



CHANGING COMMUNICATIONS IN A WARMING WORLD

An analysis of the failures of environmental education and the lack of clear communication during natural disasters

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Introduction

Climate change was a predicted event, but instead of working to prevent its effects world populations continued to grow, burning more fossil fuels, creating pollution, and urbanizing the natural environment. In 2018, climate change is an established threat around the world and already dozens of populations in Bangladesh, Honduras, Thailand, China, and many other countries are experiencing more extreme weather events, such as droughts, hurricanes, and heat waves.¹ Despite the increase of natural disasters and the visible signs of pollution in India and China there are many individuals around the world who are failing to grasp the severity of climate change. These individuals are skeptical of its reality, and so they do not feel compelled to alter their behavior or support renewable energy. This skepticism is preventing an international solution to climate change. It is also allowing for the continued release of fossil fuel emissions and leading to more lives being lost during natural disasters.

The skepticism over climate change is a consequence of the failure to communicate information and the risks with the general public. The roots of this communication failure are from a lack of substantial environmental education in many institutions. In this guidebook ways to improve environmental education, the public's engagement with climate change, and communication during natural disasters will be explored because possessing a strong environmental background can save lives during extreme weather events. So, the need for environmental education is clear, yet schools are failing to demonstrate the importance of protecting the natural world to their students. They are not learning why they should be motivated to preserve nature or in some cases they are not even being taught why the Earth and its species are in danger. If people were more educated on the environment and the effects of climate change than they would have a better understanding of the dangers that can occur during a storm. This prior knowledge could potentially save more lives during a disaster because people would understand the hazards and when it is necessary to evacuate. Furthermore, communities are failing to be proactive and develop protective measures such as levees or seawalls. Instead they are continuing to build in flood zones. During natural disasters government officials are failing to effectively communicate disaster updates and evacuation warnings to every residents. The lack of environmental education and the failure to be proactive and communicate during natural disasters results in less support for sustainability and other green initiatives. Therefore, the incorporation of environmental education into all school systems and stronger communication methods prior to and during natural disasters have the potential to inspire environmental advocates and save more lives during extreme weather events.

Part I

What is Environmental Education?

Environmental Education (EE) is a relatively new field in the world of academia. The words "environment" and "education" were not commonly used together until the middle of the 1960s, during the Golden Age of environmentalism. Some of the greatest thinkers and writers from the 18th-19th century such as Thoreau, Sterling, Rosseau and Humboldt contributed to the development of environmental instruction, thought and practice. Sir Patrick Geddes (1854-1993) was a Scottish

professor of Botany who was one of the first intellectuals to recognize the importance of linking the environment with education. Geddes created instructional methods that brought teachers and their students directly in contact with their environment, so he is considered one of the founders of the modern environmental education movement.² Now in the 21st Century, environmental education is defined by the Environmental Protection Agency (EPA) as "... a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment".³ The goal of EE is not to create advocates, but rather individuals who are informed and have the ability to make conscientious decisions as well as to understand how to interpret various sides of modern environmental issues, such as climate change.⁴

The natural environment supports life for the entire planet and humans rely upon it for natural resources, shelter, medicine, food and many other key ingredients that support societies way of existence. EE has the potential to provide information to students on how technological innovation, pollution and other human activities are harming the planet; however, currently EE is not properly educating the students on climate change or other prominent environmental issues. Climate change is advancing, and it is no longer just a problem for future generations since it is affecting communities all over the globe. Climate change is influencing weather patterns, increasing food insecurity and raising the risk of natural disasters. Teachers who advocate and expand upon environmental education have the ability to educate their students on environmental justice, environmental health, and climate change.⁵ Everyone deserves the opportunity to understand what climate change is and how to adapt their actions to a warming world. EE can be a versatile field if adapted into various subjects, like English, Music, and Art. As a part of No Child Left Behind Act, states are re-evaluating their education system, and EE must be a factor they consider in their evaluation. The *Baltimore Sun* stresses the importance of EE, "The need for environmental education has never been greater. Every day, the country seems to be facing new and difficult choices... ranging from how to meet energy needs to how to deal with toxic materials that might pollute our air, water or soil".⁶ By 2100, the average U.S. temperate is projected to increase between 3-12 °F. The raise in temperature could lead to more extreme weather events such as heat waves and droughts. The ocean is also warming and this change in temperature is projected to increase the amount of precipitation and wind speed of storms, making them more common and destructive around the globe.⁷ There is a definitive need for stronger environmental education, so that children have the opportunity to grow up understanding what is happening in the world around them. Children and the general public value relevance and by incorporating them into the learning process and discussion then they feel that they have the power to make a difference for the future of their environment. EE is not a new idea, so why is environmental education currently failing to efficiently educate the populace?

Why Environmental Education is Failing

Unlike Algebra and Chemistry, the environment is not a staple in all education systems. A study conducted in 2016 found that only 38% of American students were correctly taught that climate change is a result of human activities, such as the burning of fossil fuels. The study surveyed 1,500 teachers and discovered that many students only spend an hour or two out of the entire academic year learning about climate change. Not only are students being taught incorrect information, but 4% of teachers avoided explaining what the causes of climate change actually are.⁸ These students are the ones who

are going to experience the effects of climate change and they are either being given false information or they are only spending a minimal amount of time a year learning about one of the largest issues affecting the planet.⁹ Furthermore, the secondary education institutions that do offer environmental science or studies usually offer it as an elective, thus the information would not reach the entire student body. Saylan and Blumstein authors of *The Failure of Environmental Education: (and How We Can Fix It)*, believe that “environmentalism is not an option like choosing one’s religion or political affiliation. It is a responsibility and fundamental aspect of cohesive society...it isn’t something we should debate teaching”.¹⁰ The environment is rapidly changing, and it is expected that the younger and future generations are supposed to solve the problem of climate change, but the younger generations are being cheated out of the opportunity to learn about climate change and connect with nature. These students are not being offered a decent environmental education, and so the system is failing them.¹¹

Children are becoming disconnected from nature for several reasons. Technology is one of the factors leading children to become more disconnected from the natural world. Richard Louv, an American journalist and non-fiction author, coined the term Nature Deficit Disorder, which is the physical, psychological, and cognitive consequences of alienating humans from nature and the effects are particularly harmful for children because they are more susceptible in their developing years. The 2008 Recreation Participation Report surveyed 60,000 Americans and discovered an 11 percent decline in the participation of outdoor activities among children ages 6-17.¹² Children are becoming disconnected from nature for several reasons including urbanization, virtual entertainment, and even the fear of strangers and kidnapping is leading parents to keep their children indoors. The growing disconnect from nature is a prime cause for concern for many educators and environmentalists because people’s love and respect for the natural world is often born from direct exposure to the outdoors. Richard Louv questions modern society, “As the care of nature increasingly becomes an intellectual concept severed from the joyful experience of the outdoors, you have to wonder: Where will future environmentalists come from?”.¹³ Consistent exposure to nature has been proven to reduce symptoms of Attention Defect Disorder, produce positive emotions, generate creativity, reduce stress and even lead to a faster recovery from an illness. Technology is causing children to become disconnected from nature and EE is not providing them with enough opportunities and information to understand why they should want to reconnect with the outdoors.¹⁴

