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SUBCOMMITTEE ON EMERGENCY PREPAREDNESS, RESPONSE, AND RECOVERY

"ASSESSING THE HOMELAND SECURITY IMPACTS OF A CHANGING CLIMATE,"

April 9th, 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. 2018 saw the 4th 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 it's 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 born diseases into new areas.

By objective, empirical measures, the Earth's climate is changing. The past five years have been the hottest five years in human history; eight out of the top ten have been in the past ten, and all of them in past twenty. 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% increase since the 1960s, 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 US, in the Midwest and Northeast in particular, have increased by 40% to 50% since 1900, and may increase as much as a further 50% 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 US is

no different. This puts a growing population, and it's 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 two feet of rise by the end of the century. Using updated data and methods, the National Climate Assessment predicts up to four 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 mid west 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 effect 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 two months, and average size of wildfires has increased by 300%.

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 one 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 under resourced 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 EO 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-critical actions and 3 feet for critical actions (such as the location of critical infrastructure). In August of 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 it's 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 it's 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.