NOT FOR PUBLICATION UNTIL RELEASED BY THE SUBCOMMITTEE

Statement by

Rear Admiral (ret.) David W. Titley

Director, Center for Solutions to Weather and Climate Risk
The Pennsylvania State University

on

U.S. Security Implications of International Energy and Climate Policies and Issues

Submitted to the

Subcommittee on International Development and Foreign Assistance, Economic Affairs, International Environmental Protection and Peace Corps
United States Senate

July 22, 2014

NOT FOR PUBLICATION UNTIL RELEASED BY THE SUBCOMMITTEE

Chairman Markey, Ranking Member Barrasso, and distinguished members of the Committee, thank you for the opportunity to discuss the implications of climate change on geo-political security. It is a privilege to come before you today and discuss this very important topic.

Introduction

I am David Titley and I currently serve as the Director of the Center for Solutions to Weather and Climate Risk at the Pennsylvania State University. I had the honor of serving in the United States Navy for 32 years where my capstone assignment was Oceanographer and Navigator of the Navy, Director of U.S. Navy Task Force Climate Change, and Assistant Deputy Chief of Naval Operations for Information Dominance. Subsequent to my time in the Navy, I served as Chief Operating Officer at the National Oceanic and Atmospheric Administration (NOAA).

My Center at Penn State currently receives no Federal Funding and my views do not necessarily represent those of the Pennsylvania State University.

You invited me here today in my position as a member of CNA's Military Advisory Board – MAB for short. In this capacity I am here today not only representing my views on the security implications of climate change, but the collective wisdom of the 16 Admirals and Generals who also serve on CNA's MAB.

I. Global Trends: Accelerating Risks

Since we published our first report in 2007 on the national security implications of climate change, we have witnessed nearly a decade of scientific discoveries in environmental science, burgeoning scholarly literature on complex global interdependence associated with climate change, and a series of reactions, or in many cases failure to react, to the impacts of climate change. In the seven years that have passed since our initial assessment we have witnessed more frequent and/or intense

weather events, including heat waves, sustained heavy downpours, floods in some regions, and droughts in others areas. Nine of the ten costliest storms to hit the United States have occurred in the past 10 years, including Hurricane Katrina and Superstorm Sandy. Speaking for the MAB, we assess that the nature and pace of observed climate changes— and an emerging scientific consensus on their projected consequences— pose severe risks for our national security. Still, there those who remain skeptical about the observed changes, the causes, and debate on the magnitude of the risk.

When I was on active duty, both serviing as the Senior Military Assistant to the Direcot of Net Assessment and particularly as a Flag Office was how to think about risk and uncertainty. Managing risk is seldom about dealing with absolute certainties but, rather, involves careful analysis of the probability of an event and the consequences should the event occur. When it comes to our national security, even very low probability events with dire consequences must be considered and mitigation/adaptation schemes developed and employed. Rather than assessing a range of estimates as proof of disagreement that can be used to justify inaction, military leaders view such evidence through the lens of varying degrees of risk the estimates could represent. Military leaders evaluate the probability and possible consequences of events in determining overall risk. Today, the risks posed by predicted climate change, in the MAB's judgment, represent even graver potential than they did seven years ago and require action today to reduce risk tomorrow.

A. Four Important Global Trends

There are four import global trends, worthy of note, which will provide additional fuel to the accelerating risks of climate change. First is global population growth. Half a billion people have been added since the MAB completed its first report in 2007 and another half billion will be added by 2025. Most of this growth is in Africa and Asia, two of the areas likely to be most impacted by climate change. The second trend is urbanization. Nearly half of the world now lives in urban areas with 16 out of 20 of the

largest urban areas being near coastlines. The result is more of the world's population is at risk from extreme weather events and sea level rise. The next trend is a global increase in the middle class with an accompanying growth in demand for food, water, and energy. The National Intelligence Community predicts that by 2030 demand for food would increase by 35 percent, fresh water by 40 percent, and energy 50 percent. Even without the climate changing, it will be a challenge to meet these growth targets. Climate change will further stress the world's ability to produce food and drinkable water at levels necessary to meet demand. A 2012 National Intelligence Council assessment found that water challenges will likely increase the risk of instability and state failure, exacerbate regional tensions, and divert attention from working with the United States and other key allies on important policy objectives. The final trend notes that the world is becoming more politically complex and economically and financially interdependent. As such, we believe it is no longer adequate to think of the projected climate impacts to any one region of the world in isolation. Climate change impacts, combined with globalization, transcend international borders and geographic areas of responsibility.