As shown above the health benefits of nature are significant and so parents and educators need to encourage children at a young age to interact with their natural environment. The outdoors is a workbook for students that is waiting to be explored and teachers need to harness the materials within their surroundings and bring them into the classroom. Teachers have an opportunity to help society by encouraging their students to go outside and explore. Teachers can help students detach from the virtual world and re-establish a connection with the natural environment.¹⁵

Aside from the advancements in technology, another problem plaguing EE is that the lessons must be relevant in order for the public to truly retain it and comprehend how it affects them. Educators cannot simply assume that their students are an empty vessel waiting to absorb the information. Rather if they want the students to retain the information then they should make it pertain to the student’s everyday life.¹⁶ If the information is relevant and focus’ on problems that can actually occur in the area where the child is learning then they can leave the classroom motivated to make a difference. Rachel Carr is a social scientist and a resident of Easton, Pennsylvania. Rachel is the director of Nurture Nature Center and she also thinks that relevance is very important factor in environmental education. She

believes, “people need to be able to internalize the information and make it relevant to them... {and} that multiple trusted sources within a community must work on this education together. {For example} an earth science teacher is an appropriate way to learn about the science aspects, but the message about action should be reinforced by municipal leaders, by the fire department, by the police department, by nonprofit agencies, and some sort of branded campaign about this at a local level would probably be really influential.”¹⁷ Therefore, it is especially important that students learn the skills that require them to think critically and recognize the problems that their environment is facing.¹⁸

Students need to think critically about the environment and in order to help foster this form of thinking schools must consider questions like how to expose children to the natural world. Again, relevance is the answer to addressing this problem. For instance, students in Easton, Pennsylvania should learn about how there is a likelihood of intense flooding and what they can do to prevent it or decrease the magnitude of the damage.¹⁹ Emphasizing the relevance to students is a new direction for EE, especially since “relevance may be the toughest hurdle environmental education faces in changing behavior”.²⁰ While this may be one of the greatest challenges, EE will be most effective if the students can understand the relevance of an issue and learn at a young age that they can set an example for their community.²¹

The environment is rapidly changing, and the effects are visible both locally and internationally, yet there are still many barriers preventing people from believing in climate change. The majority of these barriers stem from a lack of widely available environmental education. Environmental education needs to be implemented in schools worldwide because the effects of climate change are no longer just a problem for future generations. The effects of climate change are happening now, and they require immediate response. In 2009, the American Psychological Association discovered that there are many obstacles preventing the public from believing in climate change and altering their individual behaviors.²² One of the main reasons is that the public claims that they do not trust the science because they do not understand it. The future is unclear, and scientists cannot predict with 100% certainty how the effects of climate change will impact the Earth; however, this uncertainty is prompting people to believe that it is okay to postpone incorporating environmentally friendly measures into their everyday lives. The changing science and uncertainty can also translate into people’s minds as believing that the future is doomed, which is why the public needs to be reminded that there is always hope and be inspired to take action. One way to remind students that there is hope is to encourage them to reconnect with nature and inspire them to find new ways to mitigate the effects of climate change. Schools are designed to foster creativity and innovation, there just needs to more effort and funding designated to incorporating the environment into the everyday curriculum.²³

Despite the fact that the future is unknown, EE needs to convey the message that the effects of climate change are only intensifying. Realistically, if society expects the younger generations to solve the problem, then the current generation must make behavioral changes too. Education has the power to help the general public understand that “We concurrently share a moment unprecedented in human history: we have a preview of our own destruction or salvation. The future is shaped only in the present”.²⁴ Institutions need to do more than tell people how they should act as individuals. Instead the government, schools, and other establishments, like the media, can encourage people to become leaders or role models within their community. Climate change is one of the largest issues affecting the planet and people need to feel empowered to make a difference and act as advocates for Earth.²⁵

Environmental education is currently experiencing modifications and improvements in California. California's Department of Education created *A Blueprint for Environmental Literacy* in 2015. An Environmental Literacy Task Force of 47 formal and non-formal educators came together with the goal of creating residents who are trained to make wise and environmentally conscience' choices. California²⁶ realized that a good quality of life and a healthy state requires an environmentally literate populace. An environmentally literate populace is defined as residents who have the skills to comprehend, analyze, and be able to address current and future environmental issues.²⁷ California's Department of Education partnered with a company called Ten Strands whose mission is to deliver a high-quality education that promotes environmental literacy to students in grades K-12. According to their education standards, instructors must teach the importance of protecting the environment, use materials that connect students to nature, promote STEM and a green-collar economy²⁸. They should also encourage students to think critically about the future and environmental issues. Together California's Department of Education and Ten Strands have already trained 19,419 teachers in environmental literacy methods and 4,175 new schools have been created in California that incorporate environment-based learning. California is leading the United States in the environmental movement with their mission to create environmentally literate residents. California's initiatives are a tremendous victory for EE and their actions and literacy guide can act as a model for other states to adopt. However, even if other states are not ready to take on such drastic, but necessary, measures to improve their EE methods there are dozens of less taxing techniques that individual schools could implement into their curriculum.²⁹

Key Points

Environmental Education is failing because:

- Technology is separating people from nature
- Children are experiencing a form of Nature Deficit Disorder
- Educators are not helping to re-establish their student's connection with nature
- Students need to be taught that there is hope for the future and that they should strive to save the environment
- Climate change is not just a problem for future generations
- California is working to create environmentally literate students, and this is a tactic other states could adopt into their school systems
- Schools are teaching the skills required for economic success, but not always the importance of a sense of community or a responsibility to their planet

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Suggestions for Environmental Education:

California is taking massive steps to improve EE and to create environmentally conscious citizens, but there are many other simple steps schools could take to incorporate nature and environmental issue into their everyday curriculum.

Ways to implement EE into all Curriculums:

- Students could take a trip to local fisheries to learn about tipping points³⁰
- To combine science and mathematics younger students could go outside of the school to count earthworms or other organisms³¹
- Students could learn about where their food in the cafeteria is sourced from
- Students could study if organic or a locally-sourced food is an option for their school³²
- Older students could create a green house or build solar panels to teach the other children about sustainability and renewable energy
- Recycling, composting, and incorporating green technology such as energy efficient light bulbs in every building would be an interactive way to demonstrate to students how they can make a difference
- Activities that expose children to nature or encourage them to think critically about the environment will improve EE

EE needs to expand beyond just educating children since climate change is affecting every individual on the planet. So, the entire public deserves the opportunity to be educated on the consequences of climate change and how they can make a difference. Climate change requires immediate action, so community centers like the YMCA, JCC, or even community colleges should offer classes for adults that explain to them the causes of climate change and what they can do in their own homes to help the environment. A strong environmental education can help students understand how they can address the problem of climate change. So, taking the time to educate the general public would not only help raise awareness for climate change, but it would also get people genuinely engaged with the environment and motivated to help protect it.

