ASSESSING THE HOMELAND SECURITY IMPACTS OF A CHANGING CLIMATE

HEARING

BEFORE THE

SUBCOMMITTEE ON EMERGENCY PREPAREDNESS, RESPONSE, AND RECOVERY

OF THE

COMMITTEE ON HOMELAND SECURITY HOUSE OF REPRESENTATIVES

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ASSESSING THE HOMELAND SECURITY IMPACTS OF A CHANGING CLIMATE

Tuesday, April 9, 2019

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON HOMELAND SECURITY,
SUBCOMMITTEE ON EMERGENCY PREPAREDNESS,
RESPONSE, AND RECOVERY,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:11 p.m., in room 310, Cannon House Office Building, Hon. Donald M. Payne, Jr. (Chairman of the subcommittee) presiding.

Present: Representatives Payne, Rose, Underwood, Clarke, King, Joyce, and Crenshaw.

Mr. PAYNE. The Subcommittee on Emergency Preparedness, Response, and Recovery will come to order. The subcommittee is meeting today to receive testimony on "Assessing the Homeland Security Impacts of a Changing Climate."

So good afternoon. I want to thank the witnesses for being here today to discuss this incredibly important topic.

I am especially glad that the subcommittee hearing is leading the Committee on Homeland Security's efforts on climate change this Congress. The last time this committee held a noticed activity on climate change, it was in 2015 when the Republicans held a hearing entitled "Examining DHS's Misplaced Focus on Climate Change."

Let me be clear: Climate change is here, it is happening, and the scientific evidence is there, and it is a threat to our security. If continued unchecked, the effects of climate change will have a devastating impact on nearly every aspect of American life. Scientists from all over the world are clear: If we do not start taking steps to address this issue, it will soon be too late.

As climate change continues to make extreme weather events worse, our critical infrastructure will be at risk of failing—a terrifying prospect for our homeland security. That risk is increasing, according to researchers at the RAND Corporation, as we see stronger disasters and an under-investment in resiliency.

It is not just infrastructure, but it is also health care systems, food production, military installations, commerce, and so much more that are at risk—all things that are critical to our homeland security.

With the FEMA work force already stretched too thin to adequately respond to current disasters, there are serious questions as to how they will be able to respond as climate change intensifies hurricanes and other disasters.

However, instead of trying to incorporate climate change in how it plans for the future, FEMA has stripped any mention of it from their 2018–2022 strategic plan which guides the agency's actions over the next few years.

But you don't have to look far into the future to see how climate change is affecting us. It is no coincidence that 18 of the 19 warmest years on record have occurred since 2001. The world is getting warmer, and that is a fact.

Or take, for instance, Hurricane Harvey, one of the most devastating storms in recent history. Studies have shown that the rainfall during Hurricane Harvey, which was over 60 inches, was as much as 38 percent higher than would be expected in a world without climate change.

This isn't some far-off phenomenon. This is affecting real people right now—the thousands of residents in and around Houston who dealt with flooding and whose lives are still being put back together.

In my own home State of New Jersey, we are seeing some of the most intense warming trends in our country. In an analysis of data from the National Oceanic and Atmospheric Administration, New Jersey is one of the top 3 fastest-warming States in the country.

Yet, despite these dire warnings, the Federal Government is doing nothing to try to stop the effects of climate change. In fact, it is making the problem worse by rolling back rules and regulations aimed at reducing greenhouse gas emissions and rolling back smart building rules to protect infrastructure from floods.

Despite controlling the House for the past 8 years, Republicans in Congress did nothing to address what scientists agree will be the devastating effects of climate change.

Today, we have an expert panel of witnesses that can discuss the science of climate change, why it matters to our homeland security, and the effects on children, who are a particularly vulnerable population when faced with extreme weather events. I look forward to hearing their views on this topic.

[The statement of Chairman Payne follows:]

STATEMENT OF CHAIRMAN DONALD M. PAYNE, JR.

APRIL 9, 2019

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has stripped any mention of it from their 2018–2022 strategic plan, which guides the agency's actions over the next few years.

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Mr. PAYNE. With that, I now recognize the Ranking Member of the subcommittee, the gentleman from New York, Mr. King, for an opening statement.

Mr. KING. Thank you, Mr. Chairman. I regret that I got here late. I was over on the House floor, and there was sort of a mix-up on when the votes were going to start. But, in any event, I appreciate you having this hearing.

The bottom line is, from the wildfires on the West Coast and tornadoes in the South to the hurricanes along the eastern seaboard of the United States, no area of the country is immune to the devastating effects of natural disasters.

But pre-disaster mitigation has the potential to limit the negative effects of natural disasters. These pre-disaster mitigation efforts by policy makers, individuals, first responders, and emergency preparedness professionals must ensure that no geographic region of the country is left unsupported.

Mitigation activities include upgrading and strengthening existing structures from all hazards, identifying sustainable flood and erosion control projects, purchasing hurricane shutters to resist wind, and managing vegetation to reduce potential fire fuel.

The FEMA's Hazard Mitigation Grant Program helps communities implement hazard mitigation measures following a Presidential major disaster declaration to reduce the risk of loss of life and property from future disasters.

To receive funds through this grant program, FEMA requires each State complete a State hazard mitigation plan. New York's 2019 State hazard mitigation plan highlights 5 goals and objectives, to include: Coordination between Federal, State, and local entities; protection of existing properties; increasing awareness of hazard risk and mitigation capabilities among stakeholders, citizens, and elected officials alike; preserving or restoring the functions of natural systems; and to build stronger infrastructure.

Not only do mitigation activities aim to reduce deaths, injuries, and property damage, they also have the potential to limit the eco-

nomic impact of disaster recovery efforts. A recent report by the National Institute of Building Sciences found that, by designing buildings to meet 2018 building code standards, the National mitigation benefit-cost ratio is $6 to $1 invested for floods and $10 to $1 invested for hurricanes and $12 to $1 invested for earthquakes.

The report also found that impacts of 23 years of Federal mitigation grants provided by FEMA, the Economic Development Administration, and HUD resulted in National benefit of $6 to $1 invested.

Unfortunately, our focus on emergency preparedness oftentimes occurs in the aftermath of a natural disaster, which is too late. However, as we have hardened our defenses preemptively in the event of a terrorist attack, we also must be prepared for the devastation of a severe weather event.

The reality is that natural disasters will continue to occur. We should use every disaster as an opportunity to learn and improve our mitigation capabilities to decrease the loss of life and damage to our homes and infrastructure.

I would also say, Mr. Chairman, though, that I would hope that, as we go forward on this, we focus on what can be done as far as mitigation rather than get into a debate over climate control.

I am not disputing anything that you said, but this committee was established back in 2001, 2002, and 2003 because of the attacks at 9/11. There are any number of other committees in the House that do deal with natural disasters, do deal with climate control. While we have a role to play, I would say I don't want us to go too far afield. We have a hard enough time coordinating our efforts against terrorism.

We always say that other committees are cutting into our turf. We have always said that there should be a focus of our committee on counterterrorism and terrorism. That can be, obviously, expanded to white supremacist groups here in the country. But it is geared toward acts of violence and acts of terrorism.

If we focus our efforts going beyond what I believe is the role of Homeland Security in meeting these natural disasters, then I think we are diluting our efforts and really undercutting the purpose of why this committee was formed back in—I guess it was 2003 before it actually came into effect.

So, with that, again, I commend you for holding the hearing today, but I do hope that, as we go forward, we realize that our main goal as a committee, our main purpose from the genesis was to focus on terrorism. I realize that has been expanded now, which I understand. I support that. But I think we should leave the debate over climate control and global warming to other committees.

We can, let's just say, accept for the purpose of the argument that everything is true, and then we should focus on what the mitigation should be, rather than getting into debates on how to change the climate, or prevent climate change.

With that, I yield back. I also look forward to the testimony of all the witnesses, and I appreciate them taking the time to be here today.

I yield back.

[The statement of Ranking Member King follows:]

STATEMENT OF RANKING MEMBER PETER T. KING

Thank you, Mr. Chairman. From the wildfires on the West Coast and tornadoes in the South, to the hurricanes along the eastern seaboard of the United States, no area of the country is immune to the devastating effects of natural disasters.

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Unfortunately, our focus on emergency preparedness oftentimes occurs in the aftermath of a natural disaster, which is too late.

However, as we've hardened our defenses preemptively in the event of a terrorist attack, we must also be prepared for the devastation of a severe weather event.

The reality is that natural disasters will continue to occur, and we should use every disaster as an opportunity to learn and improve our mitigation capabilities to decrease the loss of life and damage to our homes and infrastructure.

I look forward to hearing from our witnesses today on how to continue to improve our preparedness and mitigation capabilities in the face of the unpredictable nature of disasters and emergencies.

Mr. PAYNE. Well, I would like to thank the gentleman. It is duly noted. I respect your concern in that area, and we will continue to try to work toward our goal, which is to keep the country safe.

Mr. KING. Mr. Chairman, I have no doubt of your dedication, believe me. I want that on the record clear as day.

Mr. PAYNE. Thank you. Yours, as well.

Other Members of the subcommittee are reminded that, under the committee rules, opening statements may be submitted for the record.

[The statement of Chairman Thompson follows:]

STATEMENT OF CHAIRMAN BENNIE G. THOMPSON

APRIL 9, 2019

The very real and sad truth is that climate change is upon us. Unfortunately, under the Republican-controlled House, the Nation lost 8 years of Congressional oversight and planning for climate change.

As recently as 2015, Members of this committee were debating the value of the Federal Government working to address climate change. We cannot afford to have years go by where Congress sits idly by as climate change produces more deadly and frequent natural disasters. A changing climate is a threat to U.S. infrastructure, agriculture, economy, health care, population, and so much more. This all makes it a clear and serious threat to our homeland security.

During the hyperactive 2017 hurricane season and unprecedented California wildfires, we bore witness to the unfortunate impacts of climate change. Hurricane Harvey, for example, was one of the most significant rain events in U.S. history. Through science, we know that the increased temperatures caused more rainfall, and subsequently this extreme rain event.

Science also helps us to understand that human behavior is the largest contributing factor to climate change. Therefore, it is incomprehensible that the Trump administration continues to roll back regulations that help to mitigate the impacts of climate change.

Instead of facing this problem head on, the Department of Homeland Security, as well as other agencies under Trump, refuse to even mention climate change, as if not mentioning it would make it go away. We cannot have DHS, who oversees FEMA, simply ignore a problem that is so critical to our homeland security.

We have reports from the Department of Defense, the Government Accountability Office, and even the Department of Homeland Security in previous administrations, that have recognized this threat. It will threaten our military bases and critical infrastructure, reduce our agricultural yields, and make the spread of disease more prevalent.

Another sad truth is that low-income communities will suffer compounded impacts of climate change. As a Hurricane Katrina survivor, I understand the toll one intense disaster can have on communities—especially low-income communities.

With it being already more difficult for low-income communities to recover from major disasters, it is unfathomable to imagine how these communities will deal with having intense disasters on a more regular basis. More frequent and extreme weather also puts an incredible strain on Federal resources; inhibiting response and recovery activities. We saw this unfold in Puerto Rico following Hurricane Maria, where by the time the storm hit, Federal resources were stretched so thin that the island that suffered from a subpar response, contributing to an astonishing death toll of 3,000.

The Federal Government is already incapable of adequately responding to the disasters we're seeing now, let alone as they get worse in future years. We cannot continue to allow climate change to intensify. We must do what we can to promote a cleaner environment that can be sustained for generations to come.

Investments today in mitigation, that will reduce the future damage of extreme weather events, is a smart down payment for our safety and security, and this administration should be working with Congress to make that happen.

Mr. PAYNE. Our panel. Let me—I welcome our panel of witnesses.

Our first witness, Dr. Astrid Caldas—I am sorry. I did a job on that one, didn't I?

Ms. CALDAS. You are almost there, sir.

Mr. PAYNE [continuing]. Is a senior climate scientist with the Union of Concerned Scientists.

Next we have Mr. Tim Manning, a former deputy administrator of the Federal Emergency Management Agency and currently a senior advisor to the Pacific Disaster Center and president and CEO of Berglind-Manning, L.C.

Next we have Ms. Kristie Trousdale, who is the deputy director of Children's Environmental Health Network.

Last we have Chief Dan Eggleston, who is the president and chairman of the board for the International Association of Fire Chiefs.

Without objection, the witnesses' full statements will be inserted into the record.

I now ask each witness to summarize his or her statement for 5 minutes, beginning with Dr. Caldas.

Say it for me one time.
Ms. CALDAS. Excuse me?
Mr. PAYNE. Say your name for me one time.
Ms. CALDAS. Astrid Caldas.
Mr. PAYNE. Astrid Caldas. Thank you. You may proceed.

STATEMENT OF ASTRID CALDAS, PH D, SENIOR CLIMATE SCIENTIST, UNION OF CONCERNED SCIENTISTS

Ms. CALDAS. Thank you.

Chairman Payne, Ranking Member King, and Members of the subcommittee, thank you for inviting me to testify about climate change science and impacts.

I am Astrid Caldas, a senior climate scientist at the Union of Concerned Scientists, and I will focus on general impacts and not on the military. The sources for our information are in my submitted written testimony.

Eighteen of the 19 warmest years since record keeping began have occurred since 2001. Many high school graduates from the class of 2019 have lived their whole lives in a world of record-breaking temperatures. The last 5 years have been the 5 hottest of all.

There is strong consensus among the scientific community that global warming and climate change have been happening for decades, are caused by humans through the emission of carbon dioxide from the burning of fossil fuels, and that the need for emissions reductions is urgent to avoid the worst consequences.

Two recent scientific assessment reports state that millions of people, including here in the United States, are already being affected by worsened heat, drought, wildfires, flooding from extreme precipitation and sea-level rise, and stronger hurricanes. Economic impacts are staggering. The past 3 years have been 3 of the 4 costliest years for climate-related disasters in the United States.

Climate change is expected to make these disasters worse unless we put all our might into reducing heat-trapping emissions.

There were 13 extreme rain events in the United States between May 2015 and June 2018 even though such events had, historically, a probability of 0.2 percent of occurring in any 1 year. The type of devastating rain that fell in Louisiana in 2016 is expected to occur 40 percent more often and be 10 percent more intense now than it was before global warming.

Extreme rain events have become more frequent and more intense, especially in the Northeast and the Midwest. With more extreme rain, flood frequency has increased in the Mississippi River Valley and across the Midwest over the last century. Eastern Pennsylvania, New York, and New Jersey have also experienced an increase in flood frequency over the last 50 years.

There has been an increase in the intensity of hurricanes since 1970. A warmer sea surface and higher humidity in the air provide fuel to stronger hurricanes, the latter increasing the amount of rain they bring. The record-breaking rainfall from Hurricane Harvey was about 3 times more likely and 15 to 38 percent more intense because of global warming. Storm surge is riding on higher seas, and the area flooded by Hurricane Sandy was about 27

square miles larger than it would have been in 1880, when seas were 8 inches lower.

Heat records are being broken much faster than cold records, with California experiencing record-breaking heat waves in 2017 and 2018. Global warming has contributed to the severity and probability of about 80 percent of record-hot days globally since the mid-20th Century.

Droughts are now occurring at higher temperatures. The flow of the Colorado River has been reduced, and multi-year droughts have led to massive agricultural losses in both California and Texas.

Warming temperatures and dryer soils have contributed to increases in area burned, number of large wildfires, and wildfire season length. The area burned in the western United States between 1984 and 2015 was twice what it would have been without climate change. The Tubbs Fire in 2017 was the most destructive in California's history, until the Camp Fire of 2018 surpassed it.

Finally, climate change can exacerbate historical inequities. Socio-economically vulnerable segments of the population face big challenges recovering from disasters due to lack of resources and historic disfranchising. These communities are often located in riskier areas, such as the Lower Ninth Ward in New Orleans, which flooded heavily during Hurricane Katrina, or can't access resources necessary for recovery, such as in Puerto Rico after Hurricane Maria.

Ignoring climate change will not make it go away or lessen its impacts. Investing in climate preparedness will help reduce future costs of climate impacts, and cutting global warming emissions will help limit the magnitude of those impacts. Only action can make it less damaging to our lives, our health, economy, and planet.

Thank you.

