more areas of the world become industrialized, health issues due to air pollution will continue to increase.

**How strongly would you agree or disagree with the following statements about water pollution?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, Unsure/ Cannot Answer)

D. Industrial pollutants in water cause harm to our ecosystems.

E. I personally experience damaging health consequences from using polluted water.

F. In the near upcoming decades, water pollution will cause substantial increases to global health issues.

**17. Climate change has gained significant attention around the globe. The population of the United States holds a wide range of views on this issue**

**Which of the following statements most closely reflects your opinion on global warming or climate change? (bubble one)**

-Most scientists believe that human-caused climate change is occurring.

-Most scientists believe that human-caused climate change is NOT occurring.

-Most scientists are unsure whether human-caused climate change is occurring or not.

**18. How strongly would you agree or disagree about the following statements regarding climate change or global warming?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, Unsure/ Cannot Answer)

A. If climate change is not addressed, the world will encounter negative consequences such as more frequent extreme weather events and rising sea levels and loss of biodiversity.

- B. I personally feel endangered by the effects of climate change.
- C. Climate change will threaten our material standard of living in the United States.

**19. Various governmental regulations have set legal standards for chemical use in agriculture, but some people are still concerned about potential negative health consequences of chemical use. Others are not all that concerned.**

**How strongly would you agree or disagree about the following statements regarding chemical usage in the agriculture?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, Unsure/Cannot Answer)

- A. Chemicals used in agriculture, such as pesticides or growth hormones, are negatively impacting human health in the United States.
- B. Chemicals used in agriculture can infiltrate and damage water resources.
- C. I personally feel endangered by consuming food produced with heavy use of chemicals.

**20. Fossil fuels have driven the US economy for decades, but some people are concerned about natural limits to their supply as well as negative impacts that they have. As our society is looking for alternative sources of energy, nuclear power has become a controversial topic.**

**How strongly would you agree or disagree with the following statements regarding fossil fuels?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, Unsure/Cannot Answer)

- A. Relying on fossil fuels such as coal and petroleum is detrimental to the environment.
- B. If we do not implement sustainable energy production within our generation, future generations will suffer lower standards of living.

**21. How strongly would you agree or disagree with the following statements regarding fossil fuels and nuclear energy?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, Unsure/Cannot Answer)

- A. Despite our best efforts to ensure safety precautions and measures, nuclear energy substantially threatens the health and safety of our society.
- B. Radiation from nuclear power plants poses dangerous health risks to people.
- C. Nuclear waste disposal poses dangerous health risks to society.
- D. I personally feel threatened by the use of nuclear power.

**22. I would now like to know more about your attitudes regarding the environment.**

**How strongly do you agree or disagree with the following statements?**

(Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree, Unsure/ Cannot Answer)

- A. Despite the fact that many people see significant challenges, I think we are currently doing enough to protect our environment.
- B. Though the environment is experiencing contamination, the levels are not alarming enough to cause harm to human health or ecosystems.
- C. We should devote more resources than we currently do towards research that can help ensure the health of our environment into the future.
- D. The earth has plenty of natural resources if we just learn how to develop them.

**How strongly do you agree or disagree with the following statements?**

- E. When humans interfere with nature it often produces negative consequences.
- F. We should put more efforts towards reducing our consumption of our resources, even if this means reducing our material standards of living.
- G. Nations across the globe should work together to effectively implement an international policy on climate change.
- H. We should put more effort into protecting our ecosystems.

**How strongly do you agree or disagree with the following statements?**

- I. We should have stricter and better protection of biodiversity.
- J. Finding sustainable energy sources, such as wind, solar, and hydropower, should be a higher priority than developing and relying on current fossil fuel sources, even if it is more costly.
- K. Environmental issues are generally more important than other national and international issues, such as economic growth, foreign affairs, and education.

**23. Whether people have strong concerns about the environment or not, people spend varying amounts of their daily time on issues of environmental concern.**

**In the following set of questions, I am interested in your own activities.**

**How would you describe the frequency of your behavior for the following actions:**

(Never, Rarely, Sometimes, Often, Frequently, Cannot Answer)

- A. I discuss environmental issues with my peers.
- B. I engage with my family about environmental issues.
- C. I go out of my way to recycle any of my trash that can be recycled.
- D. I reuse products that are meant for one-time usage, such as water bottles or plastic bags.
- E. When I shop for groceries, I look for organic options first.
- F. I am very conscious about turning off lights and appliances when they are not in use.