Part II

Why is the Public Not Engaged with Climate Change?

Education is the first step to engaging the public with climate change. However, currently support for climate change is limited because people are refusing to alter their behavior. Simply recognizing that climate change exists is not enough to help save the planet. The public needs assistance to understand the science and to develop an emotional connection with the problem. There is a general lack of knowledge across the United States about the impact of fossil fuels and many people do not understand what they can do to reduce their carbon footprint.³³ People are reluctant to even slightly alter their lifestyle and so, “Pro-environmental behavioural responses to climate change are even more limited; few people are prepared to take actions beyond recycling or domestic energy conservation”.³⁴ Educating the public is not the answer to all of the environment’s problems because there is no guarantee what the public will do with the information. However, it is a start and if done well it could lead to the birth of more environmental activists and solutions to climate change.³⁵

Educating the public on climate change would make a stronger impact if it was accompanied by opportunities for the public to engage in meetings or programs with local officials. Such meetings have the potential to improve the trust between the general public and community leaders, as well as to help individuals understand that they can take action and that they do have a say in what happens in their own backyard. Reports have shown that the scientific uncertainty and the lack of government support is fueling public skepticism over the reality of climate change. Thus, climate change is not always considered an immediate threat by the public or the government. In addition, the effects of climate change are not easily visible by everyone and the science and numerous advocacy groups have actually overwhelmed public opinion. Therefore, it has become easier for the people to disconnect with nature rather than tackle the problem of climate change.³⁶

Another reason why people are failing to engage with climate change is because the government and various advocacy groups are failing to appeal to a person’s inherent values. Presenting facts such as in the past 30 years the ocean’s waters have become 30% more acidic maybe be beneficial for scientists and environmentalists, but to the general public that single statistic does not possess much significance.³⁷ Facts do not appeal to people’s consciousness and so they are not the best way to motivate people to care about climate change. A stronger technique for environmental advocates would be to explain how it is society’s obligation to take responsibility for their actions and to motivate them to work to stall the effects of climate change. In order to inspire climate change engagement political officials and advocacy groups must empower the public by explaining to them the scientific reasoning behind climate change and appealing to their innate ethical values.³⁸

The media and the government can also set an example of how people can adopt environmentally friendly measures. For instances, they could install solar panels, carpool, recycle or even compost. If the general public does not witness political actors or their community leaders making a change then subsequently many of them may lack the motivation to really understand and engage with climate change. People need to be inspired to make effective behavioral changes that reduce their carbon footprint. There are some individuals who are not in the position to change their lifestyle due to social or economic factors, but there are many who could set an example for their community by finding ways to reduce their individual carbon emissions.³⁹ Climate change is a massive and international

problem, which requires a much larger solution than individual action can solve. While everyone has the power to help the environment the problem is constantly escalating, and so attention needs to be directed on how to create substantial solutions that can be enacted across the globe. Lindsay Meiman⁴⁰, the U.S. Communication Coordinator for *350.org* believes that, “While our individual behaviors of course matter, it is through our collective efforts and movement building through which we can build true paradigm shifts. In other words, climate change is an issue of justice. It is not just about polar bears in the Arctic (though it is), but rather a crisis in which our communities are impacted -- especially low-income communities and communities of color who have done the least to contribute to the problem.” Communities all around the world are experiencing the effects of climate change and many of them are not even the main contributors of fossil fuel emissions. There are some communities that are attempting to mitigate their impacts on the environment by working to eliminate single-use products, banning pesticide use and by developing climate action plans; although, due to the magnitude of the issue all communities need to be conducting similar actions to truly reduce the amount CO₂ emissions. Despite this reality, climate change skeptics will not change their position until the media and the government portray and recognize climate change as an actual threat to civilization. Therefore, in order for people to truly comprehend the severity of climate change and work towards creating effective solutions it needs to be better communicated through mass media sources.

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How to Improve Climate Change Communication

The influence of the media on public opinion is also a factor when considering climate change communication. So, unlike other world issues, climate change does not receive the same mass media attention as terrorism or political corruption. Consequently, this leads the general public to believe that climate change is not an immediate threat. In 2016, a study completed by the Climate Change Communication Program, run by Yale University, discovered that 69% of Americans do believe that climate change is happening, but 50% of Americans believe that it will not be a problem until 25 years from now or that it will never affect citizens of the United States. Over 50% of Americans believe that climate change will not personally affect them, and it is this attitude and lack of media coverage that drives the lack of public engagement with climate change.⁴¹ Communities and individuals develop an understanding and respect for climate change through their interaction with each other, thus the media can play a vital role at communicating the causes and effects of climate change with the public.⁴²

Climate change has been plagued by the problem of misinformation since it appeared in the news in the late 1990s.⁴³ Presently, about 90% of scientists support the fact that humans caused climate change, but Yale University determined that only about 16% of American voters realize this. The debates

over climate change are no longer about a lack of science or evidence instead the disparity is due to an ongoing miscommunication with the public.⁴⁴

The public relies on the news to explain to them current events and the threats society is facing. The majority of consumer capitalism is fueled by fossil fuels and since these emissions are the main cause of climate change there is an ongoing bias surrounding the issue. Fossil fuels promote economic growth and many industries choose to ignore the science behind climate change since it has the potential to slow down business. Many companies, like Exxon, in the 1990s even funded denial campaigns to try to disprove the science.⁴⁵

Now there is a market for renewable energy and green technology, but some corporations are refusing to adapt and are still utilizing fossil fuels. The various attitudes towards climate change can cause the media to report false or subjective information. Climate change is one of the most divisive topics covered in the media and the top news outlets try to match their coverage to their audiences' preferences. For example, Fox News usually appeals to a more conservative audience who tends to be less concerned with environmental issues. Thus, an individual who only watches Fox News has the potential not to be educated on climate change or other environmental issues compared to someone who exposes themselves to a variety of media outlets. In May of 2014 CNN aired a climate change debate between Bill Nye⁴⁶ and Nick Loris⁴⁷ from the Heritage Foundation⁴⁸. Neither of these professionals are climate scientists, yet they are discussing an issue that had already been proven. There can be debates on how to solve the problem of climate change; however, the question of is climate change a real issue has already been resolved. This debate spread the wrong message to the public because they should not be questioning the reality of climate, but rather how to combat it. Again, it is the public's responsibility to expose themselves to different news sources, but also to research statements and opinions to make sure they understand the entirety of the issue.⁴⁹