[The prepared statement of Ms. Caldas follows:]

PREPARED STATEMENT OF ASTRID CALDAS

APRIL 9, 2019

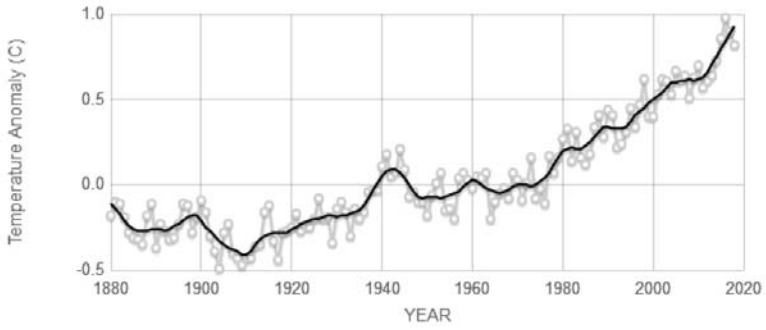
Chairman Payne, Ranking Member King, and Members of the subcommittee, thank you for providing me the opportunity to testify here today on climate change science. I am a senior climate scientist at the Union of Concerned Scientists and in that capacity, I am here to talk about climate science itself, and climate change impacts. I hope you find this testimony valuable to your efforts around Emergency Preparedness, Response, and Recovery

I will start my testimony by calling your attention to the fact that 18 of the 19 warmest years since record keeping began have occurred since 2001, meaning high school graduates from the class of 2019 have lived their whole lives in a world of record-breaking temperatures. Furthermore, the last 5 years have been the five hottest of all.[1] These are all well-recorded data from various sources around the globe and assessed by NOAA and NASA. Global warming is happening right now and has been happening for many decades (Figure 1). The trend is clear and is slated to continue unless we start putting all our might into reducing heat-trapping emissions.

Global warming is caused mainly by the accumulation of carbon dioxide emissions from the burning of fossil fuels such as coal, oil, and natural gas. In addition to warming, this is causing changes in countless natural and human systems that rely on and in turn influence climate. For instance, among other changes, glaciers are shrinking, Arctic sea ice is decreasing, sea level is rising, and oceans are getting warmer and more acidic. Global warming and climate change are two separate—but deeply interconnected—phenomena.

[1] NOAA 2018 *https://www.noaa.gov/news/2018-was-4th-hottest-year-on-record-for-globe*.

FIGURE 1: GLOBAL LAND-OCEAN TEMPERATURE INDEX[2]



Source: climate.nasa.gov

The science of climate change is very well established. Recently, two important scientific assessment reports were released that describe the current and projected impacts of climate change: The Intergovernmental Panel on Climate Change Special Report on Global Warming of 1.5C (IPCC 1.5)[3] and the U.S. Fourth National Climate Assessment (NCA4),[4] mandated by the U.S. Government to be produced every 4 years. Climate assessments provide the public and policy makers with the most scientifically sound summary and evaluation of the most recent policy-relevant research. It is worth noting that each of these reports is the product of hundreds of National and international experts from a range of sectors.

The IPCC 1.5 states that "Human activities are estimated to have caused approximately 1.0 C of global warming above pre-industrial levels, with a likely range of 0.8 C to 1.2 C," and the NCA4 states that "Earth's climate is now changing faster than at any point in modern civilization. [. . .] These changes are primarily the result of human activities, the evidence of which is overwhelming and continues to strengthen." It also states that climate change presents growing challenges to: (1) The economy and infrastructure, (2) the natural environment and the services ecosystems provide to society, and (3) human health and quality of life.[5]

There is strong consensus among the scientific community (as shown in the conclusions of the reports, based on thousands of scientific research publications) that climate change is happening now, is caused by humans, and that the need for emissions reductions is urgent in order to avoid the worst consequences. The NCA4 also quantifies climate change impacts in economic terms, providing an indication of the potential for reducing risks through mitigation actions. The report concludes that these climate-related impacts will only get worse and their costs will mount dramatically if carbon emissions continue unabated. Annual losses in some sectors are projected to exceed $100 billion by the end of the century and surpass the gross domestic product of many States.

Both reports state that millions of people are already being affected on their everyday lives by worsened heat, drought, wildfires, flooding from both extreme precipitation and sea level rise, stronger hurricanes, and more. The economic impacts and costs of these disasters are staggering. The past 3 years have been 3 of the 4 costliest years for climate-related disasters here in the United States (Figure 2). Two thousand eighteen was the fourth-highest year for both the number and costs of declared disasters. Hurricanes Harvey, Irma, Maria, and the California wildfires created unprecedented demand for Federal disaster help in 2017. The Federal Government has provided at least $120 billion in supplemental funding for these disasters, as well as help with response and recovery.[6]

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[2] *https://climate.nasa.gov/vital-signs/global-temperature/*.
[3] *https://www.ipcc.ch/sr15/*.
[4] *https://www.globalchange.gov/nca4*.
[5] *https://www.globalchange.gov/nca4*.
[6] *https://www.gao.gov/products/GAO-18-472*.

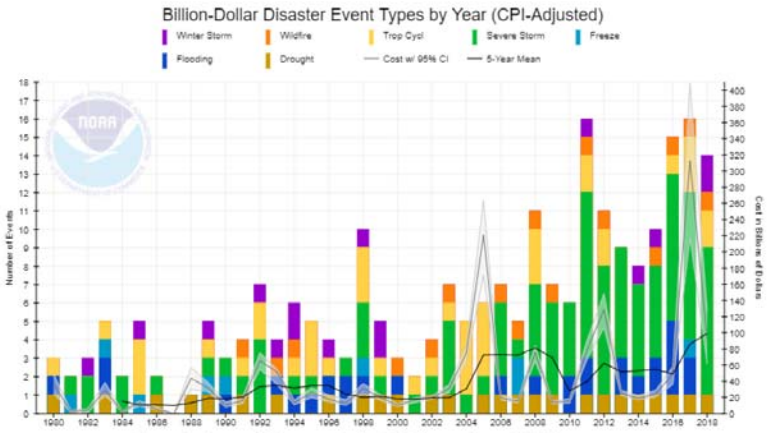
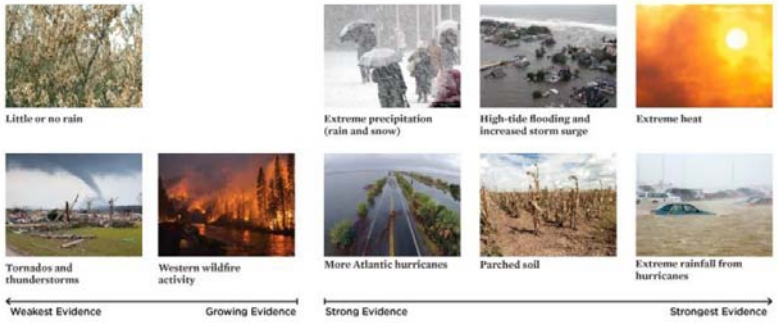


Figure 2: Costs of disasters in the U.S. (Image from NOAA)

As the Government Accountability Office points out,[7] in light of growing extreme weather and climate-related disaster costs, the Federal Government must invest ahead of time to help communities prepare instead of just in recovery after disasters strike. A recent study[8] shows the Nation can save $6 in future disaster costs, for every $1 spent on pre-hazard mitigation. Investing in climate resilience would help reduce future costs of climate impacts and cutting global warming emissions would help limit the magnitude of those impacts.

In the past few years the science has advanced to a point where the proportion of climate change that contributed to the severity and probability of individual extreme events is now possible.[9] The science of attribution tells us that certain types of extreme events have been made more intense and/or more likely by climate change (Figure 3). There is strong evidence suggesting that extreme precipitation (including rain from hurricanes), coastal flooding (from high tides and storm surge), and heat waves are influenced by climate change. We will look at some examples.

FIGURE 3: SCIENTIFIC EVIDENCE FOR CONNECTIONS BETWEEN EXTREME WEATHER EVENTS AND CLIMATE CHANGE[10]



[7] *https://www.gao.gov/highrisk/limiting__federal__government__fiscal__exposure/why__did__study*.

[8] *https://www.nibs.org/page/mitigationsaves*.

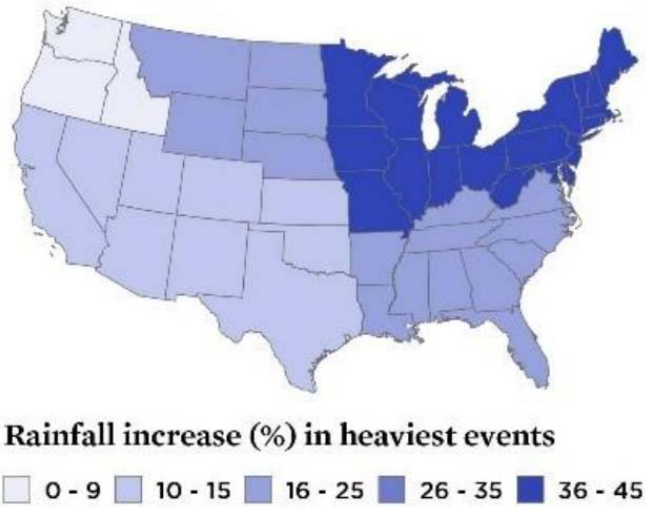
[9] NAS, 2016: Attribution of Extreme Weather Events in the Context of Climate Change. The National Academies Press, 186 pp.

[10] *https://www.ucsusa.org/our-work/global-warming/science-and-impacts/climate-attribution-science*.

EXTREME RAINFALL

Studies have shown that extreme precipitation events have become more frequent and more intense in many parts of the United States since the early to mid–1900's, with the eastern half of the country seeing increases of 50 percent or more in extreme rainfall event frequency and the western half seeing smaller increases or even decreases. The amount of rain falling in the heaviest events is also increasing, especially in the Northeast (Figure 4). Warmer air holds more moisture (in the form of water vapor), and more moisture means more water can fall as rain. This is one reason, all else being equal, a storm occurring in very hot air can bring more precipitation than the exact same storm would in cooler air.

FIGURE 4: PERCENT INCREASE IN THE AMOUNT OF RAIN FALLING DURING THE HEAVIEST 1 PERCENT OF EVENTS PER REGION IN THE CONTINENTAL UNITED STATES BETWEEN 1958 AND 2016 [11]



Rain events once considered rare are now occurring more often than historical records would lead us to expect. For example, the U.S. National Weather Service recorded 13 rare rain events (not including hurricanes) between May 2015 and June 2018 even though such events had a 0.2 percent probability of occurring in any 1 year.[12] All of these events led to flooding.

Analyses of specific rain events are bringing to light the connection between human-induced warming and extreme precipitation. Human-caused climate change made the record-breaking rainfall during Hurricane Harvey in 2017 about three times more likely and 15–38 percent more intense,[13] [14] and a study of the devastating rains in Louisiana in 2016—in which more than 2 feet of rain fell in a 2-day period—concluded that such downpours are expected to occur 40 percent more often and be 10 percent more intense now than they were before the Industrial Rev-

[11] *https://www.ucsusa.org/global-warming/global-warming-impacts/floods; https://www.globalchange.gov/nca4.*

[12] *https://www.nws.noaa.gov/oh/hdsc/aep_storm_analysis/.*

[13] van Oldenborgh, G.J., K. van der Wiel, A. Sebastian, R. Singh, J. Arrighi, F. Otto, K. Haustein, S. Li, G. Vecchi, and H. Cullen. 2017a. Attribution of extreme rainfall from Hurricane Harvey, August 2017. Environmental Research Letters 12(12):1–11. doi:10.1088/1748-9326/aa9ef2.

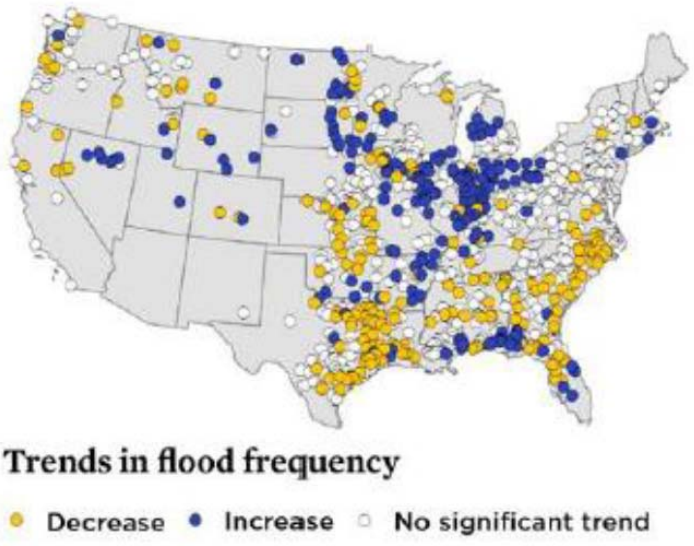
[14] Risser, M.D., and M.F. Wehner. 2017. Attributable human-induced changes in the likelihood and magnitude of the observed extreme precipitation during Hurricane Harvey. Geophysical Research Letters 44(24):12457–12464. doi:10.1002/2017GL075888.

often and be 10 percent more intense now than they were before the Industrial Revolution and global warming.[15]

FLOODING

More volume of rainfall falling in the heaviest events for a region typically leads to flooding. Data from gauges in rivers and streams consistently show that flood frequency has increased in the Mississippi River valley and across the Midwest over the last century. Similarly, parts of the Northeast—eastern Pennsylvania, New York, and New Jersey in particular—has experienced an increase in flood frequency over the last 50 years (Figure 5). These regions are mostly seeing more floods, not necessarily more severe floods, although some increase in moderate and major flood frequency risk has occurred, especially in the Midwest.

FIGURE 5: TRENDS IN FLOOD FREQUENCY[16]



HURRICANES

Recent research suggests that there has been an increase in intense hurricane activity in the North Atlantic since the 1970's. With global warming, there will likely be more intense hurricanes, whose impacts are likely to be exacerbated by sea level rise. Increases in population density along the coast also increases the destructive potential of hurricanes. The Congressional Budget Office, in a report on potential increase in hurricane damage, stated that between 2000 and 2010 the population of counties susceptible to hurricane damage grew 22 percent faster than the overall U.S. population.[17]

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[15] van der Wiel, K., S.B. Kapnick, G.J. van Oldenborgh, K. Whan, S. Philip, G.A. Vecchi, R.K. Singh, J. Arrighi, and H. Cullen. 2017. Rapid attribution of the August 2016 flood-inducing extreme precipitation in south Louisiana to climate change. Hydrology and Earth System Sciences 21(2):897–921. doi:10.5194/hess-21-897-2017.

[16] *https://www.ucsusa.org/global-warming/global-warming-impacts/floods;* Slater, L.J., and G. Villarini. 2016. Recent trends in US flood risk. *Geophysical Research Letters* 43(24):12428–12436. doi:10.1002/2016GL071199.

[17] *https://www.cbo.gov/publication/51518.*

Hurricanes can form when surface ocean temperatures exceed about 79°F (26° C). The rising of warm, moist air from the ocean helps to power the storm. Oceans absorb most of the warming in the atmosphere, and since 1970, sea surface temperatures world-wide have warmed by about an average of 0.1° C per decade, which provides additional fuel to hurricanes. Hurricanes also require high humidity, and since warmer air can hold more water vapor, that also helps fuel hurricanes—and increase the amount of rain they bring (see Figure 6).

The impact of a hurricane's storm surge can be worse now than in the late 19th Century, because sea level has risen by 8 inches since then, mainly due to global warming. In fact, the area flooded by Hurricane Sandy in 2012 was about 27 square miles larger than it would have been if the hurricane hit in 1880, mainly because of sea level rise.[18]

Figure 6: Hurricanes in a warmer world

EXTREME HEAT

With global warming, heat records are being broken much faster than cold records.[19] On average, hot days are getting hotter and cold days are also getting hotter globally. In the United States, California experienced record-breaking heat waves in 2017 and 2018, in addition to several others since the then record-breaking wave of 2006.

Extreme heat is one type of extreme weather for which the evidence of climate change's influence is strong (see Figure 3), and all over the world heat waves are occurring more frequently. A study has found that global warming has contributed to the severity and probability of about 80 percent of record-hot days globally over the 1961–2010 period.[20]

WILDFIRES

Warming temperatures and drier soils, important factors in wildfires, have contributed to increases in area burned, number of large wildfires, and wildfire season length. Other factors such as wind, land use, and forest management also play roles in determining wildfire risk.