**How would you describe the frequency of your behavior for the following actions:**

- G. I walk, bike, carpool, or take public transportation regularly because it will reduce my resource consumption.
- H. I buy eco-friendly or energy efficient products even if they are more expensive than regular products because I want to reduce my ecological impact.
- I. I actively seek out and stay informed with current environmental news through media, classes, or organizations.
- J. I limit my water usage because I do not want to use more water than I need.

**How would you describe the frequency of your behavior for the following actions:**

- K. When considering the purchase of goods, such as appliances or vehicles, energy- efficiency is my primary concern.
- L. I consciously limit my use of air conditioning in the summer and heating during the winter to reduce my environmental impact.
- M. I volunteer my time or money to an environmental cause or organization.
- N. I actively participate in pro-environmental political activities, such as being involved with grassroots organizations.

## Appendix B

Frequency tables of the Descriptive Statistics of the Participants in this Study

### Age

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 18	22	10.1	10.1	10.1
19	46	21.1	21.1	31.2
20	41	18.8	18.8	50.0
21	56	25.7	25.7	75.7
22	32	14.7	14.7	90.4
23	13	6.0	6.0	96.3
25 and older	8	3.7	3.7	100.0
Total	218	100.0	100.0	

### Sex

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	53	24.3	24.3	24.3
Female	165	75.7	75.7	100.0
Total	218	100.0	100.0	

### Race

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid White/Caucasian	178	81.7	81.7	81.7
Black/African-American	5	2.3	2.3	83.9
Asian	13	6.0	6.0	89.9
Multiracial	13	6.0	6.0	95.9
Other Race	5	2.3	2.3	98.2
Prefer not to Answer	4	1.8	1.8	100.0
Total	218	100.0	100.0	

**College Year**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid First Year	51	23.4	23.4	23.4
Second Year	38	17.4	17.4	40.8
Third Year	55	25.2	25.2	66.1
Fourth Year	64	29.4	29.4	95.4
Fifth Year +	10	4.6	4.6	100.0
Total	218	100.0	100.0	

**Religious Beliefs**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	62	28.4	28.4	28.4
2	43	19.7	19.7	48.2
3	39	17.9	17.9	66.1
4	43	19.7	19.7	85.8
5	31	14.2	14.2	100.0
Total	218	100.0	100.0	

**Religious Activity**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	94	43.1	43.1	43.1
2	36	16.5	16.5	59.6
3	34	15.6	15.6	75.2
4	25	11.5	11.5	86.7
5	29	13.3	13.3	100.0
Total	218	100.0	100.0	

**Political Orientation**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	16	7.3	7.3	7.3
2	36	16.5	16.5	23.9
3	65	29.8	29.8	53.7
4	72	33.0	33.0	86.7
5	29	13.3	13.3	100.0
Total	218	100.0	100.0	

**Political Party**

	Frequency	Percent	Valid Percent	Cumulative Percent
Republican	52	23.9	23.9	23.9
Democrat	75	34.4	34.4	58.3
Valid Independent	69	31.7	31.7	89.9
Other	22	10.1	10.1	100.0
Total	218	100.0	100.0	

**Hometown geography**

	Frequency	Percent	Valid Percent	Cumulative Percent
Urban	28	12.8	12.8	12.8
Valid Suburban	134	61.5	61.5	74.3
Rural	56	25.7	25.7	100.0
Total	218	100.0	100.0	

**Parental income**

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than \$50,000	27	12.4	12.4	12.4
50,000-74,999	26	11.9	11.9	24.3
75,000-99,999	39	17.9	17.9	42.2
Valid 100,000-149,999	42	19.3	19.3	61.5
150,000-199,999	22	10.1	10.1	71.6
200,000+	14	6.4	6.4	78.0
Unsure/ No Answer	48	22.0	22.0	100.0
Total	218	100.0	100.0	



**Father's Education**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than High School	5	2.3	2.3	2.3
	High School Diploma or Equivalent	31	14.2	14.2	16.5
	Some College and/or 2 year degree	41	18.8	18.8	35.3
	Bachelor's Degree	65	29.8	29.8	65.1
	Post-Bachelor's Degree, i.e. Masters, Doctoral, or Equivalent	76	34.9	34.9	100.0
	Total	218	100.0	100.0	

**Mother's Education**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than High School	6	2.8	2.8	2.8
	High School Diploma or Equivalent	27	12.4	12.4	15.1
	Some College and/or 2 year degree	42	19.3	19.3	34.4
	Bachelor's Degree	86	39.4	39.4	73.9
	Post-Bachelor's Degree, i.e. Masters, Doctoral, or Equivalent	57	26.1	26.1	100.0
	Total	218	100.0	100.0	

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