Instead of prompting research and discussion, the debates over climate change is leading society to ignore the problem. Yale's Climate Change Communication Program found that 67% of responders never discuss climate change.⁵⁰ The lack of discussion and motivation to research the issue is impeding environmental legislation and sustainability. This is why it is the duty of the media and the public to broaden their coverage and perspectives to include all the skepticism and resolutions regarding climate change. Almost 70% of Americans are ignoring one of the world's greatest threats, thus this is not raising awareness for climate change nor any other environmental problems. There are other ways that the public can learn about climate change than just the traditional media sources such as through pop culture, social media, and even through television. For example, a popular medical drama on ABC called *Grey's Anatomy* has recently been addressing social justice issues such as police violence, gender bias, and immigration rights. The show reaches thousands of viewers every week and by incorporating these issues into the storyline it can trigger the viewers to research and become educated on that particular issue. *Grey's Anatomy* is helping people develop a connection with some of the world's principal problems; although, one issue they have not discussed is climate change.⁵¹ The environment is rapidly changing and so the traditional media sources are not substantial enough to educate the entire public on the effects of climate change. So, new methods need to be incorporated into society that attempt to raise more awareness (not debate) for climate change.⁵²

Examples of Techniques to Raise Awareness:

- Celebrity Endorsement
- Educational programs solely focused on educating the public on climate change
- Advertisements on billboards, public transportation, or short info commercials
- Public lectures designed to educate and get the media's attention
- Social media campaigns
- Include environmental information on store bought items⁵³
- Climate change ads on radio stations and magazines
- More publicity for corporations that donate to the environmental organizations, incorporate recycled materials, or use environmentally friendly methods to create their products

The first Earth Day, in 1970, was created to raise public awareness for environmental issues like deforestation, endangered species and pollution. All over the country, there were rallies, marches, and educational programs that attracted the attention and participation of more than 10 million Americans. Senator Gaylord Nelson, an environmental advocate and sponsor of the original Earth Day believed that the purpose was to “get a nationwide demonstration of concern for the environment so large that it would shake the political establishment out of its lethargy and, finally, force this issue permanently onto the political agenda”.⁵⁴ Nelson was also responsible for the idea of environmental teach ins, which were events in schools for the public designed to help people understand environmental issues and turn them into activists. The first Earth Day created a mass environmental movement and it educated thousands of people on key environmental issues.⁵⁵ So, I believe that it is time for another huge environmental movement, but this time it should be centered on climate change. Rallies, marches, and teach-ins is the type publicity and support that the Earth needs to raise public awareness. A massive climate change movement, is an ideal technique to influence legislation, raise climate change publicity, and offer the public an opportunity to receive an accurate education on the causes and effects of climate change.

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Part III

How Technology is Impacting the Coverage of Natural Disasters

Due to rapidly advancing technology, the media is constantly evolving. Now, news reporters are no longer the first people on the scene of a crime or natural disaster, first informers⁵⁶ allow the world to have access to information almost instantly. Frequently, technology allows the public to learn about a natural disaster well before it strikes, whereas in the past the world would only be informed of a extreme weather event either hours before or after it has already occurred. Hurricane Katrina was the first major natural disaster in the United States that received 24/7 media coverage in 2005.

The expansion of media coverage and social media has also affected the role of emergency managers in disaster situations. First informers and the media allow the audience to become active participants in news cycles and world events. Despite these benefits from first informers, they have created a major challenge for emergency managers since now they need to rapidly sort through the information that is released into the media and quickly determine what is true. False information is a major concern for emergency managers during a natural disaster for several reasons. First, during a natural disaster, such as a hurricane or earthquake, it is imperative that the public receive accurate information as quickly as possible. Rapid and accurate information is extremely necessary because it informs the people if they need to evacuate, where the closest shelters are, or if the storm has changed course or magnitude. Second, during an emergency, government officials always try to mitigate panic and the release of false information from first informers.⁵⁷ Also, the spread of false information can also cause immense confusion for the people who live in an area that is being impacted by a storm. These people are struggling to stay out of harm's way and it is possible that they have lost some forms of connection like electricity or internet and so they often have less information on the storm than the outside world. It is imperative that the information the people in the disaster zones do receive is accurate because this could affect their decision to evacuate.⁵⁸ Lastly, as discussed in the previous section about environmental education, conflicting information simply confuses the public and leads to a mistrust and lack of action from the general public. During a crisis, it is imperative for the public to think fast and also to respond to the emergency warnings; however, these communications are only effective if they reach the public and if they trust them enough to take action.⁵⁹

Why Do Natural Disaster Communications Fail?

Now majority of the public has access to information almost instantly whether it be through the internet, television, or radio. Despite the availability of information, citizens are still not taking the threat of natural disasters seriously even if they have been affected by a storm in the past. According to the Center for Research on the Epidemiology of Disasters there were four times as many extreme weather events in the last 20 years than in the previous 75 years.⁶⁰ Thus, it is even more important that the public takes the threat of natural disasters seriously and begin to completely trust emergency officials during disaster events. There are several major challenges surrounding natural disaster

communications including the dissemination of information and the fact that the public does not always trust or choose to act upon the information provided by emergency managers.⁶¹

In the hours prior to a storm one of the most precious commodities is time. So, in disaster prone areas a lot of research has gone into establishing early warning systems. These systems are composed of four main factors: prior knowledge of the storm, technical monitoring and warning alerts, dissemination of information and public awareness. Warning the public and ensuring that the proper information reaches all households is the key to disaster preparedness. Early warning systems and the proper dissemination of information can save lives since it gives the public the time to evacuate to shelters, gather supplies or even to get a safe distance away from the storm. While these systems may not protect infrastructure, they do save lives as was the case in Bangladesh, where they have established a 48-hour early warning system. While it cannot protect everyone, this system has been proven to save more lives than in previous storms. In 1970, Bangladesh was destroyed by Cyclone Bhola and 300,000 lives were lost. In 2007, a similar storm, Cyclone Sidr, struck Bangladesh and there were only 3,000 casualties as a result of the early warning system. Thus, technology is improving communication systems, but there are several ways that these systems can fail, such as human error, poor communication, and unpredicted weather events.⁶²

Early warning systems are effective if they disseminate accurate information and people follow the government's warnings. However, climate change is altering the patterns of storms, which could drastically impact the effectiveness of the early warning systems.⁶³ In addition, these systems are also subject to technology failure and human error. Massive storms have the potential to destroy any preplanned communication infrastructure. Consistent and accurate communication during a disaster can mean the difference between life and death for hundreds of people. Harsh winds, seismic activity, tidal waves all have the power to destroy communication infrastructure such as telephone poles, cell towers, and other forms of wireless communication. The physical damage to communication infrastructure is costly and can take time to repair. Thus, this not only has consequences during natural disasters, but also immediately after the storm for emergency responders and rescue teams. The hours and days immediately following an extreme weather event are crucial for first responders because it is their top priority to locate survivors and prevent any further loss of life. Relief efforts are impeded when the communication infrastructure is destroyed, and people cannot call 911 for help. In conclusion, victims of natural disasters, emergency managers, and first responders rely on steady communication methods and procedures. So, when the infrastructure is damaged in a storm it can cause major disruptions to existing protocols and recovery efforts.⁶⁴