More frequent and extensive wildfires pose threats to lives, critical infrastructure, and property. According to the NCA4, the area burned in the Western United States between 1984 and 2015 was twice what it would have been without climate change[21] (Figure 7). In October 2017, more than a dozen fires burned through northern California, killing dozens of people and leaving thousands more homeless. The poor air quality as smoke plumes darkened skies caused the cancellation of school and other activities across the region. The Tubbs Fire, which burned parts of Napa, Sonoma, and Lake counties, was the second-most destructive in California's history, with an estimated $1.2 billion in damages, including the destruction of over

[18] Miller, K.G., R.E. Kopp, B.P. Horton, J.V. Browning, and A.C. Kemp. 2013. A geological perspective on sea-level rise and its impacts along the U.S. mid-Atlantic coast. Earth's Future 1(1):3–18. doi:10.1002/2013EF000135.

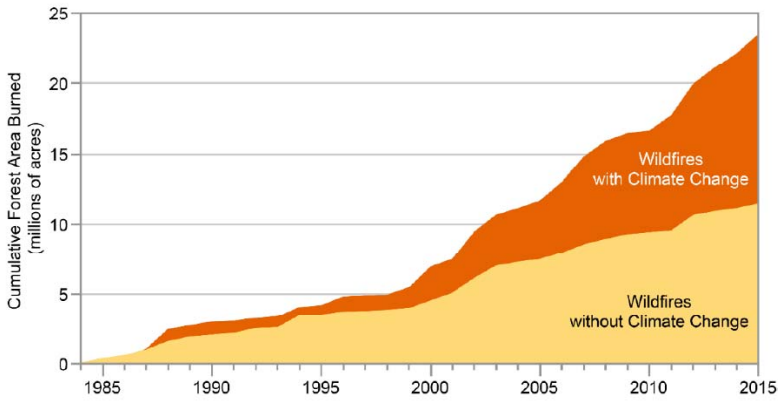
[19] *https://science2017.globalchange.gov/*.

[20] Diffenbaugh, N. S. et al. 2017. Influence of global warming on extreme events. Proceedings of the National Academy of Sciences, 114 (19) 4881–4886; DOI: 10.1073/pnas.1618082114.

[21] *https://nca2018.globalchange.gov/chapter/25/*.

5,000 structures. The Camp Fire of 2018 surpassed it in number of structures and acreage burned, and in number of deaths.[22]

FIGURE 7: CUMULATIVE AREA BURNED BY WILDFIRES IN THE WESTERN UNITED STATES[23]



DROUGHT

Droughts have always occurred, but they are now occurring at higher temperatures, causing massive die-off of forest species in the 4-corners region (trees that were centuries old and experienced droughts before). California is suffering massive losses in its agricultural system due to a multi-year drought, and the flow of the Colorado river has been reduced due to higher temperatures.

According to the NCA4, during 2010–2015, a regional drought impacted agriculture in the Southern Great Plains, with soybeans fields in Texas severely affected due to the reduction of irrigation water released for farmers on the Texas coastal plains.

EQUITY CONSIDERATIONS

Climate change can exacerbate historical inequities, environmental injustice, and environmental racism. Disadvantaged segments of the population already face big challenges recovering from disasters, due to lack of resources and historical disenfranchising, and disasters make these challenges worse. A recent analysis of U.S. Government recovery programs showed that "white Americans and those with more wealth often receive more Federal dollars after a disaster than do minorities and those with less wealth."[24] Also, a recent study showed that "natural hazard damages and how relief is provided afterward [in the United States] exacerbate the growing gap between white and black wealth."[25]

Children, older adults, people of color, and fixed and low-income communities are often at greater risk. The latter are often located in riskier areas that may be more prone to flooding, such as the Lower Ninth Ward in New Orleans, which flooded heavily during Hurricane Katrina, or have fewer public services and resources necessary for recovery from disasters. In Puerto Rico, when hurricane Maria hit, almost 3,000 residents died, the majority for lack of access to medical services.[26]

Extra attention must be paid to ensure that the vulnerabilities of these front-line communities are identified and addressed.

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[22] *http://calfire.ca.gov/communications/downloads/fact_sheets/Top20_-_Deadliest.pdf.*

[23] *https://nca2018.globalchange.gov/chapter/25/#fig-25-4.*

[24] *https://www.npr.org/2019/03/05/688786177/how-Federal-disaster-money-favors-the-rich.*

[25] Howell, J., & Elliott, J.R. (2018). As Disaster Costs Rise, So Does Inequality. Socius. *https://doi.org/10.1177/2378023118816795.*

[26] *https://publichealth.gwu.edu/sites/default/files/downloads/projects/PRstudy/Acertainment of the Estimated Excess Mortality from Hurricane Maria in Puerto Rico.pdf.*

ACTION IS NEEDED ON BOTH ADAPTATION AND MITIGATION

Ignoring climate change will not make it go away or lessen its impacts. Only action on both adaptation (reducing and preparing for the risks) and mitigation (reducing heat-trapping emissions) can make it less damaging to our lives, our health, our economy, and our planet.

Thank you for this opportunity to speak with you today. I look forward to your questions.

Mr. PAYNE. Votes have just been called, so the committee will stand in recess to allow Members to vote on the floor. The committee will reconvene 15 minutes after the conclusion of the last vote in this series of votes on the floor.

So, for right now, we are in recess.

[Recess.]

Mr. PAYNE. The committee will come to order.

I believe next we have Mr. Tim Manning, former deputy administrator of the Federal Emergency Management Agency and currently a senior advisor to the Pacific Disaster Center and the president and CEO of Berglind-Manning, L.C.

Mr. Manning.

STATEMENT OF TIMOTHY MANNING, SENIOR ADVISOR, PACIFIC DISASTER CENTER, AND PRESIDENT AND CEO, BERGLIND-MANNING, L.C.

Mr. MANNING. Thank you, Mr. Chairman.

Chairman Payne, Ranking Member King, Members of the subcommittee, thank you for the opportunity to speak with you this afternoon on the impact of a changing climate on disasters.

I am Tim Manning, former deputy administrator of FEMA for Protection and National Preparedness, currently serving as a consultant and university lecturer on disaster and emergency management and global resilience. I appreciate the opportunity to speak with you on this critical topic today.

Disasters are increasing with frequency and impact world-wide. Two-thousand eighteen saw the fourth-highest number of billion-dollar disasters, only behind 2017, 2016, and 2011.

The American disaster preparedness and response community has made and continues to make enormous strides in its ability to prepare our communities for the risks and hazards with which they are faced. Disaster management plans, strategies, staffing, response—they are all based in an assessment of potential future crises that is in most cases rooted and calibrated against an understanding of the hazards and disasters of the past.

My great concern and consideration of the rapidly-changing climate is that we may be significantly underestimating the risks and hazards with which we are faced and the readiness of emergency management agencies to respond. Without an overt and concerted effort to account for the impacts of climate change, FEMA and the American emergency management community will not be fully prepared to protect, mitigate, and respond to the threats facing the Nation.

We know a changing climate makes disasters worse—more frequent, more intense storms, often in places unaccustomed to such events, impacting infrastructure, exacerbating flooding, and even expanding the spread of mosquito- and other insect-borne diseases.

A warmer atmosphere holds more moisture and results in significantly heavier rainfall in shorter periods of time. Heavy precipitation events in the Midwest and Northeast, in particular, have increased by up to 50 percent since 1900 and may increase as much as another 50 percent over the next 50 years. With this increase in heat retention comes warmer oceans and the potential for stronger, more intense coastal storms, including in areas unaccustomed to such events.

Shifting temperatures result in shifting weather patterns in the interior, potentially resulting in greater or less snowfall in areas, changing the spring flood risk and other impacts.

Rising sea levels raise the base on which storm surge and tsunamis ride, greatly increasing the potential inundation of areas, as well as bringing frequent non-storm blue-sky or clear-sky flooding to American cities such as Charleston; Annapolis, Maryland; and New York City.

Changing weather patterns affect wildfire risk as well. According to analysis by the National Research Council, we have experienced an extension of the western fire season of more than 2 months in a year. The average size of wildfires has increased by 300 percent.

While many attempts to address the impacts of climate change have been made in recent years, as you noted, Mr. Chairman, in your opening remarks, the word "climate" does not occur once in the current 2018 to 2022 FEMA strategic plan. One argument is that the general philosophical approach to emergency management of all-hazards preparedness, in which agencies prepare for any hazard, accounts for any potential changes from climate. But that belies the reality.

Staffing, budgeting, the number and scale of response teams, equipment, prepositioning, even response planning assumptions are all based on an assessment of what worked or didn't in previous disasters. Underestimating the severity, frequency, or possible location of disasters will result in organizations under-resourced for the mission at hand.

The strategic objectives of FEMA are laudable. In their strategic plan, the goal of quadrupling the investment in mitigation is an ambitious and potentially very valuable effort. However, if this investment is made against the base flood elevation model that does not account for rising sea levels and increased rainfall intensity, it can likely lead to poor decisions and wasted money and effort.

In 2015, President Obama issued Executive Order 13690 which, among other things, established a Federal flood standard in recognition of rising sea level and climate change of an additional 2 to 3 feet of freeboard for Federally-funded projects, including hazard mitigation. However, in August 2017, President Trump rescinded that order.

FEMA and the emergency management community is not likely to be right-sized or positioned for its potential disaster mission without accounting for a likely future that is very different from its recent past.

The international community recognized this with the Sendai Framework for Disaster Risk Reduction, to which the United States is a signatory, by calling on nations to, "prepare or review and periodically update disaster preparedness and contingency

policies, plans, and programs considering climate change scenarios and their impact on disaster risk". We should adopt this approach as well.

Mr. Chairman, thank you again for the opportunity to discuss the impact of climate change on disasters and the emergency management community in the United States, and I look forward to your questions.

[The prepared statement of Mr. Manning follows:]

PREPARED STATEMENT OF TIMOTHY MANNING

APRIL 9, 2019

Chairman Payne, Ranking Member King, Members of the subcommittee, thank you for the opportunity to speak with you today on the impact of a changing climate on disasters, emergency management agencies, and communities' readiness for crises. I am Tim Manning, former deputy administrator of FEMA for Protection and National Preparedness, currently serving as a consultant and university lecturer in disaster and emergency management and global resilience. Thank you for inviting me here today to discuss this critical topic

Disasters are increasing with frequency and impact world-wide. Two thousand-eighteen saw the fourth-highest total number of billion-dollar disasters, only behind the years 2017, 2011, and 2016. And over the past many years, the American disaster preparedness and response community has made, and continues to make, enormous strides in its ability to prepare our communities for the risks and hazards with which they are faced, and respond to the multitude of disasters impacting our Nation. In the time between crises, tremendous work is undertaken to build the capacity of our governmental and non-governmenetal agencies, in staffing, training, equipping, and planning. These efforts, however, and the targets against which success is measured, are all based in an assessment of potential future crises that is, in most cases, rooted and calibrated against an understanding of the hazards and disasters of the past. My great concern, in consideration of the significant change in the profile of disasters of recent years as a result of a rapidly-changing climate, coupled with population, housing stock, and GDP growth in coastal communities, is that we may be significantly underestimating the risks and hazards with which we are faced, and the readiness of emergency management agencies to respond. And without an overt and concerted effort to account for the impacts of climate change, FEMA and the American emergency management community will not be fully prepared to protect, mitigate, and respond to the threats facing the Nation.

There is no currently no scientifically-based method, of which I am aware, to link any specific individual disaster to climate change. But we can predict that a changing climate will make disasters worse—more frequent and more intense storms, often in places unaccustomed to such events; reduce the effectiveness, or render inoperable, infrastructure; exacerbate flooding; and even public health emergencies from the potential spread of mosquito and other insect-borne diseases into new areas.

By objective, empirical measures, the Earth's climate is changing. The past 5 years have been the hottest 5 years in human history; 8 out of the top 10 have been in the past 10, and all of them in past 20. The atmospheric gasses that have the greatest impact on heat retention have increased to levels never before recorded or measured. Within the past few weeks, the NOAA Mauna Loa observatory measurement of carbon dioxide in atmosphere was 415 parts per million, a 30 percent increase since the 1960's, half again as much as the start of the industrialist revolution, and on its way to twice the concentration that has existed over the past 10,000 years. Water vapor, the variable with the most impact on warming, has also been increasing. As warmer air holds more water, a feedback loop develops which may result in further warming. Further, a warmer atmosphere holding more moisture can result in significantly heavier rainfall in shorter periods of time. According to the fourth annual National Climate Assessment, the number of the top-heavy precipitation events United States, in the Midwest and Northeast in particular, have increased by 40 percent to 50 percent since 1900, and may increase as much as a further 50 percent over the next 50 years.

American society has grown as it has, in the places it has, with the infrastructure is has, in an adaptation to the environment and climate of its regions, and with a change to that climate, our infrastructure is often unsuited to the volume of runoff, temperature, water resources. Changing demographics and economics has resulted

in increasing urbanization and a migration toward coasts globally, and the United States is no different. This puts a growing population, and its housing stock and economic production, in the way of potential changing weather patters, and likely increasing risk.

With this increase in heat retention in the atmosphere, comes warmer oceans. Hurricanes, typhoons, and other cyclonic storms are fueled by warm water, and with warmer water, comes the potential for stronger, more intense coastal storms. And with warmer water further north and comes new storm risks in areas unaccustomed to frequent tropical storms. Shifting temperatures also result in shifting weather patterns in the in interior, potentially resulting in greater or less snowfall in areas, and changing spring flood risk.

Warmer water also occupies greater volume than cooler water, and so in combination with melting polar ice, warmer oceans result in a rising sea level, raising the base level on which storm surge and tsunamis ride greatly increasing the potential inundation areas. Additionally, non-storm high tide flooding, or so-called "nuisance flooding" or "blue sky flooding" is an increasing problem in American cities such as Charleston, South Carolina and Annapolis, Maryland. The Intergovernmental Panel on Climate Change's most conservative estimates for potential sea level rise, not even accounting for subsidence as we're seeing in the Chesapeake Bay and Norfolk areas, we can expect up to 2 feet of rise by the end of the century. Using updated data and methods, the National Climate Assessment predicts up to 4 feet. For context, here in Washington, that results in flooding of much of Anacostia Naval Station and Reagan National Airport on a normal day. If the storm surge experienced during Hurricane Isabel or Hurricane Hazel, it could mean well into Washington, DC, and flood all of Bolling Naval Air Station and Reagan National Airport, and all of Norfolk.

There is an old saying regarding the difference between weather and climate that "climate it what you expect, and weather is what you get" and that's no more obvious than with the effect of a warming global climate on severe cold weather events in winter. Warmer air from the tropics disturbing the winter jet stream results in unusually cold arctic air being pulled down into the Midwest and mid-Atlantic, spawning so many of the comments dismissive of climate-change warnings such as "if there's global warming, why is it so cold?" These unusually cold weather events degrade first responders' capabilities and exhaust the resources of even otherwise well-prepared cities, putting millions of people at risk.

Changing weather patterns affect wildfire risk as well. According to analysis of the National Research Council, we have experienced an extension of the western fire season of more that 2 months, and average size of wildfires has increased by 300 percent.

And what does this mean for disaster impacts and FEMA and emergency management? Using the recent past for an expectation of future disasters has always been a challenging approach. The variability of natural events intersecting with our communities means that estimating the probability of disaster activity 1 year to the next is difficult. As with hurricane season prediction, a less-than-average year can still overwhelm the response and recovery system with a single storm coming ashore in the wrong place as we experienced with Hurricane Andrew. In the face of what we can objectively observe as a rapidly-changing disaster environment, we must ensure we take this very likely different future into account when planning.

While many attempts to address the impacts of climate change have been made in recent years, the word "climate" does not occur once in the current 2018–2022 FEMA Strategic Plan. One may make the argument that the general philosophical approach to emergency management, that of "all-hazards" preparedness in which agencies prepare for any possible disaster rather that specific scenarios, and that a changing climate does not create new hazards, but simple exacerbates existing, and therefore attention to climate change is unnecessary. But that belies the truth: Staffing, budgeting, the number and scale of response teams, equipment, prepositioning, and even response planning assumptions, are all based on an assessment of what worked or didn't in previous disasters. And underestimating the severity, frequency, or possible location of disasters will result in organizations underresourced for the missions at hand.