Communication plans such as early warning systems and alerts are also liable to human error. On January 13th, 2018, a false missile alert was sent to the public of Honolulu telling them that there was a ballistic missile heading for Hawaii and that the residents and tourists should seek immediate shelter.⁶⁵ It was eventually revealed that during a shift change the wrong button was pressed, but it took 40 minutes for the public to be notified of this mistake even though the local government was aware of the error almost instantly. Within these 40 minutes people were running for safety and people were terrified for their children and other family members. Mistakes such as this one can result in chaos and upheaval, which is why they have to be rectified immediately. Not only do false alarms cause widespread panic, but Ajit Pai, chairman of the Federal Communications Commission explains, "False alerts undermine public confidence in the alerting system and thus reduce their effectiveness during real emergencies".⁶⁶ One of the largest threats to emergency warning systems is the fact that people have

the ability to ignore them. Already people are not taking all of the steps they could to prepare for natural disasters and there are some who question the severity of a storm and refuse to prepare or evacuate despite the weather forecasts. Therefore, accidentally releasing an emergency notification threatens the likelihood that people will take genuine emergency alerts seriously.⁶⁷

Sending out false alerts also creates distrust between the public and the local government. For the emergency action plans to work in a real natural disaster situation, the public must trust the warnings of government officials, but according to a poll done by the Pew Research Center in 2015, only 19% of Americans said that they trust the government always or most of the time.⁶⁸ The lack of trust can be a major deterrent for the general public when they are deciding whether to listen to emergency officials and evacuate during a disaster or risk staying in range of a storm. When an individual ignores an evacuation order there is a strong possibility that first responders and additional response teams would not be able to immediately attend to that person if they needed medical attention or if they are trapped in unstable conditions.⁶⁹

There are many personal, environmental and financial reasons why people would choose to ignore an evacuation order. Some reasons are that they believe that they can wait out the storm or that they do not understand that there are usually shelters in place for the evacuees. Some people do not understand the evacuation warnings due to the fact that they speak a foreign language, or they have a disability, such as hearing impairment. In addition, a main problem in areas that are constantly affected by hurricanes, such as Florida and Texas, is that the public can experience hurricane fatigue, which is where the people are too tired of constantly uprooting their lives and leaving their homes. Hurricane fatigue occurred during the evacuation of Galveston, Texas during September of 2008, for Hurricane Ike.⁷⁰ Hurricane Ike, threatened many coastal cities and over 1,000 residents were forced to evacuate. The National Weather Service even warned that those who did not evacuate were likely to experience death from flooding. Despite this warning, about 40% of the people in the immediate danger zone chose not to evacuate. Many of these people remembered evacuating for Hurricane Rita in 2005, where the evacuation order was not well planned and over 100 people were killed from being stuck in traffic jams while trying to evacuate.⁷¹ This incident forced residents of Galveston to distrust evacuation orders and the very fact that the government could protect them. It is for this reason that false alerts like the one in Hawaii and poor emergency planning cannot only pose a severe risk during a storm, but it also leaves a bad impression with the general public who are already prone to be skeptical of the severity of natural disasters.⁷²

Key Points

- Time is one of the most precious commodities during a storm
- The public needs to trust the information in order to take precautionary steps or evacuate if necessary
- Early warning systems are essential and can save lives
- Trusting the government's information is necessary in all disaster events
- Sharing all possible options with the public and making sure the information is accessible to everyone is one of the best ways to improve communication with the public
- Proactive planning is essential when designing emergency action plans

Part IV

Hurricane Katrina

While communication may not seem like the largest problem during an extreme weather event there are many examples of recent natural disasters that could have had better outcomes if stronger communication strategies were already set in place. One such example is Hurricane Katrina, which was the first storm to ever receive 24/7 media coverage. Hurricane Katrina was an unprecedented and powerful cyclone that struck the Gulf Coast on August 25, 2005. The storm flooded the city of New Orleans, and over 100,000 people in Mississippi, Alabama, and Louisiana were displaced. Katrina also created over 100,000 dollars' worth of damages. Hurricane Katrina was particularly catastrophic in New Orleans, where they were already at risk for major flooding. The Hurricane exposed this already known danger and several other planning and communications mishaps. There was science and publications (through magazines like *Scientific American* and television) warning the public that the chances of a hurricane striking the Gulf Coast was extremely likely. Thus, there was ample time for the city to prepare and communicate emergency action plans with the public. Four years prior to Hurricane Katrina a flood control study proposed to the city that their levees need repair in order to withstand a superstorm, although no improvements were ever made to these structures. Furthermore, one year prior to Katrina, the Army Corps of Engineers and emergency managers conducted an exercise where they tested the impact of a super hurricane on the levees. They noted what critical repairs needed to be made and demanded to know why none of the suggestions from the four-year-old case study had been implemented. However, instead of issuing funds to make the repairs, local officials and city planners responded to the requests with further budget cuts. In this case, the public was trying to communicate with the government through reports and suggestions, but they failed to present a powerful enough message that would force the government to take action to protect the city against massive inundation.⁷³

The government paid little attention to the possibility of levee failure during a storm, and the residents of New Orleans were becoming more accustomed to the risk of flooding. They knew from past storms that there was potential for severe inundation, but, "In the minds of these residents, neither promises from the government nor active attention had materialized and its image of openness and honesty had been damaged".⁷⁴ By not taking action or explaining the risks to the public the government had already tarnished their reputation with the residents of New Orleans. During the early stages of the storm the media and emergency officials released conflicting messages regarding the possibility of levee failure. Scientific terms such as breaching⁷⁵ and overtopping⁷⁶ were misused and to the general public who are not familiar with this jargon were simply confused and unsure of which report to trust. Effective risk communication must use language that can be understood by the entire public and it should help the people take action, not confuse them and hinder their ability to decide what to do. Better communication would have prevented the multitude of false alerts and would have been more beneficial for citizens who were trying to decide if they should evacuate.⁷⁷

The public was inaccurately informed of the potential levee failure and they were not effectively motivated to take action, and this resulted in 70,000 individuals who did not (or were unable) to evacuate. Due to the confusing messages and slow response from the federal government some people did not realize the true threat of the storm. Even during the recovery phases, the federal government

was slow to send aid and assess the true extent of all the damages. These mistakes also significantly impaired the people's relationship and trust with the local and federal government. Hurricane Katrina is a prime example of where there were multiple communication errors that resulted in confusion and a lack of action from the general population.⁷⁸ Nonetheless, this communication catastrophe demonstrates the importance of using clear and concise language as well as giving the public consistent and accurate information.⁷⁹

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California Wildfires

Hurricane Katrina exposed several planning and communication flaws associated with emergency action plans. After Hurricane Katrina, the majority of emergency action plans were updated, but there are still many natural disasters that could have had less casualties if more efficient communication measures were in place. One of the most recent examples of this is the California Wildfires of 2017. Last year, California had over 9,000 wildfires blazing across the country, which burned 1.2 million acres of land, destroyed over 10,000 structures and killed 46 people. Unlike in past years, the fires also affected Northern California.⁸⁰ While these wildfires were immensely destructive to the land, the casualties could have been avoided with better communication systems. Sheriff Rob Giordono of Sonoma county told CBS News that “Communication problems in general have been difficult”.⁸¹ He describes how alerts were sent out, but many people did not receive them due to the fact that their technology system is designed to call landlines⁸² only in certain areas, and so if an individual does not have a landline or if they chose not to sign their cell phone up for these alerts, than they did not receive the emergency messages.⁸³

Napa county’s officials relied on a text messaging service that gives various updates throughout the year, such as if a water main breaks or if and when there is going to be a parade. Subscription to this service is voluntary and only a marginal number of people were signed up prior to the start of the fires, so again the warnings and updates were not reaching all the residents. Similarly, Sonoma county sent text messages and robocalls, but data obtained from California Public Records revealed that only 50% of the numbers actually worked. Every county threatened by the wildfires had the option to utilize a federal warning system that would loudly buzz every cell phone (within range of a working cell phone tower)⁸⁴ providing them with an update on the wildfires or information on the nearest evacuation center. Out of eight counties affected by the wildfires, only one chose to activate this system. Emergency officials in several of the other counties were too worried about inciting mass panic, which is why they chose not to activate the federal warning systems.⁸⁵ Many residents in the danger zone claimed that they were caught by surprise and did not know that the fires were advancing closer to their homes. Thus, the emergency warnings were not reaching these households in time for the people to prepare for evacuation.⁸⁶ As stated above, time is crucial during a natural disaster and if the residents of these counties would have had more time to evacuate or advanced warnings on the location of the wildfires it is possible that there would have been far fewer casualties. The wildfires in California exposed the country’s need to update its early warning systems to incorporate new technology such as text messages and emails. In addition, it also demonstrated the importance of being transparent and providing the public with accurate and timely information in order to motivate them to take action.

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Hurricane Harvey

Hurricane Katrina demonstrated the risk of not being proactive and preparing for future flooding. The wildfires in California showed the dangers of not using updated technology and providing an accurate amount of time to evacuate. On August 25, 2017, Hurricane Harvey made landfall in Texas where it produced 130 mph winds and dumped over 27 trillion gallons of water over Houston. Hurricane Harvey was a Category 4 hurricane that was responsible for killing 80 people and over 30,000 people were displaced from their homes. Hurricane Harvey was one of the most devastating and unprecedented storms in the history of the United States. Due to the magnitude and power of Hurricane Harvey stronger communication methods should have been in place; however, instead the residents of Texas experienced similar communication problems that occurred in Louisiana and California.⁸⁷

There was a multitude of city planning mistakes that occurred before Hurricane Harvey was even on the forecast. One mistake was that the local government allowed city developers to build new communities without taking flood projections into account. Moreover, the federal government even promised to subsidize flood damages. Thus, the state now became vulnerable to flooding and bad policy decisions. One of the reasons the flooding was so disastrous in Houston was due to the lack of zoning laws in the city. When developers built these new properties, the environmental impacts were not considered. If developers would have taken the environment into account than they would not have paved over acres of empty land that absorbs rain water.⁸⁸

Hurricane Harvey was like no other storm in history and Houston was drastically unprepared for it. Hurricane Harvey⁸⁹ is the third 500-year flood⁹⁰ to hit Houston in the past three years, but Harvey is the worst rainstorm in the history of the United States. Marshall Shepherd⁹¹ told the *Huffington Post* that “We’re kind of making this up as we go... we haven’t seen this type rain fall over {over such a short} amount of time”.⁹² Prior to the start of the storm, weather forecasts were predicating the extent of the storm and warning people that areas may become inhabitable for weeks or maybe even months. This storm revealed that conveying the true dangers of extreme weather events to the public is extremely challenging. Not everyone understood that a tropical storm does not just consist of strong winds and storms surges, but also heavy rain.⁹³

Despite the drastic warning, people still refused to leave their homes after the evacuation order was sent. Many people were influenced by traumatizing past experiences and optimism bias⁹⁴ and believed that the storm was not a true threat to them. Harvey was one of the most destructive storms in history, yet the media and the government failed to communicate the risk of such an immense amount of rainfall to the public. Thus, Harvey demonstrated the importance of clearly communicating risks to the public.⁹⁵

The destruction and aftermath of Hurricane Harvey is shocking. Harvey is not the last storm of its kind because climate change is exasperating rainstorms all over the world. Kevin Trenberth, a climate scientist, believes that about 30 percent of the rainfall during Hurricane Harvey can be attributed to the human-induced climate change. Climate change is allowing for a warmer atmosphere, which increases evaporation rates and enhances the carrying capacity of rainstorms. Climate change was predicted, and Houston knew that the chances of a storm like Hurricane Harvey were likely, and yet it was decided to ignore the risks and to not protect the city from flooding. Ignoring the chance of storms and the existence of climate change will only increase the death and destruction, “...Harvey is what climate change looks like in a world that has decided, over and over, that it doesn’t want to take climate change

seriously”.⁹⁶ Climate change is one of the world’s largest problems since it effects every aspect of the Earth, including the frequency and magnitude of natural disasters. Nevertheless, this is not a battle between man and nature. Andy Horowitz, a disaster historian from Tulane University, believes, “Nature isn’t racist. Nature doesn’t target the poor. So if you see disparate impacts with Harvey, ask what human choices caused them”.⁹⁷ Natural disasters are being exasperated as a result of society’s actions, so while improvements to communication methods are necessary to save lives during storms, it will not solve the underlying problem of climate change. In order to reduce the effects of climate change and subsequently natural disasters, countries worldwide must work together to adopt renewable energy, find ways to minimize pollution, and to lower the amount of CO₂ in the atmosphere.⁹⁸

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How to Improve Disaster Communications with the Public

- Emergency officials should work on developing better relationships with community leaders because they are trusted by the general public
- Emergency officials could also try sharing information with first informers
- They also need to develop a better emotional connection with the public and they can do this by being empathetic, consistent, and most importantly demonstrating that their information is accurate and reliable
- It is important for the public to be educated on why natural disasters are occurring and to understand how human activity is exasperating the effects of climate change
- Emergency officials should always speak in clear and concise language and avoid using scientific terminology
- They also need to expand where they display the news and emergency alerts by utilizing social media platforms like Facebook, Snapchat, or Twitter⁹⁹
- There should also be emergency warnings on music streaming sites like Spotify and Pandora
- Emergency officials need to acknowledge that the mistakes that have been made in the past¹⁰⁰
- Government officials should not be wary to utilize systems that send emergency text messages, phone calls or emails to every individual in the danger zone
- A mandatory app should be created that is preinstalled in every smart phone and that is only activated to deliver storm or evacuation warnings

How to Increase Preparedness for Natural Disasters

As demonstrated by the communication failures and the lack of preparedness that occurred during Hurricane Katrina, the California Wildfires, and Hurricane Harvey there is still the need to expand communication networks as well as to help citizens understand how to be proactive and prepared for natural disasters. One way to help people prepare for natural disasters is to educate them early on in their lives on the dangers that occur during extreme weather events. Children can have the opportunity to learn what natural disasters are prevalent in their area and how they can be prepared for them. If the information is relevant and the children are able to fully understand it then it is likely that they will bring it home to their parents, so an entire family has the potential to be indirectly educated on how to be proactive during natural disasters. The media can also play a prominent role in educating children and their families on how to be prepared for extreme weather events. In 1969, *Sesame Street*, a popular children's program, started educating children on what to do in a fire. Based off this episode, in the 1980s FEMA decided to implement Big Bird's "Ready Set Go" series. The purpose of these episodes was to inform children on natural disasters and explain how to prepare for them. As a part of the series, there were even child friendly emergency kits that included board games, information on evacuation routes, and cassette tapes with stories and educational songs such as "Hurricane Blues". These kits were actually a huge success, but FEMA was never able to comply with all of the orders. The "Ready Set Go" series was designed not only to educate children, but also to inspire their parents to take action to protect their families from natural disasters.¹⁰¹ These kinds of programs belong in the media right now since they are an excellent tool to help educate children and their families about the prevalence and magnitude of extreme weather events.