The strategic objectives of FEMA are laudable and will likely assist in preparing for the effects of climate change. For example, quadrupling the investment in mitigation is an ambitious and potentially valuable effort. However if this investment is made against a base flood elevation model that does not account for rising sea levels and increased rainfall intensity, it can likely lead to poor decisions and wasted money and effort. In 2015, President Obama issued E.O. 13690 which among other things, directed climate-informed decision making in relevant policy and established a Federal flood standard of an additional 2 feet of free board for non-crit-

ical actions and 3 feet for critical actions (such as the location of critical infrastructure). In August 2017, President Trump rescinded it.

FEMA, the Federal Government, and the American emergency management community, is not likely to be right-sized or positioned for its potential disaster mission load, nor able to support smart investment in disaster mitigation and risk reduction without accounting for a likely future that is very different from its recent past. The international community recognized this with the Sendai Framework for Disaster Risk Reduction, to which the United States is a signatory, by calling on nations to "prepare or review and periodically update disaster preparedness and contingency policies, plans, and programmes . . . considering climate change scenarios and their impact on disaster risk . . . ". We should too.

Thank you again for the opportunity to discuss the impact of climate change on disasters and the emergency management system in the United States. I look forward to your questions.

Mr. PAYNE. Thank you, Mr. Manning.

Ms. Kristie Trousdale is the deputy director for Children's Environmental Health Network.

We would at this time hear your summary of your testimony.

STATEMENT OF KRISTIE TROUSDALE, MPH, DEPUTY DIRECTOR, CHILDREN'S ENVIRONMENTAL HEALTH NETWORK

Ms. TROUSDALE. Thank you. Good afternoon, Chairman Payne, Ranking Member King, and distinguished Members of the subcommittee. It is an honor to testify before you today.

Our children are our most valuable resources. They represent the future of our Nation. Yet 1 in 4 students in the United States has a chronic condition.

Many of the childhood diseases and developmental disabilities that have been increasing over the past 40 years are environmentally mediated. Children are more vulnerable than adults to environmental hazards because of their unique physiological and behavioral traits and because their bodies are still developing. The youngest children are not aware of environmental risks, and they lack the knowledge, resources, and power to address them.

Climate change heightens these risks, especially for children from communities of color and lower income. Droughts, wildfires, and extreme heat events are increasing in frequency and intensity; hurricanes and flooding are increasing in severity; and patterns of infectious disease are changing.

Pediatricians in the United States report that they are already seeing the serious effects of climate change on children's health. We know that young children are among those most at risk from physical injuries and death resulting from wildfires and weather disasters. They are dependent on caregivers and may lack the knowledge, mobility, and communication skills to keep safe.

Disasters can also cut off access to medical care, compounding the risks to injured children as well as to those with pre-existing conditions.

Extreme weather disasters also affect children's mental health. Children exposed to Hurricane Katrina were 5 times as likely as pre-Katrina cohorts to have serious emotional issues such as post-traumatic stress disorder, anxiety, and depression. For many of the most vulnerable children, these issues persist and adversely affect the trajectory of their lives.

Heat waves are projected to increase in frequency and intensity. Research has associated low birth weights, premature birth, and

congenital heart defects with maternal exposure to extreme heat. Young children are also more vulnerable to heat-related illness, and student athletes are at the greatest risk from exertional heat stroke.

Climate change is degrading our air quality. Approximately 10 percent of children aged 5 to 19 in the United States suffer from asthma. Increased levels of ground-level ozone, particulate matter, and pollen due to warmer temperatures, increased atmospheric carbon dioxide, and more frequent, intense, and long-lasting wildfires exacerbate asthma symptoms. Inhalation of particulate matter also affects unborn children by increasing the risk for premature births and lower birth weights.

Infectious disease risks, such as foodborne and waterborne illnesses, increase with climate change. Access to safe drinking water is critical. Children drink more proportionately than adults, and because their immune systems are still developing, they can have more pronounced responses to infections.

In addition, the changing climate can create conditions favorable for the spread of vector-borne diseases such as Lyme disease and Zika. In the United States, young boys are among those most at risk of contracting Lyme disease, and children born to women infected with the Zika virus are at risk for microcephaly, brain damage, and other birth defects.

Over 13 million children in the United States live in food-insecure households, and disasters exacerbate this as families face food spoilage, employment instability, and disrupted food systems.

Also, many families rely on the free or reduced breakfasts and lunches offered through schools to help ensure their children are fed. When disasters strike, children, however, are unable to attend school, some of them for weeks.

Indeed, schools and child care programs are important settings for the approximately 65 million American children who attend them and for their communities, yet there is no Federal oversight for the protection of their environmental health in these settings. Many facilities are old, contain hazardous building materials, and are in poor condition. Many are located on or near hazardous sites. These risks can be amplified in disasters, and many schools and child care providers lack the resources, capacity, and knowledge to address them.

Climate change makes children's environmental health and issues of health disparities more visible than ever. I urge the subcommittee to consider children's unique vulnerabilities in all environmental decisions and policies within its jurisdiction, providing special consideration of those children who are most vulnerable. This is our moral imperative, and it is an investment in the stability and security of our country.

Thank you for your leadership and for the opportunity to testify before this subcommittee.

[The prepared statement of Ms. Trousdale follows:]

PREPARED STATEMENT OF KRISTIE TROUSDALE

APRIL 9, 2019

Good afternoon Chairman Payne, Ranking Member King, and distinguished Members of the subcommittee. It is an honor to appear before you today at this impor-

tant hearing to discuss Homeland Security impacts related to climate change. I am Kristie Trousdale, deputy director of the Children's Environmental Health Network (CEHN).

CEHN is a National nonpartisan nonprofit organization with the mission of protecting the developing child from environmental health hazards and promoting a healthy environment. We raise awareness of how natural and built environments affect children's health; support and stimulate preventive research; advocate for strong, child protective policy; and provide education and training to multiple audiences on children's environmental health and actionable steps to reduce children's exposures to environmental hazards. CEHN has been the National leading voice of children's environmental health for over 27 years and leads or advises many of the critical National conversations on children's environmental health issues, including service to the National Institutes of Health and U.S. Centers for Disease Control and Prevention.

Our children are our most valuable resources. They represent the future stability and security of our Nation. Yet approximately 75 percent of young Americans between 17 and 24 would not qualify for military service, with nearly one-third ineligible due to health problems other than obesity, such as asthma, mental health issues, or Attention Deficit Hyperactivity Disorder.[1] One in 4 students in the United States students has a chronic condition, 1 in 5 has learning and attention problems, and the number of children receiving Social Security Income for disability is almost 7 times larger than it was 30 years ago.[2 3 4]

This is not just a problem for our country's military and defense needs. Over the past 3 decades there has been an unsettling rise in the number of Americans who are unfit for work. Currently over 13 million Americans receive a disability check from the Government, and most of them are unable to work.[5] This represents a looming National security and stability crisis. Many of the childhood chronic diseases and developmental disabilities that have been increasing significantly over the past 40 years are environmentally mediated, and many are already increasing and intensifying due to our changing climate. Children from communities of lower income and communities of color face greater exposures to pollution and environmental hazards and suffer disproportionately from the resulting health effects.[6 7]

Over 88 percent of global disease associated with climate change impacts children—especially the youngest and most vulnerable children.[8] However, their unique needs continue to be under-prioritized in conversations and actions around mitigation, preparedness, response. I urge that the subcommittee use its role to ensure that children's health and development are placed at the center of decision making for policies within its jurisdiction related to climate change.

There is solid consensus in the scientific community that children are more vulnerable than adults to environmental hazards because of their unique physiological and behavioral traits. A child's patterns of exposure differ than that of an adult. For example, many harmful air pollutants are emitted or exist low to the ground, within a young child's breathing zone, such as motor vehicle exhaust, mercury vapor, radon, and pesticides.[9] Infants and toddlers also crawl and play on the ground and explore the world orally which exposes them, via ingestion, to more hazards.[9] Proportionately, children eat more, drink more, and breathe more than adults, and their skin surface area to volume ratio is greater as well, increasing risk for dermal absorption of harmful compounds.[9] Their bodies also differ in how they absorb, detoxify, and excrete substances.

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[1] Ready, Willing, and Unable to Serve. Mission: Readiness. Retrieved April 4, 2019 from *http://cdn.missionreadiness.org/MR-Ready-Willing-Unable.pdf.*

[2] Centers for Disease Control and Prevention. Managing Chronic Health Conditions in Schools. Retrieved April 4, 2019 from *https://www.cdc.gov/healthyschools/chronicconditions.htm.*

[3] National Center for Learning Disabilities. The State of Learning Disabilities: Understanding the 1 in 5. Retrieved April 4, 2019 from *https://www.ncld.org/the-state-of-learning-disabilities-understanding-the-1-in-5.*

[4] National Public Radio. Unfit for Work: The startling rise of disability in America. Retrieved April 4, 2019 from *http://apps.npr.org/unfit-for-work/.*

[5] Social Security Administration. Monthly Statistical Snapshot. Retrieved April 4, 2019 from *https://www.ssa.gov/policy/docs/quickfacts/stat_snapshot/.*

[6] Southeast Pediatric Environmental Health Specialty Unit. Monograph. Break the Cycle of Environmental Health Disparities in Vulnerable Children. Retrieved April 4, 2019 from *https://www.researchgate.net/publication/51970363_Break_the_Cycle_of_environmental_health_-disparities_in_vulnerable_children.*

[7] Children's Environmental Health Network. Children and health disparities. Retrieved April 4, 2019 from *https://cehn.org/wp-content/uploads/2015/11/EJ-Factsheet_2018_FINAL.pdf.*

[8] Zhang Y, Bi P, Hiller JE. Climate change and disability-adjusted life years. J Environ Health. 2007; 70:32–36.

Additionally, children are more vulnerable to harm from these exposures because their bodies are still developing. There are critical windows of development for organs and organ systems, during which, if disrupted by a harmful exposure or experience, adverse and lasting effects can occur.[9] Early exposures have the potential for not only immediate harmful effects on children's health and development, but can set up the system for developing disease later in life as well.[9] Indeed, children have many years of life ahead of them within which to develop symptoms of diseases with long latency periods that may have been triggered by early exposures, such as cancer or Parkinson's disease. Older children have agency, and more and more young people are speaking out on their own behalf and mobilizing action with regard to climate change's impacts on their generation. However, the youngest of children are not aware of environmental risks and climate change, and they lack the knowledge, mobility, funds, and power to address them. Children are dependent on adults to protect them, and it is our moral imperative to do so.

Climate change is increasing the frequency and severity of droughts, wildfires, and extreme heat events. It is increasing the severity of superstorms and flooding and affecting the incidence and geographic distribution of infectious diseases. These effects intensify existing environmental health risks to children.[10] In addition, children are more likely to live in high-risk areas such as floodplains, and they are more likely to live in poverty.[11] Pediatricians in the United States report that they are already seeing the serious effects of climate change on children's health.[12] Thus, mitigation of climate change via significant reductions in greenhouse gas emissions is of utmost importance in child health protection.

In addition, children remain an afterthought in preparedness, response, and recovery measures during natural disasters. In 2010, the National Commission on Children and Disasters released an assessment of the gaps in Federal planning that lead to risks to children in times of disasters. The Commission developed 81 recommendations and sub-recommendations to prioritize the health and safety of children in preparedness, response, and recovery measures.[13] However, as of 2015, 79 percent of these recommendations remained unfulfilled.[14]

The following climate change-related environmental effects are among those of concern regarding children.

HEAT-RELATED ILLNESS

Children and pregnant women are among those most at risk from extreme heat events and the frequency and intensity of these events are projected to increase in the coming decades due to climate change. Studies have associated low birth weight, premature birth, and certain congenital heart defects with maternal exposure to extreme heat during critical windows of development.[15] [16] [17] Young children are also less able than adults to regulate their body temperature, they tend to dehydrate more quickly, and they are more likely to be physically active outdoors. Student athletes, especially youth football players and long-distance runners, are at risk from exertional heat stroke.[18] Over 9,000 U.S. high school athletes are treated for heat

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[9] Bearer, CF. Environmental health hazards: How children are different from adults. Future Child. 1995; 5(2):11–26.

[10] Stanberry LR, Thomson MC, James W (2018) Prioritizing the needs of children in a changing climate. PLoS Med 15(7): e1002627. *https://doi.org/10.1371/journal.pmed.1002627.*

[11] Fothergill, A. (2017, July 27). Children, Youth, and Disaster. Oxford Research Encyclopedia of Natural Hazard Science. Ed. Retrieved 31 Mar. 2019, from *http://oxfordre.com/naturalhazardscience/view/10.1093/acrefore/9780199389407.001.0001/acrefore-9780199389-407-e-23.*

[12] The Medical Society Consortium on Climate and Health. Accessed on April 1, 2019 at *https://medsocietiesforclimatehealth.org/about/.*

[13] National Commission on Children and Disasters. 2010 Report to the President and Congress. Retrieved April 2, 2019 from *https://archive.ahrq.gov/prep/nccdreport/nccdreport.pdf.*

[14] 2015 National Report Card on Protecting Children in Disasters. Save the Children. Retrieved April 2, 2019 from *https://www.savethechildren.org/content/dam/usa/reports/emergency-prep/disaster-report-2015.pdf.*

[15] S. Ha, D. Liu, Y. Zhu, S.S. Kim, S. Sherman, P. Mendola. Ambient temperature and early delivery of singleton pregnancies. Environ. Health Perspect., 125 (2017), pp. 453–459.

[16] Ha S, et al. Ambient temperature and early delivery of singleton pregnancies. Environ Health Perspect. 2017;125(3):453. doi: 10.1289/EHP97.

[17] Zhang, W., et al. Projected Changes in Maternal Heat Exposure During Early Pregnancy and the Associated Congenital Heart Defect Burden in the United States. Journal of the American Heart Association. 2019; 8:(3).

[18] Beasley, M. Athletes and heat stroke: Prevention and treatment. Boston Children's Hospital Notes. Retrieved April 1, 2019 from *https://notes.childrenshospital.org/protecting-athletes-heat-exertional-heat-stroke-prevention-sports-medicine-specialist/.*

illness each year, and in the past two decades, deaths of football players due to heat stroke nearly doubled.[19] [20]

AIR QUALITY

Approximately 10 percent of children aged 5–19 in the United States suffer from asthma.[21] According to the Centers for Disease Control and Prevention, 1 in 6 children with asthma ends up in the emergency department and about 1 in 20 is hospitalized each year.[22] Asthma is the leading cause of school absenteeism, accounting for millions of missed school days each year.[23] The warmer temperatures brought about by climate change lead to increased concentrations of smog/ground level ozone, a major contributor to asthma exacerbation that is also known to decrease lung functioning in young children and at elevated levels to lead to the development of asthma in children who play outdoor sports.[24]

Allergic response to pollen is also one of the most common causes of asthma exacerbations in children, and warming temperatures extend the length of pollen-producing plants' growing season and the duration of the allergy season. In addition, increased levels of atmospheric carbon dioxide results in increased production of pollen from plants such as ragweed, and increased potency of the pollen produced.

Inhalation of particulate matter also exacerbates asthma and children's other respiratory illnesses. This particle pollution can also affect unborn children by increasing the risk for premature births and for lower birth weights. Particulate matter is a mixture of solid particles and liquid droplets found in the air. The particles exist in many different sizes and can contain hundreds of different chemicals. Those particles that are under 10 micrometers in diameter (PM10), and especially those under 2.5 micrometers (PM2.5) in diameter, can lodge deep within our lungs and pose the greatest health risks. Over 10,000 tons of PM2.5 were released during the burning of the northern California wildfires in 2017.[25] In the fall of 2018 California school closures due to wildfires kept over 1 million children at home.[26] The frequency and intensity of wildfires is projected to increase in the coming decades.

INFECTIOUS DISEASES

Increasing temperatures and weather disasters cause increased food- and waterborne illnesses, especially due to flooding, structural damage, and power loss. For example, there were increased cases of leptospirosis, a relatively rare bacterial infection in humans, in Puerto Rico post Hurricane Maria, due to contaminated water.[27] Because children's immune systems are still developing, they can have more pronounced responses to infections.[28] Severe disasters can also hamper adequate health care service, amplifying the spread of infectious diseases such as tuberculosis or influenza.

Altered patterns of rainfall can cause the expansion of breeding grounds and range, and increased populations for mosquitos, ticks, and other disease vectors for illnesses such as Lyme disease, dengue, and Zika. Children tend to spend more time outdoors than adults, and in the United States, young boys are among those most

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[19] Kerr, ZY, et al. Epidemiology of exertional heat illness among U.S. high school athletes. Am J Prev Med. 2013 Jan;44(1):8–14.

[20] Annual Survey of Football Injury Research: 1931—2017. National Center for Catastrophic Sport Injury Research. Retrieved April 4, 2019 at *https://nccsir.unc.edu/files/2013/10/Annual-Football-2017-Fatalities-FINAL.pdf.*

[21] Centers for Disease Control and Prevention. National Current Asthma*[sic] Prevalence (2016) Retrieved April 1, 2019 from *https://www.cdc.gov/asthma/most_recent_data.htm.*

[22] Centers for Disease Control and Prevention. Vital Signs: Asthma in Children—United States, 2001–2016. Retrieved April 1, 2019 from *https://www.cdc.gov/mmwr/volumes/67/wr/mm6705e1.htm?s_cid=mm6705e1_e.*

[23] Hsu, J., Qin, X., Beavers, S. F., & Mirabelli, M. C. (2016). Asthma-Related School Absenteeism, Morbidity, and Modifiable Factors. American journal of preventive medicine, 51(1), 23–32. doi:10.1016/j.amepre.2015.12.012.

[24] McConnell, R., Berhane, K., Gilliland, F., London, S.J., Islam, T., Gauderman, W.J. et al. Asthma in exercising children exposed to ozone: a cohort study. Lancet. 2002; 359: 386–391.

[25] Week of wildfires polluting air as much as year of cars. CNN. Retrieved from *https://www.cnn.com/2017/10/13/health/california-fires-air-pollution-trnd/index.html.*

[26] Calmatters. School closures from California wildfires this week have kept more than a million kids home. Retrieved April 4, 2019 from *https://calmatters.org/articles/school-closures-california-wildfires-1-million-students/.*

[27] Henry J Kaiser Family Foundation. Public Health in Puerto Rico after Hurricane Maria. Retrieved April 1, 2019 from *https://www.kff.org/other/issue-brief/public-health-in-puerto-rico-after-hurricane-maria/.*

[28] American Academy of Pediatrics. Outbreaks, Epidemics, and Other Infectious Disease Emergencies. Retrieved April 1, 2019 from *https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Documents/MIDCCSoutbreaks.pdf.*

at risk from contracting Lyme disease.[29] Puerto Rico, which is hardest hit by the Zika virus in the United States, has seen an increase in the Aedes mosquito breeding grounds since Hurricane Maria, and research indicates that the number of pregnant women with Zika is now near that of levels in 2016 during the height of the problem.[30] Children born to women infected with the virus are at risk of developing congenital Zika syndrome, which includes symptoms such as microcephaly, brain damage, and other birth defects.

INJURIES AND DEATH FROM EXTREME WEATHER EVENTS

Young children are also among those most at risk from physical injuries and death resulting from wildfires and severe storms. Settings where children spend their time, such as school and child care facilities, may be structurally unsound, or be otherwise unprepared for disasters. Young children's mobility issues place them at higher risk, as some need to be carried and others guided via handholding. Children are among the most likely to drown in floods,[31] and floodwaters can pose electrical hazards, mix with and spread sewage and toxic chemicals, hide unsafe conditions such as broken glass, and pose risks of hypothermia. Compounding these risks is the fact that access to medical care is jeopardized in extreme weather events, due to power loss or facility damage. Children who are injured, or those with chronic health conditions or special needs may not be able to receive critical medical attention.

FOOD SECURITY

As of 2016, over 13 million children in the United States face hunger. Disasters exacerbate food insecurity for the poor, as exemplified in under-resourced communities in South Florida after Hurricane Irma. Families faced food spoilage and unpaid time off, and most grocery stores only accepted cash and could not process Supplemental Nutrition Assistance Program debit-like cards due to power outages.[32] In Puerto Rico, 19.7 percent of families had difficulties securing meals for their children daily after Hurricane Maria.[33]

Many families rely on the free or reduced breakfasts and lunches offered through schools to help ensure their children are fed. However, approximately 8.5 million children were unable to attend school, some of them for weeks, due to Hurricanes Harvey and Irma.[34] After Hurricane Maria, students aged 5–17 in Puerto Rico missed an average of 78 days of school, and those children in preschool missed 92 days of early learning and care in their programs.[33]

Extreme heat, drought, floods, and rising sea levels threaten agricultural yield, fisheries, and meat production, as well, thus affecting food prices and access for children and pregnant women in poverty across the globe.[35] In addition to a diminishing supply of food, the quality of food is also at risk. Rising atmospheric carbon dioxide, while producing bigger crops, reduces the nutritional value of food crops. Staple crops, including rice, legumes, and wheat show a loss of protein and micronutrients, including essential elements such as iron and zinc, which are critical to children's health.[36] Children already at risk for malnutrition will face increased food insecurity and resultant health and development problems.

ACCESS TO SAFE DRINKING WATER

Flooding, structural damage, and power loss can lead to failed drinking water systems and thus contaminated drinking water. Post-Hurricane Harvey, 166 water sys-

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[29] Centers for Disease Control and Prevention. Lyme Disease Charts and Figures: Historical Data. Retrieved March 31, 2019 from *https://www.cdc.gov/lyme/stats/graphs.html.*

[30] PBS. What's the truth about Zika virus in post-hurricane Puerto Rico? Retrieved April 2, 2019 from *https://www.pbs.org/newshour/show/whats-the-truth-about-zika-virus-in-post-hurricane-puerto-rico.*

[31] The World Health Organization. Drowning. Retrieved April 1, 2019 from *https://www.who.int/news-room/fact-sheets/detail/drowning.*

[32] WLRN. After Hurricane Irma, Food Insecurity In Miami-Dade's Poorest Communities. Retrieved April 2, 2019 from *https://www.wlrn.org/post/after-hurricane-irma-food-insecurity-miami-dades-poorest-communities.*

[33] The Youth Development Institute of Puerto Rico .The impact of Hurricane Maria on children in Puerto Rico. Retrieved April 2, 2019 from *https://drive.google.com/file/d/0B—GGLGhvE3QueDJYWTJNTThCTFE5YkExbnllQ3VOcEtKeWFF/view.*

[34] USA Today. Hurricanes Harvey and Irma kept 1 in 6 students in the USA out of school. Retrieved April 2, 2019 from *https://www.usatoday.com/story/news/2017/09/15/hurricanes-drove-millions-students-school/668156001/.*

[35] Columbia University. How Climate Change Will Alter Our Food. Retrieved April 2, 2019 from *https://blogs.ei.columbia.edu/2018/07/25/climate-change-food-agriculture/.*

[36] Meyers, SS., et al. Increasing CO_2 threatens human nutrition. Nature. 2014; 510: 139–142.

tems were under boil-water orders and another 50 water systems were shut down completely.[37] One week after Hurricane Maria 55 percent of Puerto Ricans lacked clean drinking water,[38] and 1 month after the disaster approximately 1 million were without reliable drinking water.[39] Heavy storms and flooding can also contaminate private wells.

MENTAL HEALTH

Children exposed to Hurricane Katrina were five times as likely as pre-Katrina cohorts to have serious emotional issues, such as post-traumatic stress disorder, anxiety, and depression.[40] According to the Youth Development Institute of Puerto Rico, a reported 44 percent of children struggled with emotional and behavioral problems after Hurricane Maria, with 23 percent specifying struggles with anxiety.[33] In addition to immediate fears of safety in a crisis situation, children may experience a loss of home and belongings, may have to leave their neighborhood, and may be separated from family, caretakers, communities, and friends. Disasters may also destroy community resources that are integral to their sound development, such as schools, hospitals, and places of worship. Mental health implications are concerning especially for those children who are already at higher risk, such as those living in under-resourced areas.

IMPORTANT SETTINGS OUTSIDE THE HOME

Approximately 65 million children attend schools and child care in the United States, yet many schools and child care programs in the United States do not comprehensively evaluate nor address matters pertaining to children's environmental health.[41] [42] There is no Federal oversight for the protection of children's environmental health in these learning and care settings, despite the legal mandate that children spend a significant portion of their time in school facilities. Many schools and child care facilities in this country are old, in poor condition, and/or are located on or near hazards sites, and already present environmental health risks which can be exacerbated in disasters.[43] [44] In addition, many schools and child care programs are unprepared to safely manage these crises.

The National Commission on Children and Disasters' 2010 Report to the President and Congress outlined recommendations specific to both settings, and the Federal Emergency Management Agency (FEMA) has developed a variety of tools as part of its Multi-hazard Emergency Planning for Schools toolkit. Yet as of 2015 18 States and the District of Columbia had not adopted minimum emergency planning standards at schools and child care.[14] While many schools and child care programs have developed emergency plans, many plans do not meet National guidelines and the implementation of plans are hampered due to funding, training, capacity, and communications issues. In some States, school and child care emergency plans are not mandated, and not all regulated child care providers and/or schools are subject to the relevant standards.

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[37] U.S. Environmental Protection Agency. Status of Water Systems in Areas Affected by Harvey. News Release. Retrieved March 31, 2019 from *https://www.epa.gov/newsreleases/status-water-systems-areas-affected-harvey.*

[38] U.S. Department of Defense. DoD Accelerates Hurricane Relief, Response Efforts in Puerto Rico. DoD News. Retrieved March 31, 2019 from *https://dod.defense.gov/News/Article/Article/1330501/dod-accelerates-hurricane-relief-response-efforts-in-puerto-rico/.*

[39] Sutter, JC. CNN. About 1 million Americans without running water. 3 million without power. This is life 1 month after Hurricane Maria. Retrieved March 31, 2019 from *https://www.cnn.com/2017/10/18/health/puerto-rico-one-month-without-water/index.html.*

[40] Abramson, D.M., Park, Y.S., Stehling-Ariza, T., & Redlener, I. (2010). Children as bellwethers of recovery: Dysfunctional systems and the effects of parents, households, and neighborhoods on serious emotional disturbance in children after Hurricane Katrina. Disaster Medicine and Public Health Preparedness, 4(S1), S17–S27.

[41] Paulson, J. & Barnett, C. Who's in Charge of Children's Environmental Health at School? New Solutions. 2016; 20 (1): 3–23.

[42] Seltenrich, N. Environmental exposures in the context of child care. Environ Health Perspect. 2013 May; 121(5): a160–a165.

[43] American Society of Civil Engineers. 2017 Infrastructure Report Card: Schools. Retrieved April 4, 2019 from *https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Schools-Final.pdf.*

[44] Center for Effective Government. Living in the shadow of danger: Poverty, race, and unequal chemical facility hazards. Retrieved April 4, 2019 from *https://www.foreffectivegov.org/sites/default/files/shadow-of-danger-highrespdf.pdf.*

[45] Military Parents Outraged After Mold Found in Base School Damaged by Florence. Military.com. Retrieved April 2, 2019 from *https://www.military.com/daily news/2018/09/25/military-parents-outraged-after-mold-found-base-school-damaged-florence.html.*

In addition, a great deal of focus centers around school or child care evacuation planning and family reunification, and there is often significant pressure to reopen schools as quickly as possible to provide education and other key community services as well as stability for children and their families after a disaster. Yet many health problems from disasters arise during the recovery period. Mandatory standards, protocols, and oversight for reopening schools and child care facilities safely are needed to prevent unnecessary harmful exposures to children, such as the serious mold and pest issues reported at Brewster Middle School at Camp Lejeune when it reopened after Hurricane Florence.[45]

CONCLUSION AND RECOMMENDATIONS

Climate change makes children's environmental health issues more visible than ever. It is a threat multiplier and it exacerbates inequalities; children from communities of color and communities of lower income bear the brunt of climate change effects.

I urge the subcommittee to understand and recognize that:

- the environments where children live, learn, work, and play, have direct and significant impacts on their health;
- children, especially those from communities of color and communities of lower income, including children on Tribal lands, are particularly vulnerable to environmental hazards;
- children are our future; and
- we have a moral obligation to protect children.

I ask that the subcommittee:

- consider children's health in all environmental decisions and policies; and
  - provide special consideration and prioritization of those children who are most vulnerable—those from communities of color, from communities of lower income.
  - Apply the pediatric environmental health lens to climate change legislation.
  - Support continued measures to aggressively mitigate the changing climate.
  - Support measures to intentionally address children's unique risks and needs in preparedness, response, and recovery.
- support all Federal, State, and Tribal agencies and programs that protect children's health.
  - Ensure capacity, training, and funding needs—for improved coordination across agencies, sectors, and multiple levels of government in matters of preparedness, response, and recovery measures.

Your support is critically needed for key Federal agencies such as the U.S. Environmental Protection Agency, especially the Office of Children's Health Protection, the Centers for Disease Control and Prevention, especially the National Center for Environmental Health, and the Agency for Toxic Substances and Disease Registry. These agencies conduct research, set guidelines, and develop surveillance and intervention programs to address children's environmental health issues. They also help to fund critical efforts such as the Children's Environmental Health and Disease Prevention Research Centers and the Pediatric Environmental Health Specialty Units—programs which have developed strong community ties.

I commend the subcommittee for holding this hearing today and for inviting CEHN to provide the children's health perspective to the conversation on climate change. Children, not profits, need to be placed at the center of decision making to reduce the risk of disease or disability, and to assure that our children will have long, healthy, and productive lives. This is our shared moral imperative. Protecting the health and development of our most precious resources will also safeguard the stability and security of our country for generations to come.

Thank you for the opportunity to testify on these critical issues and thank you for your leadership.

Mr. PAYNE. Thank you, Ms. Trousdale.

Let's see. Now we are going to recognize Chief Eggleston to summarize his statement for 5 minutes.

[45] Military Parents Outraged After Mold Found in Base School Damaged by Florence. Military.com. Retrieved April 2, 2019 from *https://www.military.com/daily news/2018/09/25/military-parents-outraged-after-mold-found-base-school-damaged-florence.html.*

STATEMENT OF DAN EGGLESTON, EFO, CFO, CMO, PRESIDENT AND CHAIRMAN OF THE BOARD, INTERNATIONAL ASSOCIATION OF FIRE CHIEFS

Chief EGGLESTON. Good afternoon, Chairman Payne, Ranking Member King, and distinguished Members of the subcommittee.

My name is Dan Eggleston, and I am the chief of Albemarle County, Virginia, Department of Fire Rescue. I am also the president and chairman of the board of the International Association of Fire Chiefs, who I am representing today. Thank you for the opportunity to testify at today's hearing.

No matter if it is a hurricane, tornado, flood, or wild land fire, America's local fire departments are the first to arrive on scene and often the last to leave. For the critical first 24 hours, local fire departments must provide emergency response in treacherous conditions without expectations of immediate State or Federal assistance. In short, local fire departments, large and small, are all-hazard responders, responsible for meeting these great challenges.

The cost and intensity of climate-related disasters are increasing. According to NOAA, the United States has witnessed 14 or more weather-related disasters costing more than $1 billion each year for the past 3 years. In addition, we have seen the number of acres burned by wild land fires increase by two-thirds over the past 10 years to 8.8 million acres.

In addition to property loss, these disasters are causing tragic losses. According to NOAA, the 14 weather-related disasters in 2018 costing more than $1 billion in damages caused 247 deaths. According to NFPA, 44 firefighters were fatally injured between 2007 and 2016 as a result of wild land fires. An additional 1,335 ground injuries were caused by wild land fires between 2011 and 2015.

Congress should take the following three steps to help local communities and fire departments prepare for the increased number of climate-related disasters.

No. 1, continue to promote mitigation efforts.

The IAFC thanks Congress for passing, and President Trump for signing, the Disaster Recovery Reform Act. This legislation promoted both pre-disaster and post-disaster mitigation activities.

It also focused on the importance of State and local adoption of model commercial and residential building codes. The NIBS released a study earlier this year demonstrating that the adoption of the model building codes generates a National benefit of $11 for $1 invested.

Furthermore, the adoption of wild land fire codes provides a benefit of $4 for every $1 invested. We urge Congress to prioritize the use of Federal funds for building and rebuilding structures in communities that meet this consensus-based code.

No. 2, support community preparedness programs.

The IAFC recommends that communities assess the risk of floods, wind storms, and wild land fires. In order to prepare for these disasters, the whole community must be engaged, from Federal and State officials to local homeowners.

Programs like the IAFC's Ready, Set, Go! program help local homeowners take steps to make their homes fire-safe, prepare for

the event of a wild land fire, and evacuate quickly when fire threatens.