Fossil fuel emissions continue to be released at alarming rates and the effects of climate change will only increase the likelihood and magnitude of natural disasters. Thus, educating the people on their effects and helping them become prepared is more important now than in the past. On its website, FEMA suggests that every home have an emergency supply kit equipped with enough food and water for at least three days as well as a flashlight, a radio, prescriptions, important documents, and any other items a person may need. They also suggest that each family make their own communication strategy for how they plan to keep in touch with family members. Also, FEMA suggests that each family develop a map of nearby places where they could get resources such as food, water, or medical support. They explain that consistently updating the emergency kit/to go bag and listening to emergency warnings is the best way to stay updated and prepared for storms.¹⁰² The media has the ability to remind people to become prepared and stay vigilant. Thus, if all these different platforms (schools, emergency officials, and the media) worked together they could create environmentally active and prepared citizens. The combination of education and being proactive prior and during natural disasters could drastically decrease the frequency and magnitude of these storms. It would also reduce the number of lives lost during these extreme weather events.

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Conclusion

Climate change is one of the world's largest threats that requires international cooperation and millions of citizens across the globe to change their behaviors and adopt environmentally friendly habitats. In order for the public to make these life adjustments, they must understand why and how the environment is being affected by human activities. This is why more environmental education must be implemented into all school systems nationwide. However, it is not just enough to teach students about the environment. Schools should be providing students with the tools they need to think critically about climate change and how to formulate solutions. Early exposure to the natural world and incorporating the environment into various disciplines would help children grow up to be environmentally active individuals. Climate change is still a topic surrounded by skepticism and disbelief, which stems from a lack of education. Climate change can be taught to children as early as grade school where teachers can communicate to their students the causes of climate change, and the risks for the future if CO₂ emissions continue at the same rate. Many people in society have not been educated on climate change, so they do not understand its effects or how they can make a difference.

Citizens who have a background in environmental education would have a better understanding of the risks that occur during a natural disaster. Environmentally educated individuals would be taught that extreme weather events are being exasperated due to the warming climate. Emergency officials and the media cannot just assume that people have pre-existing knowledge or that they will understand what to do during a natural disaster. Therefore, in order to save the most people during a storm accurate information must be distributed and clear and concise language should always be used to avoid any sources of confusion, like what occurred during Hurricane Katrina. Furthermore, the technology and platforms utilized to contact residents in a disaster zone must constantly be updated to avoid situations where the alerts are only going to landlines, which was one of the largest communication problems during the California Wildfires.

There are many areas where communication can be improved during natural disasters; however, communities also need to become more proactive to protect against natural disasters. Hurricane Harvey could have been less destructive if developers did not build in flood zones. Other countries are being proactive to protect their citizens from climate change. The United States is to be reactive and respond after the disaster. One example of a proactive country is Japan, which is constantly being impacted by major earthquakes. Nonetheless, Japan has become one of the world's leaders in disaster preparedness. They possess some of the world's most advance early warning technology and they have built hundreds of earthquake and tsunami proof shelters. On this day, some schools will practice evacuation drills and other companies and homes will take the necessary steps to ensure that they are equipped for a natural disaster.¹⁰³ Thus, in order to save more lives during these storms communication methods must be improved. City leaders should be evaluating the risks to their communities and taking the necessary precautions to prevent natural disasters. They should also be updating their technology and education standards to make people more aware during a storm. One of the best provisions against extreme weather events is to reduce CO₂ emissions. This would require the public to be educated on climate change and provided with the required skills to think critically and formulate solutions that would save thousands of lives and ecosystems across the planet.

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- ²³ Ibid P. 70-79
- ²⁴ Ibid P. 55
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- ²⁶ It is important to note that California is not the only state taking on environmental initiatives. States such as Washington, Oregon and Hawaii have also made great strides to educate their citizens on climate change and their surrounding environment.
- ²⁷ A Blueprint for Environmental Literacy." A Blueprint for Environmental Literacy - Science (CA Dept of Education). Accessed March 21, 2018.
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- ³¹ Ibid P. 79
- ³² Ibid P. 83
- ³³ A person's carbon footprint is defined as the amount of carbon dioxide and other carbon compounds emitted due to an individual's use of fossil fuels. A person's carbon footprint can be reduced by taking simple steps such as carpooling to work or school or even by using public transportation.
- ³⁴ Whitmarsh, Lorraine, Saffron O'Neill, and Irene Lorenzoni. *Engaging the Public with Climate Change: Behaviour Change and Communication*. New York, NY: Routledge, 2015. P. 3
- ³⁵ Ibid P. 3-10
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- ⁴⁰ As an intern with the Alliance for Sustainable Communities located in Bethlehem, Pa. Lindsay inspired collective effort by creating the Climate and Sustainability Commitment, which was adopted by the Bethlehem area school district in 2014.
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- ⁴² "What Is Climate Change Communication?" Yale Program on Climate Change Communication. Accessed March 24, 2018. <http://climatecommunication.yale.edu/about/what-is-climate-change-communication/>.
- ⁴³ Bekiempis, Victoria. "Leaving Science Cold." Newsweek. February 21, 2016. Accessed March 26, 2018.