We have seen examples, including in the State of New Jersey, where planning for wild land fires can be utilized to help communities evacuate from other natural disasters. We ask the Congress to continue to fund community preparedness programs at FEMA and the U.S. Forest Service.

Finally, No. 3, support programs that prepare local fire departments to respond to climate-related disasters.

A well-prepared fire department is best prepared to handle a major disaster. Leadership programs at the U.S. Fire Administration and National Fire Academy help fire service leaders identify and prepare for all-hazard risk to their communities. As disasters increase in intensity, they draw in resources from around the Nation through EMAC and other mutual-aid agreements.

It is important that local fire departments have the necessary training, equipment, and staffing to respond to local and regional and National disasters. The FIRE and SAFER grant programs provide matching grants to local fire departments to meet these needs. The U.S. Forest Service's State and volunteer fire assistance programs provide links between Federal and State authorities and local fire departments to prepare for wild land fires. When disasters strike, the Nation's urban search-and-rescue teams, hosted by local fire departments, provide life-saving capabilities.

We ask that Congress reject proposed cuts to these programs and adequately fund them. We also ask Congress to support Nationwide mutual-aid systems like EMAC and NMAS.

As the risk from climate-related events increases, the Nation must take steps to mitigate, respond, and recover from them. The Federal Government is working with partners like the IAFC to prepare for these events. We ask that Congress continue to support these efforts to keep Americans and our firefighters safe.

Thank you again, and I look forward to answering any questions that you may have.

[The prepared statement of Chief Eggleston follows:]

PREPARED STATEMENT OF DAN EGGLESTON

APRIL 9, 2019

Good morning, Chairman Payne, Ranking Member King, and distinguished Members of the subcommittee. My name is Dan Eggleston, and I am president and chairman of the board of the International Association of Fire Chiefs (IAFC), and fire chief of the Albemarle County, Virginia, department of fire rescue. Thank you for the opportunity to participate in the committee's assessment of the homeland security impacts of a changing climate.

The IAFC represents the leadership of over 1.1 million firefighters and emergency responders. IAFC members are the world's leading experts in firefighting, emergency medical services, terrorism response, hazardous materials (hazmat) incidents, wildland fire suppression, natural disasters, search and rescue, and public-safety policy. Since 1873, the IAFC has provided a forum for its members to exchange ideas, develop best practices, participate in executive training, and discover diverse products and services available to first responders.

THE FIRE AND EMERGENCY SERVICE COMMUNITY

America's fire and emergency services are the only organized group of individuals that is locally situated, staffed, trained, and equipped to respond to all types of emergencies. There are approximately 1.1 million men and women in the fire and emergency service—approximately 300,000 career firefighters and 800,000 volunteer

firefighters—serving in over 30,000 fire departments around the Nation. They are trained to respond to all hazards ranging from earthquakes, hurricanes, tornadoes, and floods to acts of terrorism, hazmat incidents, technical rescues, fires, and medical emergencies.

The fire service protects America's critical infrastructure—the electrical grid, interstate highways, railroads, pipelines, petroleum, and chemical facilities—and is, in fact, even considered part of the critical infrastructure. The fire service protects Federal buildings, including military installations and interstate commerce. No passenger airliner takes off from a runway or train leaves a station that is not protected by a fire department.

THE NATION'S CHANGING CLIMATE

As the Nation's climate changes, it creates new challenges for the Nation's fire and emergency service. No matter if it is a hurricane, a tornado, flooding, or a wildland fire, America's local fire departments are the first to arrive on scene and the last to leave. They must provide emergency response and medical aid to the public despite the outside conditions. In many ways, the Nation's changing climate is helping to transform the local fire department into an all-hazards response force.

It is important to recognize the effects of the Nation's changing climate. According to the National Oceanic and Atmospheric Administration, the United States averaged 6.2 weather-related disaster events that each cost $1 billion or more each year from 1980 to 2018.[1] In 2016, our Nation had 15 such events, 16 such events in 2017, and 14 such events in 2018.

In addition, we have seen an increase in the Nation's wildland fire problem. In 2018, the National Interagency Fire Center reported approximately 58,000 fires, which burned approximately 8.8 million acres. In comparison, there were almost 79,000 fires in 2008, which burned approximately 5.3 million acres. So, even as the number of wildland fires are reduced, their intensity increases.[2]

There has been an increase in Federal spending on disasters. For fiscal year 2018, Congress appropriated approximately $50 billion. In contrast, Congress only appropriated approximately $18.5 billion for fiscal year 2013, which includes the aftermath of Hurricane Sandy.[3] These costs are equally clear in the wildland fire arena, where the Federal Government spent a record $3.1 billion on wildland fire suppression costs in 2018. From 2009 to 2013, the Federal Government spent an average of $1.35 billion on wildland fire suppression costs. By comparison, from 2014 to 2018, the Federal Government spent an average of $2.34 billion on wildland fire suppression, an increase of 42 percent.[4]

These disasters have real-life costs too. The United States has had 241 weather and climate disasters since 1980 where overall damages reached or exceeded $1 billion. The total cost of these 241 incidents is more than $1.6 trillion. In 2018, the 14 weather or climate events costing more than $1 billion in damages also caused 247 deaths.[5] According to the National Fire Protection Association (NFPA), a total of 44 local firefighters were fatally injured between 2007 and 2016 as a result of grass, brush, or forest fires or prescribed fires. Between 2011 and 2015, the NFPA reported that grass and forest fires caused an average of 1,330 fireground injuries to local firefighters.[6]

The Nation needs to act and prevent the loss of life and property in a dangerous and changing climate. The International Association of Fire Chiefs recommends that the Nation take common-sense steps to address this threat. We encourage Congress to continue to take steps to mitigate the threats of climate-related disasters. We recommend that Congress fund programs that help communities prepare for climate-related events, like hurricanes, tornadoes, floods, and wildland fires. We also ask that Congress support Federal programs and initiatives that will help fire departments prepare for the growing number of climate-related disasters.

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[1] NOAA, National Centers for Environmental Information (NCEI), *U.S. Billion-Dollar Weather and Climate Disorders* (2018), *https://www.ncdc.noaa.gov/billions/*.

[2] National Interagency Fire Center, *Federal Firefighting Costs (Suppression Only), (https://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf).*

[3] Congressional Research Service, *The Disaster Relief Fund: Overview and Issues,* February 1, 2019.

[4] National Interagency Fire Center, *Federal Firefighting Costs (Suppression Only),* (*https://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf).*

[5] NOAA, National Centers for Environmental Information (NCEI), *U.S. Billion-Dollar Weather and Climate Disorders* (2018), *https://www.ncdc.noaa.gov/billions/*.

[6] Marty Ahrens, *Brush, Grass, and Forest Fires,* National Fire Protection Association, September 2018, p. 7.

THE IMPORTANCE OF MITIGATION

The IAFC thanks Congress for its recent focus on using mitigation to drive down the cost of disasters. States and local communities should take steps to mitigate the effects of major climate-related disasters. These efforts can include acquiring and demolishing flood-prone buildings; adding hurricane-safe shutters and tornado-safe rooms; and replacing roofs and creating defensible space around buildings to prevent wildland fires.

The IAFC recommends that States and localities adopt current model building codes, including the International Building Code and the International Residential Code. The National Institute of Building Sciences released a study in January demonstrating that adoption of model building codes generates a National benefit of $11 for every $1 invested. Furthermore, adoption of wildland fire codes provided a benefit of $4 for every $1 invested.

The adoption of current building and fire codes has been proven to prevent the tragic loss caused by climate-driven events. The Insurance Institute for Business and Home Safety (IBHS) found that the adoption of high-wind provisions in residential buildings reduced damage to houses in Florida, After Hurricane Charley in 2004, the claim frequency for houses built after 1996 (when Charlotte County, Florida, enacted high-wind standards) was reduced by 60 percent and the claims were 42 percent less severe when a loss occurred.[7]

States and localities determine the adoption and application of building codes and standards, which means that code adoption varies by State and locality. Five States representing 12 percent of the Nation's population have State building codes that are 9 or more years old. Where States allow local governments to determine code adoption, 25 percent and 10 percent of residents in some Midwest and Gulf Coast States, respectively, also live in communities with years-old building codes. Of the 21 States that regularly face tornado risk, just 8 require tornado shelters for schools.

The IAFC thanks Congress for passing the Disaster Recovery Reform Act (DRRA; Pub. L. 115–124). This law focuses on pre- and post-disaster mitigation to reduce the cost of disasters. The bill creates a National Public Infrastructure Pre-Disaster Mitigation fund to help States take actions to prevent the threat of natural disasters. It also incentivizes States to adopt model building codes by providing Public Assistance funds to replace and restore damaged facilities to the latest codes and standards. In addition, Pub. L. 115–124 allows States that receive Fire Management Assistance Grants to receive post-fire hazard mitigation assistance to help communities recover and prevent deadly floods after wildland fires. We ask that Congress monitor the implementation of the DRRA to ensure that the Federal Emergency Management Agency meets its commitments.

COMMUNITY PREPAREDNESS

Local communities can take steps to prepare themselves for the threat of climate-related incidents. They can set and adopt current codes to ensure that buildings can sustain hurricane-strength winds or are built using fire-safe materials. Also, they can plan evacuation routes and exercise their implementation in case of advanced-notice events like hurricanes or short-notice events, like wildland fires. Also, Federal and State authorities can work together to clear hazardous fuels and plan for response to climate-driven risks like strong winds, flooding, and wildland fires. Local homeowners also should take steps like clearing brush around their homes to create a defensible space for wildland fires; boarding up their homes before hurricanes; and following State and local authorities' evacuation orders.

The IAFC and local fire departments support community risk reduction efforts. For example, we urge Federal, State, Tribal/territorial and local governments to develop community wildfire protection plans (CWPP). These plans identify and mitigate wildland-fire risks within communities. They also guide hazardous-fuels reduction programs on Federal lands and prioritize Federal funding for associated projects.

With the assistance of the U.S. Department of Agriculture's (USDA) Forest Service, the IAFC runs the "Ready, Set, Go! (RSG)" program to help communities prepare and respond to the threat of wildland fires. Using RSG resources, local fire departments assist residents in developing mitigation plans (Ready) and teaching them to be situationally aware (Set) and take action early and follow their personal wildland-fire action plans should there be a need to evacuate (Go). Currently, there are 1,881 RSG members in all 50 States.

[7] "Hurricane Charley: Natural Force vs. Structural Strength," Institute for Business and Home Safety, 2012, p. 5.

This type of community preparedness supports an all-hazards response. For example, the Barnegat Volunteer Fire Department near the New Jersey Pine Barrens was a long-time RSG member. The fire department spent more than 2,000 hours educating its communities about how to create defensible space, maintain situational awareness and develop evacuation plans in the case of wildland fires. When Hurricane Sandy struck in 2012, the fire department worked with the police department and used RSG planning to evacuate the community successfully.

The IAFC recommends that Congress continue to support Federal programs that champion community preparedness planning. Community preparedness is a key component to addressing risks caused by the changing climate. By promoting collaboration at the local level, communities can work with Federal, State, Tribal/territorial and neighboring local agencies to educate local citizens about the risk of hurricanes, tornadoes, flooding, and wildland fires. They also can help the public to take actions to reduce these risks. Community-preparedness programs also can help localities reduce the threat of climate-driven disasters by collaborating to reduce hazardous fuels and strengthen infrastructure, and help citizens take steps to strengthen their homes. Finally, these programs are important in helping local citizens to evacuate in a safe and timely manner.

ENSURING AN EFFECTIVE RESPONSE

When a climate-driven disaster strikes, the local fire department will be the first response unit on scene. For example, the NFPA reports that local fire departments responded to an estimated average of 306,000 brush, grass, and forest fires in the United States per year from 2011–2015.[8] An effective emergency response is key to reducing the damage from a disaster and ensuring an effective recovery.

At the local level, it is important to have experienced leadership. The U.S. Fire Administration (USFA) hosts the National Fire Academy (NFA), the Nation's premier fire and emergency services educational institution. As the fire service's mission has transformed to all-hazards response, the NFA has helped generations of fire service leaders to manage that change. The NFA has trained more than 1.4 million students since 1975. It includes both in-person and electronic courses to help fire service leaders adapt to the new missions that they face. We thank Congress for its continued support for USFA and NFA and are grateful for the Trump administration's proposed increase funding for these programs. We ask that Congress fund USFA at $50 million for fiscal year 2020.

It is important that fire departments be able to provide mutual aid to each other during major climate-driven disasters, both at the local and the National levels. For example, 17 States, including North and South Carolina, provided assistance to California in response to the October 2017 wildland fires. Developments in GIS and technology offer the opportunity to transform interstate and intrastate mutual aid and provide effective assistance in a timelier manner.

In the aftermath of Hurricane Katrina, the IAFC helped States to create Statewide mutual-aid agreements and plans to deploy fire department staffing and equipment in response to major disasters and everyday incidents. To help States manage their resources, the IAFC developed Mutual Aid Net, which is still in use in 18 States today. This system is an addition to the Emergency Management Assistance Compact (EMAC).

As a further evolution, the IAFC has partnered with Juvare's WebEOC and Esri's ArcGIS platforms to develop the National Mutual Aid System (NMAS). NMAS will be a tool used to request, locate, and deploy resources through all phases of a response. Using NMAS' GIS mapping tools, fire departments will be able to visualize in real-time where resources are, where they need to go, and determine response times for decision making.

An adequately trained, staffed, and equipped local fire department is a significant component to the response to a climate-driven event. Local fire departments provide the initial response to the events. For example, local fire departments—in many cases, volunteer fire departments—provide nearly 80 percent of the initial attack on wildland fires in the United States. In addition, local fire departments play a key role in the National Preparedness System, where Fire Management and Suppression has been identified as a core capability of the National Preparedness Goal. When local communities require interstate or intrastate aid, they rely upon local fire departments across the Nation to provide aid through the EMAC, State mutual-aid plans or local mutual-aid plans. If local fire departments do not have adequate staffing and equipment, the National Preparedness System breaks down.

[8] Marty Ahrens, *Brush, Grass, and Forest Fires,* National Fire Protection Association, September 2018, p. 7.

However, there are serious challenges to the preparedness of the Nation's fire and emergency service. For example:

- Almost three-quarters (71 percent) of the fire departments who perform wildland firefighting or who fight structure fires in the wildland urban interface (WUI) have not formally trained all their firefighters in this activity.
- Two-thirds of the departments that fight these fires have firefighters who do not have the appropriate personal protective equipment for wildland firefighting.
- Twenty-nine percent of fire departments have firefighters who have not received specialized training on firefighting in the WUI.[9]

Congress has taken steps to address these shortages. The Assistance to Firefighters Grant (AFG; also known as the FIRE Act) grant program and the Staffing for Adequate Emergency Response (SAFER) program provide matching grants to help local fire departments meet their basic needs and improve their capabilities to respond to all hazards. The AFG program helps localities train and equip for climate-driven disasters, like wildland fires, flooding, and windstorms. The SAFER program supports staffing for career, volunteer, and combination fire departments. The IAFC thanks Congress for its support for these programs and asks that both programs be funded at the fiscal year 2011 level of $405 million for each program.

Specifically, for wildland fire programs, Congress created the Volunteer Fire Assistance (VFA) program at the USDA's Forest Service. This program provides Federal assistance to State foresters to help rural fire departments respond to wildland fires on neighboring Federal land. Communities with populations of less than 10,000 can receive funding to use for training and equipment through the VFA program. The IAFC thanks Congress for the recent increases in funding for the VFA program and asks Congress to appropriate $18 million for the program in fiscal year 2020.

As climate-driven disasters increase, the IAFC requests that Congress continue to fund the Urban Search and Rescue (US&R) System. The US&R teams are located across the Nation and possess critical skills in responding to hurricanes, tornadoes, wildland fires, and other climate-driven disasters. These specialized teams are internationally recognized for the life-saving aid that they provide to desperate communities. We urge Congress to fund $50 million for the US&R system in fiscal year 2020 to help the teams maintain their readiness in an advanced operational tempo. We also ask Congress to pass H.R. 639, which would clarify that Federal employees, like Federal firefighters, can participate in US&R teams.

In addition, it is important to point out that programs like the State Homeland Security Grant Program (SHSGP) and the Urban Areas Security Initiative (UASI) support all-hazards response, despite their focus on terrorism preparedness. The programs use Federal funds as an incentive for fire; emergency medical services; law enforcement; public health; and other Federal, State, Tribal/territorial, and local agencies to plan and exercise together. Whether an act of terrorism, a wildland fire, or a hurricane, it is important for the key decision makers to have planned, trained, and exercised together before an event. Because of the beneficial role that these programs play in all-hazards response, the IAFC asks Congress to reject the cuts proposed for fiscal year 2020.

CONCLUSION

I thank you for the opportunity today to testify about the effects of climate change on homeland security. For the Nation's fire and emergency service, the increase in climate-driven events has steered a transformation to an all-hazards response force. As the threat of these climate-driven events increases, the Nation must focus on taking steps to mitigate this threat and prepare to respond to more serious incidents over time.

Specifically, the IAFC urges Congress to take the following actions:

(1) *Support Mitigation Efforts*.—Congress made a good first step by passing the Disaster Recovery Reform Act (Pub. L. 115–124). Now Congress must ensure that it is implemented correctly. Congress also must support the State and local adoption of current model building codes and provide incentives for their adoption. We know that these building codes will save lives and property. As Congress considers legislation to modernize the Nation's infrastructure, we ask that Federal funds be used to make sure that new infrastructure meets the relevant model building codes. We also ask that Congress support pre- and post-hazard mitigation initiatives like the new Pre-Hazard Mitigation fund established by the DRRA.

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[9] Ibid.

(2) *Support Community Preparedness Efforts*.—Programs like the Ready, Set, Go! program help local communities prepare for the threat of wildland fires, floods, hurricanes and other climate-driven disasters. Community risk reduction and community preparedness efforts help communities prepare for all hazards and educate the public about steps that they need to take to prepare their homes.

(3) *Support Federal Programs that Promote an Effective Emergency Response*.—When a disaster strikes, local fire departments will be the first to arrive. The Federal Government realizes this fact and supports programs like the AFG, SAFER, and VFA programs to help train, equip, and staff fire departments. Congress should support these programs and National assets like the US&R system. We also ask that Congress continue to fund training programs at the USFA and NFA.

As the risk from climate-related events increases, the Nation must take steps to prepare ourselves to mitigate, respond, and recover from them. The Federal Government has taken steps with partners like the IAFC to prepare for these events. We recommend that Congress continue to support these efforts to keep Americans safe.

Mr. PAYNE. Thank you, Chief.

I want to thank you all the witnesses for their testimony.

I remind each Member that he or she will have 5 minutes to question the panel.

I will now recognize myself for questions.

Dr. Caldas, what do you think is the most dangerous part of this administration's anti-science agenda?

Ms. CALDAS. Thank you, Mr. Chairman.

I believe that there are several aspects of the anti-science agenda that are not in the best interests of the American people.

Sidelining expertise and independent scientific advice is one of them. Reducing access, public access, to science, Government science and Government-scientific reports. Also compromising public protections.

That is because, by doing these things, they are preventing scientists from bringing the information to the public. They are preventing scientists from talking about their own science to the media and communicating it in a relevant way for the public and for policy makers.

They are compromising protections—air quality protections, environmental protections, pollution protections—that are not in the best interests of the American people.

They are also reducing—not reducing. They are also stopping and compromising the public advisory—scientific advisory committees. They are compromising or closing, shutting then down altogether.

They are keeping scientific advisory positions not filled. They are vacant.

Mr. PAYNE. Yes.

Ms. CALDAS. So all of this is not bringing science into policy making. All of these things together are not in the best interests of the American people and of the environment.

Mr. PAYNE. Thank you. Yes, it appears that this administration really enjoys having many positions—now we are finding at DHS acting FEMA director, acting Secretary of Homeland, acting—everyone is acting, you know? It really causes a problem.

Mr. Manning, I am very worried about the Trump administration's decision to roll back the rules that would require all infrastructure projects receiving Federal dollars to be built to flood-resistant standards. Can you discuss some of the future risk now

that the Federal Government has abandoned this resilient building proposal?

Mr. MANNING. Thank you, Mr. Chairman. Yes, I share your concern with the eradication of those requirements.

The Executive Order—the previous requirements on infrastructure investment was a 2-foot additional elevation above base flood elevation. You may all be familiar with the flood maps, flood zones. For critical activities, things like critical infrastructure, firehouses, command centers, an additional 3 feet.

What we have seen—those were based on the IPCC most conservative guidelines of a 2-foot rise in sea level over the next 50 years. I think most people—and I would defer, actually, to my colleague to the right here, accept that that is an overly conservative estimate, that it is probably going to be closer to 4 or more feet over the next 50 to 100 years of sea-level rise.

The base flood elevations as they are also don't account for severe rainfall. So all of the mitigation investments that we make, all of the public infrastructure investments we make as a Nation could potentially be at risk if we are building in low-lying elevations. We see repeatedly things like wastewater systems that don't function because of rising sea level making the drainage systems not work.

We make investments in critical infrastructure facilities at places that will flood repeatedly. As it is today, we see in Annapolis, Maryland, right outside the Naval Academy, it floods frequently with no rainfall, just because of rising sea levels in the Chesapeake.

A restoration of some restrictions, some additional freeboard in order to receive and spend Federal dollars in public infrastructure is an absolutely critical and wise decision into the future for us.

Mr. PAYNE. Thank you, sir.

I will now let the Ranking Member have 5 minutes for questions.

Mr. KING. Thank you, Mr. Chairman.

Chief Eggleston, thank you for your testimony. Thanks for being here today.

In your testimony, you discussed the importance of community preparedness. Now, as far as I know, in New York, New York City and the suburbs, they are pretty much on that, and they are actively engaged.

But what can the Federal Government do to continue to work with and encourage communities across the country to achieve a culture of preparedness, especially a community that hasn't been hit yet and they just think it is somebody else's problem?

Chief EGGLESTON. Thank you, Congressman, for the question.

I think we have a lot going on right now in terms of partnerships, like with the IAFC and FEMA, programs in place. Our point and our ask at this point is to continue to fund those programs, encourage communities to reach out and engage. Our communities are constantly changing, education requirements are constantly evolving, so it is an ever-going process.

But at the local level, I can tell you that we need some help in terms of funding to continue those programs into the future. But education is the key to help build a resilient community. Our proc-

ess right now is unsustainable, in terms of our response. We have to build a more resilient and prepared community.

Mr. KING. Along those levels in the funding, one area, among others, that the Chairman and I would agree on is on the FIRE grants, SAFER grants. In fact, I guess beginning in the last year of the Obama administration, unfortunately all 3 years of the Trump administration, their budget has called for really radical, severe cuts in those grants. The past three times, Congress has overcome that. Hopefully we will do it again. I think there is bipartisan support for those grants.

But apart from the actual political benefit or the popular benefit of those grants, can you give some detail as to how the money is spent, why it is important, why it is not just another level of spending?

Chief EGGLESTON. Certainly.

Mr. KING. I am on your side on this. I am giving you the opening there.

Chief EGGLESTON. I can speak from my local department, in that we were a recipient of both a SAFER and an AFG grant.

A SAFER grant allowed us to hire early 9 firefighters to kickstart a new station for our community that helped us lower our ISO rating, which provided benefits in terms of insurance savings to our citizens. But it also provided a much-needed protection to a very vulnerable population.

We also were able to take advantage of an AFG grant to target a vulnerable population, those who live below the level of poverty in the southern part of our county, to go in and educate the community and install smoke detectors and have a conversation about how to reduce risk.

So those are two real good examples of recent activities just in Albemarle County of how we benefited from those very valuable grants. I appreciate your support on those.

Mr. KING. Thank you.

Not in a political sense but in a very effective Governmental lobbying sense, does the International Association of Fire Chiefs intend to take a stand on this and be aggressive, you know, contacting local Members of Congress, contacting the administration on this?

Chief EGGLESTON. We do. We constantly encourage our members to reach out and engage with their elected officials to support the AFG and SAFER grants and all mitigation grants. We are actively involved in promoting any kind of mitigation activities to help us address this problem on the all-hazard problem, quite frankly.

Mr. KING. Well, thank you for your service. Thank you for cementing the relationship between me and the Chairman here today, sir.

Thank you very much. I yield back, Mr. Chairman.

Mr. PAYNE. Thank you, Ranking Member.

Next, we will hear from the gentlelady from New York, Ms. Clarke.

Ms. CLARKE. Thank you, Mr. Chairman. I thank our Ranking Member. I want to thank our expert panelists for their testimony here today.

The House has a responsibility to speak out and take action on climate change. Its impact to homeland security, I think, can't be minimized. FEMA has a very huge, mammoth task ahead of itself. Particularly when we are talking about emergency preparedness, we know that there are going to be multiple events. We have some still going on right now in the United States of America.

I think it is critical that we look at this from a migration standpoint. There will be a point where people are unable to live in their communities if we don't begin mitigating the effects of climate change and will have to move to other parts of the country in order just to survive.

So I want to politely disagree with my colleague Mr. King, who kind-of indicated that there is another area of jurisdiction that should be looking at this issue. I think we need an all-hands-on-deck, quite frankly, approach to what we know is already an issue for the American people.

When we hear the President say climate change is fake news, one wonders whether he also believes that the Earth is still flat—or that the Earth is flat. Because denying the reality that greenhouse gas emissions are contributing to rising seas and extreme temperatures flies in the face of what we are experiencing, of the science. Within the scientific community, the debate has already been settled.

So today's hearing is about recognizing that climate change is not only an environmental threat, but it is a threat to homeland security, and it is an existential threat to human life.

Rising seas, flooding neighborhoods, they are also threatening critical infrastructure. So when farmers' fields run dry from prolonged drought, it creates a humanitarian crisis of hunger and despair, the seeds from which terrorism can emerge. We have seen this in other parts of the world. So we are not stretching here to have this hearing today.

Last week, as vice chair of the Energy and Commerce Committee, I was proud to mark up a bill, and I am an original cosponsor of the Climate Action Now Act, which seeks to reverse the illogical withdraw from the Paris Agreement. The environmental causes of climate change are reason enough to be bold and take international action. The homeland security implications that we are discussing today only further reinforce the need to reduce carbon emissions and embrace green technologies before it is too late.

My question, Mr. Manning, is on FEMA's capacity. We have seen some of the worst disasters in the previous few years, and FEMA, frankly, has seemed stretched too thin to adequately respond in all cases.

Can you discuss some of the impacts to the agency and its work force if we don't get serious about incorporating efforts to mitigate climate change into our Federal policy?

Mr. MANNING. Thank you, Congresswoman. That is a wonderful and very on-point question.

FEMA, the Federal Emergency Management Agency, does all of its budgeting, planning, and staffing based on an analysis of what they expect basically the next fiscal year's worth of disasters to look like. The planning goes, obviously, much longer than a fiscal year, but from a budgeting perspective, how many people work at

FEMA, what does the staffing look like is all based on the fiscal years and a look backward at disasters.

Not unlike the way Department of Defense has a two-theater approach to its strategic mission load, FEMA does the same with two type 1 disasters happening in two parts of the country at the same time. Those are defined roughly as the things that they experienced in the past.

The concerns with not explicitly and overtly addressing the changes from a changing climate on the face of those disasters are that we will see—I mean, in combination with a migration of people to coasts and urbanization, we will see much larger disasters. We are already seeing much more intense hurricanes, much more heavy rainfall, and much more widespread flooding.

If the disasters that we see, our run-of-the-mill—"run-of-the-mill" disasters are that much worse and our catastrophic disasters are that much worse, FEMA won't be positioned correctly with budgeting and resourcing and manpower to be able to deal with that.

The planning assumptions on how the Federal Government organizes to support States will also be insufficient, because it will be based on two not-severe-enough of storms and disasters into the future.

Ms. CLARKE. I know. Can you say "Puerto Rico"?

With that, Mr. Chairman, I yield back.

Mr. PAYNE. Thank you.

Next, we will hear from the gentleman from Texas, Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman.

I thank the witnesses for appearing as well.

Mr. Chairman, I have great respect for first responders, firefighters, peace officers, people who rush in when others are rushing out. Because I have such respect for them, I am curious about the esprit de corps, the morale, when we have fires in the West and they are consuming not only property but in many cases people, and the firefighters are there risking their lives, and we have a Commander-in-Chief who seems to say things that are antithetical to what they are doing. How does this impact the morale, the esprit de corps?

Chief EGGLESTON. Thank you, Congressman, for the question.

You know, firefighters are very task-oriented and mission-focused. So, while I can't speak for the firefighters who were on the front line, I think that they were focused on protecting their communities. Because they have a love for the job and a love for their service and a love for their fellow citizens, and I think that is what motivates our firefighters.

Of course, I am sitting here thinking that we always need to continue to support our first responders, firefighters, police officers, and EMS workers, at all cost, because they are the ones that have to deal with all kinds of everyday disasters, including the large fires that we have seen out in California.

So I say we do that through recognition and support through Federal, State, and local funding is probably our best bet.

Thank you.

Mr. GREEN. Well, thank you.

Let's talk about chemical plants. In Houston, Texas, we have a large concentration of chemical facilities. We recently had an event,

and there was a requirement that persons shelter in place—shelter in place. Benzene was one of the chemicals that persons were exposed to.

We have, as I understand it, a requirement that if a Coast Guard person is exposed to benzene in an amount considered dangerous, because it is a carcinogen, that we have to monitor that person for the rest of his life to check to make sure he is OK or she is OK.

I don't know that we have similar regulations, requirements, rules for firefighters who are equally exposed. Do you have any intelligence that you can share with me on this question?

Chief EGGLESTON. Yes, sir. I am involved heavily in the fire service in terms of cancer research. The IAFC supports the adoption of an annual physical for all firefighters, which includes screening for such cancers.

Firefighters are almost twice as likely to get cancer than the average citizen. So we are very much focused on cancer prevention and screening and do support an annual physical so that we can keep firefighters' health safe and on the job.

In terms of working with industry, we promote fire departments reaching out and engaging with local industry through their LEPCs to plan for, in the event of an issue at these localities, these plants, to plan long before the event, to make those arrangements and those relationships ahead of time and understand what the hazards to the citizens are. I just spoke last week about a similar subject.

So I think it is really important to preplan those and engage with the local industry and have a unified approach to any emergency.

Thank you.

Mr. GREEN. Thank you.

My final question may be a little bit off-subject, in the sense that this should relate more to first responders, in my opinion, and persons who are helping us, but there was a mention of children and how they are impacted by this.

When you hear the call "shelter in place" and your child is away from you at school, can you give me some sense of what the school of this future should look like such that children will be able to properly shelter in place?

Anyone.

Chief EGGLESTON. I think it is important to focus on any future building codes that may build a more resilient school system. School systems and buildings that are built today have a wide range of hazards that we have to deal with, including things such as a threat from active shooters and environmental threats and man-made threats.

So I would encourage us to continue to engage with our local code officials and work with them to build more resilient schools and think of an option like that—what would we need to do to build a more resilient building to better prepare and protect our children in the event of a shelter-in-place activity?

Mr. GREEN. Mr. Chairman, you have been generous with the time. Thank you. I yield back.

Mr. PAYNE. Thank you, sir.

Next, we will hear from the gentleman from Texas as well, Mr. Crenshaw.

Mr. CRENSHAW. Thank you, Mr. Chairman.

Thank everyone for being here today.

One of the reasons I sought to join this committee was because of my district. It is in Houston. My district was devastated by Hurricane Harvey. Homes, businesses, lives were lost, of course. The severity of the storm has been mentioned in multiple opening statements, and I appreciate the focus on it.

Although, we may disagree on this figure of 38 percent, that it is 38 percent worse because of climate change. That number is based on a computer model, not the scientific method. But it doesn't really matter. What we do agree on is that it was disastrous.

Harvey wasn't the first major flood we have had in Houston either, because another thing we can agree on is that we have been experiencing these for literally hundreds of years. Between our founding in 1836 and 1936, Houston experienced 16 major floods, some of these cresting to more than 40 feet above the bayou.

I have a printout here, actually. It is by the Harris County Flood Control District. It is 11 pages' worth, since 1836, 11 pages' worth of major flooding. It is Houston, after all. We are built on a bayou. We have clay for ground. Water doesn't flow out of it very easily. It is flat ground. So we understand how important this is more so than a lot of cities.