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- ⁴⁴ "Understanding Uncertainty: How to Improve Communication Around Climate Change Evidence." Chicago Policy Review. August 16, 2016. Accessed March 24, 2018.
- ⁴⁵ Boyce, Tammy. *Climate Change and the Media*. New York, NY: Lang, 2009 P. 3-9
- ⁴⁶ Bill Nye has Bachelor of Arts in Mechanical Engineering and he is best known for his work as Bill Nye the Science Guy: a children's show hosted by PBS.
- ⁴⁷ Nick Loris is an economist and a fellow at the Heritage Foundation who has openly stated that he is skeptical about the correlation between human activity and climate change.
- ⁴⁸ Is an American conservative think tank that is based in Washington, D.C. and it is known for being skeptical of climate change and other environmental issues.
- ⁴⁹ Bekiempis, Victoria. "Leaving Science Cold." Newsweek. February 21, 2016. Accessed March 26, 2018
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- ⁵¹ Dusenbery, Maya. "'Grey's Anatomy' Finally Tackles Medicine's Gender Bias." Pacific Standard. February 08, 2018. Accessed May 05, 2018
- ⁵² Bekiempis, Victoria. "Leaving Science Cold." Newsweek. February 21, 2016. Accessed March 26, 2018
- ⁵³ One company that utilizes this method is Endangered Species Chocolate. They sell chocolate bars with information and a picture of an endangered animal on the cover of the chocolate bar. So, when a consumer purchases the chocolate, a portion of the profits are donated to protect the wildlife.
- ⁵⁴ Shafer, Jack, Jeff Greenfield, David Freedlander, and Eric Scigliano. "First Earth Day Celebrated, April 22, 1970." POLITICO. April 22, 2016. Accessed March 26, 2018.
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- ⁵⁶ First informers are members of the general public who possess cell phones and can film or photograph any type of major news events. These are ordinary citizens who happen to be on the scene of an incident and they can immediately upload their videos or images to various social media sites or send them to news broadcasters.
- ⁵⁷ Haddow, George D., and Kim Haddow. *Disaster Communications in a Changing Media World*. Amsterdam: Butterworth-Heinemann, an Imprint of Elsevier, 2014. P. 23-38.
- ⁵⁸ Richards, Christina. "When Communications Infrastructure Fails During a Disaster." Disaster Recovery Journal. Accessed April 03, 2018.
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- ⁶⁰ Ibid P. 40
- ⁶¹ Ibid P. 38-40
- ⁶² Pearson, Lucy. "Early Warning of Disasters: Facts and Figures." SciDev.Net. Accessed April 02, 2018.
- ⁶³ "Climate Change Indicators: Weather and Climate." EPA. August 02, 2016. Accessed April 02, 2018
- ⁶⁴ Richards, Christina. "When Communications Infrastructure Fails During a Disaster." Disaster Recovery Journal. Accessed April 03, 2018
- ⁶⁵ The residents of Hawaii were already nervous of an impending attack from North Korea.
- ⁶⁶ Tanner, Eugene, Maggy Donaldson, and Agence France-Presse. "US Official Defends Early-warning Systems after Hawaii 'failure'." ABS-CBN News. January 14, 2018. Accessed April 03, 2018
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- ⁶⁸ Fingerhut, Hannah. "Beyond Distrust: How Americans View Their Government." Pew Research Center for the People and the Press. November 23, 2015. Accessed April 12, 2018
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- ⁷² Drye, Willie. "Why Hurricane Ike's "Certain Death" Warning Failed." National Geographic. September 26, 2008. Accessed April 13, 2018
- ⁷³ Cole, Terry W., and Kelli L. Fellows. "Risk Communication Failure: A Case Study of New Orleans and Hurricane Katrina." *Southern Communication Journal* 73, no. 3 (2008): P. 217-218.
- ⁷⁴ Cole, 218.
- ⁷⁵ Breaching is when the levee actually completely breaks.
- ⁷⁶ Overtopping is when the water rises above the height of the levee and topples over it.
- ⁷⁷ Cole, 219-225
- ⁷⁸ The media publicized many of the failures of the federal government, which forced emergency officials to become more transparent and develop better emergency action plans.
- ⁷⁹ Ibid
- ⁸⁰ Tierney, Lauren. "2017 Was California's Largest and Most Destructive Fire Season in a Decade." The Washington Post. January 4, 2018. Accessed April 16, 2018.
- ⁸¹ CBS News. "Communication Problems Plague California as 22 Large Fires Rage on." CBS News. October 12, 2017. Accessed April 16, 2018.
- ⁸² Many people, especially college students, only have cell phones. A study conducted by the US Health Department in 2017 discovered that 50.8% of American households do not have landlines.
- ⁸³ CBS News. "Communication Problems Plague California as 22 Large Fires Rage on." CBS News. October 12, 2017. Accessed April 16, 2018.
- ⁸⁴ The fires knocked down 77 cell phone towers, thus damaging communication infrastructure, which hinders the accuracy and reliability of these warning systems. The loss of communication infrastructure is one of the greatest risks during a natural disaster.
- ⁸⁵ John, Paige St. "California Wildfires Highlighted the Failures of Emergency Notification System." Government Technology: State & Local Government News Articles. January 3, 2018. Accessed April 16, 2018.
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- ⁸⁷ "Hurricane Harvey Aftermath." CNN. August 28, 2017. Accessed April 20, 2018.
- ⁸⁸ Remes, Jacob. "Hurricane Harvey: How Humans Make Disasters Worse." Time. August 31, 2s017
- ⁸⁹ Hurricane Harvey is also one of the first storms where victims turned to Facebook and Twitter to request help as their homes were being flooded. Emergency responders encouraged the survivors to continue dialing 911 for assistance since it is supposed to be more effective. However, this is a unique example of the powers of expanding technology and the role of social media during a disaster. There were hashtags, like #sosHarvey and #helphouston, all over social media expressing the desperate need for help for the victims of Hurricane Harvey. Niki Usher, a media professor from George Washington University deemed Hurricane Harvey the first disaster in the social media age. These types of rescue requests are atypical, but these viral messages reach other sources than just the standard 911 call.
- ⁹⁰ A 500-year flood does not mean that the flood occurs every 500 years, but rather that the flood has a 1 in 500 chances of occurring in a year.
- ⁹¹ The director of the Atmospheric Sciences Program at the University of Georgia and a former president of the American Meteorological Society.
- ⁹² D'Angelo, Chris. "Hurricane Harvey Is Testing Our Ability To Communicate Natural Disaster Risks." The Huffington Post. August 30, 2017. Accessed April 21, 2018. https://www.huffingtonpost.com/entry/hurricane-harvey-communication-weather-disasters_us_59a41f8ae4b0821444c4a4ba.
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- ⁹⁴ Optimism bias is a cognitive bias that leads a person to believe that they are at a lesser risk of experiencing a catastrophe than other individuals.
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- ⁹⁶ Holthaus, Eric, Michael Grunwald, Annie Snider, Peter Kornbluh, David Freedlander, and Alex Castellanos. "Harvey Is What Climate Change Looks Like." POLITICO Magazine. August 28, 2017. Accessed April 20, 2018.
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- ⁹⁹ Social media is visited everyday by the general public, particularly the youth, so it would be a good platform to spread information about a natural disaster.
- ¹⁰⁰ For example, during Hurricane Harvey officials should have explained to the public how 51 inches of rain would impact the community.
- ¹⁰¹ Haddow, George D., and Kim Haddow. *Disaster Communications in a Changing Media World*. Amsterdam: Butterworth-Heinemann, an Imprint of Elsevier, 2014. P. 107-108
- ¹⁰² "Everyone Must Be Prepared For Emergencies." Everyone Must Be Prepared For Emergencies | FEMA.gov. Accessed April 24, 2018.
- ¹⁰³ Rauhala, Emily. "How Japan Became a Leader in Disaster Preparation." Time. March 11, 2011. Accessed May 05, 2018. <http://content.time.com/time/world/article/0,8599,2058390,00.html>.