In 1900, a deadly hurricane wiped out what was then the major regional city, Galveston. It was the deadliest storm in U.S. history. It killed more than 6,000 people, caused $35 million in damage in 1900, equaling over a billion today. It was actually because of that hurricane that people began moving inland to what is now Houston. That is why Houston went from 44,000 people in 1900 to almost 2 million a century later and well over 2 million today. Flooding has been a real problem in Houston ever since its founding.

I didn't join this committee to discuss climate change. As was pointed out earlier, that is not even in this committee's jurisdiction. I find it to be a distraction. Because is it a problem? Yes. Is it happening? I am not going to debate that. But we are here to discuss disaster mitigation and how we can mitigate flooding in any community and communities around the country. That is what is important. That is what we can address; that is what we can control. That is what we should be addressing here today.

With that, I will start with Chief Eggleston.

Thank you for being here. Thank you for your testimony.

You mentioned the benefits of the Disaster Recovery Reform Act and the importance of the new pre- and post-disaster mitigation grants. The DRRA created a National Public Infrastructure Pre-Disaster Mitigation Fund to help States take actions to prevent the threat of natural disasters.

Just real quick, what are you most focused on in terms of implementation to ensure that FEMA can properly identify worthy investments?

Chief EGGLESTON. Well, thank you, sir, for the question.

I think that our focus should be on looking at the most vulnerable populations and also enforcing the building codes to build more resilient communities, is my feeling of where the focus should be.

There is a wide range of communities out there that need this kind of assistance, so where to start with that, I couldn't tell you. But that would be my focus.

Mr. CRENSHAW. OK.

The next question I want to ask is about the States' ability to administer these in a flexible way. The DRRA provides flexibility for States to administer their own post-disaster housing strategies. Are there any other areas where more flexibility would be warranted? Essentially what I am asking is, where does Federal Government get in your way too much, or is it just about right?

Chief EGGLESTON. Well, I have been involved in a couple of recoveries from Nationally-declared disasters, and I think the support that we have gotten from the State and from the Federal Government was just right. I was a chief of a small community that was devastated by a flood, and I thought the integrated response system that was set up back in the 1990's worked perfectly to help us recover and get back in shape rather quickly.

So I am not sure exactly how to respond to that at this point, because I haven't had recent activity of a Nationally-declared disaster. But I would say that we need to focus on the integration between the locality, the State, and the Federal Government to make sure that that transition is smooth and as less bureaucratic as possible.

Mr. CRENSHAW. Mr. Manning, would you have anything to add to those questions at all in my remaining time?

Mr. MANNING. Congressman, simply that, from my time as both a State official working for a Governor and the deputy administrator at FEMA, I know the partnership, the balance between Federal Government's support of State and local governments is something that has always been—there has always been an effort to right-size, to get that to work well.

I think my experience now, in the couple years outside FEMA, the observation I have made is there seems to be strong partnerships between the current leadership of FEMA and the State and local government leadership. I think that has been my observation of recent months.

Mr. CRENSHAW. Thank you, Mr. Chairman.

Mr. PAYNE. Thank you, sir.

I think there—apparently there is a common thread from our colleagues on the other side of the aisle. Climate change is causing a lot of these disasters to be magnified. This committee deals with man-made and natural disasters. So I don't think it is—I beg to differ with my colleagues. I don't think it is out of line that we are discussing this today.

Let's see. Is that everyone?

Oh, Ms. Underwood. I am sorry. The gentlelady from Illinois is recognized for 5 minutes.

Ms. UNDERWOOD. Thank you, Mr. Chairman.

This topic is critically important to us in the Illinois 14th District. My community in northern Illinois is facing increasing threats dues to flooding along the Fox River in McHenry County.

We must be prepared to respond to the serious safety and economic risks that this flooding poses to the many homes and businesses located along the river. Persistent flooding can delay plant-

ing and damage crops, hurting our agriculture industry. Our existing water infrastructure is degrading even faster under these more extreme conditions.

Flooding has National security implications as well. Some of our major Air Force and naval bases already experience frequent floods. Three National Guard armories are located in McHenry County alone.

So this issue isn't going away. In fact, researchers suggest that this kind of extreme flooding will be the new normal in our community because of climate change. Some of your testimony did touch on flooding, and I would like to thank you for including that level of detail.

My first question is for Dr. Caldas.

You are a climate scientist, and from your professional perspective, can you tell us more about the specific threats that climate change poses to communities like mine in the Midwest?

Ms. CALDAS. Thank you, Congresswoman.

The main aspect of the impacts inland is the extreme precipitation events that are increasing not only frequency but in intensity. The amount of rain falling in the 1-percent heaviest events has increased quite a bit in the Midwest, second only to the Northeast of the country.

So when you look at the main impacts that are already correlated with climate change, the extreme precipitation events is one that we can talk about. Because flooding is the main consequence of extreme precipitation events, as you mentioned, there will be quite a bit more flooding in the area of your State.

However, we must not focus only on the physical impacts, right? This is a committee on preparedness and response. So when we talk about these disasters, we have to talk about people. People are going to be exposed not only to the physical impacts of these extreme events—the rain itself, the flooding itself—but also the psychological impacts, the social impacts, and everything that comes with a flood. Their house may not be flooded, but their place of work may. The school of their children may. They may lose their wages because they cannot go to work.

They have psychological impacts because they get flooded over and over again. I can yield to Mr. Manning here to talk about repetitive losses if places get inundated over and over and over again. Not only the mental impact is very big but also the impact on the preparedness.

So I would say that extreme precipitation events and flooding are No. 1.

Ms. UNDERWOOD. Yep. We are seeing that even in our neighboring State of Iowa. So much of that State has had catastrophic floods over the last month or so. It could happen anywhere. It is happening more frequently.

Ms. CALDAS. If I may, this last flooding event, it was not even an extreme precipitation event. It was more of a perfect storm, because there was record-breaking snowfall, which was because there is a lot more water vapor in the atmosphere. That is extreme precipitation in the form of snow, not rain.

So all that snow was there, and then the rain came down and the snow was melted. With the frozen ground, there was nowhere for the water to go but to the river, and all blocked up.

Ms. UNDERWOOD. Yep. So what can we expect to see in the Great Lakes region in the next 5 or 10 or 20 years? What do you think?

Dr. Caldas.

Ms. CALDAS. Oh, you asking him?

Ms. UNDERWOOD. No, no. You.

Ms. CALDAS. I, unfortunately, don't have a lot of specific detail on——

Ms. UNDERWOOD. OK.

Ms. CALDAS [continuing]. The Great Lakes. It is a very important region, of course—fresh water and everything. I have heard several people saying that it is going to be one of the regions that is going to be the focus of a lot of migration.

Ms. UNDERWOOD. Thank you.

Flood waters, of course, don't just go away right after a flood. Communities can remain under water for days or weeks, like we just discussed.

So, Ms. Trousdale, can you discuss the public health consequences of standing water after a flood? How are kids potentially vulnerable to these consequences?

Ms. TROUSDALE. Thank you for the question.

Flood waters obviously pose a severe drowning risk for children. They are among the most likely to drown in a flood. It also can pose electrical hazards when there are downed power lines. It can mix with raw sewage and toxic chemicals and then leave behind residues that can contaminate children's belongings, and children with open wounds can come into contact and also be infected.

Then the retreat of flood waters obviously leaves behind mosquito-breeding habitats, which can spread the vector-borne diseases such as Zika and Dengue. Of course, children, because their immune systems are still developing, they are potentially at greater risk for harm from these infectious illnesses.

Ms. UNDERWOOD. Thank you.

You wrote in your testimony that children remain an afterthought in preparedness, response, and recovery measures during these natural disasters. I know that our committee is committed to making sure that they are no longer an afterthought moving forward.

Thank you so much for all of your work and for appearing here today.

Mr. Chairman, I yield back.

Mr. PAYNE. Thank you.

We probably have a little time to ask another round, if you have time.

But let me say that, you know, the issue around climate change and whether this is the proper jurisdiction, I was going to get into that a little deeper, but I will accept that everyone is entitled to their opinion.

Mr. Manning, can you explain to this committee why fighting climate change matters in our efforts to stop terrorism?

Mr. MANNING. Well, thank you, Mr. Chairman.

You know, similar to the conversations we have been having about the domestic impacts of changing growing patterns, of weather patterns, flooding, that is an impact that is happening globally. We have seen—currently, there are conflicts in North and East Africa that are largely climate-driven, where there are conflicts between pastoral herders and agrarian farmers for—resource conflicts. I think there is a potential future where there are growing resource conflicts—access to clean drinking water, access to grazing lands, growing lands.

As you increase conflict, you have instability in nations, you have radicalization, you have all of the ingredients necessary that we have seen historically that lead toward radicalization and terrorism.

There is some argument that the Syrian conflict has roots in resource conflicts, climate-driven resource conflicts. It is no secret to anybody, the impacts on our National security from the growth of IS in the Syrian region.

So there is most definitely a link, a concern, going forward, with the changing climate, what effect that changing climate has on societies world-wide and the potential conflicts that can be driven by access to resources as a result of those changes.

Mr. PAYNE. Thank you.

Ms. Trousdale, a lot of my work has been around vulnerable populations since becoming a Member of this subcommittee, Ranking Member, and now Chairman. So that is something—children in vulnerable populations has been one of my main focuses.

As a matter of fact, I was fortunate enough to pass the CLASS Act of 2019 last week, which deals with active shooters. We know what that devastation has been to our young people across the country, as well as other populations.

Can you discuss any inequities in disaster recovery in children? Are we seeing worse outcomes in poor, minority children after a disaster?

Ms. TROUSDALE. Thank you for the question, Chairman Payne.

Unfortunately, disaster aid tends to favor wealthy Americans and white Americans and homeowners. Because they have relatively good jobs and higher incomes, they are able to have some flexibility when they are in the recovery period searching for new places to live. They are able to better navigate the bureaucracy in order to access aid. They usually have a stronger social network, so they are able to have help finding new jobs and places to stay.

Because of this, they tend to do better than families with lower incomes and from communities of color. This exacerbates the existing economic and social inequities that exist. This, obviously, then persists with the inequalities we see and the health disparities that we are seeing among children as well.

It is just an unfortunate circumstance, and we need to really address the issues that what may appear on surface as equitable treatment in the cases of disaster aid doesn't necessarily result in equitable benefits. This just means that our children from more vulnerable and under-resourced communities end up in worse positions than they started, and it exacerbates their health.

Mr. PAYNE. Thank you.

You know, I stay committed to raising these issues on a National level in order that there is some equity for all Americans in disaster times. We see what Katrina did. We saw what Harvey did. You know, people of lesser means suffered magnificently, incredibly. So I will continue to raise those issues.

I will recognize the gentlelady from Illinois once again.

Ms. UNDERWOOD. Thank you, Mr. Chairman. Just a quick comment on the scope, climate change, and its role in this committee.

You know, FEMA did include climate change in its strategic plan over a number of years as a considerable threat to our country and our on-going National security, including while Mr. Manning was at the agency, included climate change, which was important to allow the agency to plan forward.

So this subcommittee, which does deal with emergency preparedness, response, and recovery, must recognize the totality of the threats facing our Nation in order for those most vulnerable Americans to have a chance at survival during a disaster.

It is critically important, sir, and I would like to thank you for holding this hearing today.

I am a nurse. I don't know if you all knew that. As health providers, we are trained in a number of areas. During my training, there wasn't necessarily a specific focus on disaster medicine, and I know that that is the case for a variety of health professionals. But we do know that the care that folks receive after an emergency or after a disaster is critically important. So I want to speak a little bit about these training needs.

Ms. Trousdale, do you know or can you speak about the level of training that providers receive in order to identify and treat post-disaster medical issues, both for children and those around them? Then do we need to provide more professional training for medical response after a disaster?

If you could just provide some comments there.

Ms. TROUSDALE. Thank you for the question.

I can't speak to the level of training that health care professionals currently receive regarding disaster response. I can speak to the fact that we need climate change and environmental health curricula in medical schools and nursing schools, and it is an important component of schools of public health as well.

All in the medical field need to understand the underlying issues of pediatric environmental health and how children have unique vulnerabilities so that they can better anticipate their needs in a disaster, plan for them, and then be able to respond.

It is not just the immediate responses that are necessary, whether it is the physical trauma or the emotional health issues, but it is following them up afterwards and making sure that these children aren't—say, a child with asthma isn't returning home to a home that is filled with mold or that has a leaky roof and that children aren't returning to schools that have toxic residues left over from a flooding clean-up that wasn't done correctly.

So it is really important that all medical and nursing professionals have a basic understanding of how children are not just like adults but uniquely vulnerable.

Ms. UNDERWOOD. Thank you.

Did anyone else on the panel want to comment on that, health professional training?

Mr. MANNING. Well, Congresswoman, I would just like to jump in to suggest that we always could use more training, in my experience.

One of the roles I played at FEMA was overseeing the Nation's training and education for the whole Homeland Security mission, the emergency management part of that. The Department trained millions of first responders a year. While I am very proud of that, it is never enough. There is always more that can be done.

We will become a stronger Nation and a stronger community with stronger first responders but also general practitioners and neighbors that know more about how to help each other in emergencies. So I would fully support that.

Ms. UNDERWOOD. Thank you.

With that, I will yield back. Thank you, sir.

Mr. PAYNE. Thank you.

I would like to thank the witnesses for their testimony today. It has been invaluable. We would like to thank all of you for your valuable testimony and the Members for their questions.

Members of the subcommittee may have additional questions for the witnesses, and we ask that you respond expeditiously in writing to those questions.

Pursuant to committee rule VII(D), the hearing record will be held open for 10 days, without objection.

Hearing no further business, the subcommittee stands adjourned.

[Whereupon, at 4:16 p.m., the subcommittee was adjourned.]

APPENDIX

QUESTION FROM CHAIRMAN DONALD M. PAYNE, JR. FOR ASTRID CALDAS

Question. What would you say to the people that still have doubts about the current science pointing to the fact that human activity is contributing to climate change?

Answer. I would say that real, observational data tells us that there are unprecedented amounts of carbon dioxide (CO_2) and other heat-trapping gases in the atmosphere, that CO_2 levels have never been this high, and that the amount and speed of warming currently observed has not been seen in the history of human civilization. And I would tell them that yes, scientists can tell with certainty (from both physics and chemistry) that human activity is contributing to it.

The physics of global warming has been known for over a century, and the relationship between CO_2 and warming is well understood. The more CO_2 there is in the atmosphere, the warmer it gets.

Scientists know that the massive increase in carbon dioxide is almost entirely due to human activity by calculating how much CO_2 comes from burning fossil fuels and how much comes from natural sources. That is because carbon from fossil fuels has a different isotopic "signature" than carbon from other sources. Because of that difference, we can say that carbon coming from fossil fuel emissions is the largest contributor of CO_2 concentrations since pre-industrial era. [An isotope is each of 2 or more forms of the same element that differ in relative atomic mass but not in chemical properties]

Added context for understanding the problem:

There is a well-known concept in psychology called confirmation bias, which is our tendency to only listen to information that confirms our existing beliefs or ideas. When people would like a certain idea/concept to be true, they end up believing it to be true and seek information that validates it. This cognitive bias is most pronounced in the case of ingrained, ideological, or emotionally-charged views.

This is in part what has happened with climate change. So, telling people more about the science is usually a moot exercise—even if it is the truth. Mainly, we need people to see for themselves how things have changed through the years and make the right connections. That is not an easy thing to achieve.

I will however, highlight that confirmation bias is not a core value such as faith, honesty, or ethics. People live by core values, and those are usually unchangeable. Acceptance of climate change is NOT a core value, and therefore can be changed. The process for change is mostly through social processes and interactions: If my peer circle says there is no climate change, I agree because I want to belong to the circle, it is important to me to be accepted in it, INDEPENDENTLY of what the prevalent or scientifically true view is—it doesn't really matter because it is not a core value. In fact, studies show that if a trusted leader of a social circle changes their view, the circle can change it too, unless there is a personal interest in keeping the old view. The hardest part is, of course, for that leader to step up and do the right thing.

QUESTIONS FROM CHAIRMAN DONALD M. PAYNE, JR. FOR DAN EGGLESTON

Question 1. Do you think first responders, and the technology being developed for first responders, are adequately considering how climate change will affect their jobs?

Answer. Response was not received at the time of publication.

Question 2. Do you think we need more research into the effects of climate change, both current and future effects, on first responders?

Answer. Response was not received at the time of publication.