B. Accelerating Risks around the World Affect US National Security

The world around us is changing. In recent years we have observed changing weather patterns manifest by prolonged drought in some areas and heavier precipitation in others. In the last few years we have seen unprecedented wildfires threaten homes, habitats, and food supplies, not only across the United States, but also across Australia, Europe, Central Russia, and China. Low-lying island nations are preparing for complete evacuation to escape rising sea levels. Globally, we have seen recent prolonged drought act as a factor driving both spikes in food prices and mass displacement of populations, each contributing to instability and eventual conflict. For example in Syria, five years of drought decimated farms and forced millions to migrate to urban areas. In over populated cities, these climate refugees found little in the way of jobs and were quickly disenfranchised with the government. The ongoing strife in Syria has

been exacerbated by drought and rural to urban migration. In this way climate change has exacerbated a region already torn by political and ethnic tensions, serving as a catalyst for conflict. Over the coming decades we are concerned about the projected impacts of climate change on those areas already stressed by water and food shortage and poor governance – these span the globe, but present the greatest short-term threat. In the longer term it is those areas that will be threatened by rising sea level that are most at risk. There will be only so much we can do to keep the sea out, and in some areas the sea will not flow over the walls we build, it will flow under or around and make the land and aquifers not useable. We are concerned about low lying islands in the Pacific and great deltas including the Mekong, the delta of Bangladesh, the Nile delta in Egypt, the Mississippi delta and whole regions like the Everglades. Seawater inundation will drastically cut food production in many of these areas and cause millions to lose their ability to live on these retreating areas. Migration will become a larger form of adaptation. We will need to learn how to accept large transnational migration of people peacefully.

II. Accelerating Climate Risks to the US Homeland

A. Arctic is Rapidly Changing – US Needs to Prepare

While all of the areas of increased population, stresses on food and water resource are of growing concern, one of the areas about which we have the greatest immediate concern is the Arctic. Over the past few years, we have seen an almost exponential rise in the activity in the Arctic; more shipping, more resource extraction and more posturing for control over the resources. The Arctic is an example of where climate change should serve as a catalyst for international cooperation. The world is not yet prepared to respond to an accident or disaster that could occur with increasing shipping and energy exploration in this fragile region with limited infrastructure and extreme operating conditions. Some great work has been done across the U.S. government in putting together plans for increased future operation in the Arctic, with

the Navy's 2014 Arctic Roadmap as one example. The challenge is that the increase is happening now. 73 ships sailed through the Northwest Passage in 2013, up from 4 in 2007; meanwhile the Russians planted a flag on the sea bottom near the North Pole. Preparations for energy exploration are well underway. We assess that today we do not have the communications equipment, navigation aids, and sufficient ice hardened ships to respond to natural or manmade disasters in that fragile area or to protect our vital interests. In other words, we are not prepared in the short term for the rate of increase and we must invest today in increasing our capability and capacity.

B. Growing Awareness of Climate Risks and Planning in the US

On the positive side, we have seen increased awareness of climate risks in communities around the US, and constructive planning underway in various regions, regardless of whether the state or region is 'red' or 'blue'. Two examples are worth noting.

The first example is Hampton Roads Virginia, where the military and the local community are jointly addressing sea level rise. Rising sea levels, natural subsidence, and storms pose risks to the many military facilities, related commercial shipyards, and community in this critically important region. The area has hundreds of miles of waterfront from three major rivers that flow into the Chesapeake Bay. The DOD realizes that sea level rise will affect both the Hampton Roads installations and the surrounding civilian community. DOD, working with other federal, state, and local agencies, as well as the Climate Change and Sea Level Rise Institute at Old Dominion University has launched an aggressive effort to develop plans and measures to sustain the vital missions of this region and protect the surrounding communities. Our report specifically highlights the initiatives of the Hampton Road area as a positive case study.

Second, and very recently, the Pensacola Florida region is considering how to build and rebuild in a future climate that is very different than what we experience today. Spurred on by the historic floods this past April as well as the projections in the National Climate Assessment, many scientists, citizens and government leaders in the Pensacola area understand that the time to act is now, and that prudent planning and preparation will save lives, money, and economic opportunities in the long run.

III. Increasing Impacts on Military Readiness

Along with planning for increased Arctic operations, the MAB was pleased to see that the changing climate is reflected throughout the 2014 Defense Department Quadrennial Defense Review (QDR). The MAB holds that projected climate change will have three major impacts on the military: more demand; challenges to readiness; and new and harsher operating environments.

The MAB expects to see an increased demand for forces across the full spectrum of operations. Domestically, response to extreme weather events and wildfires in the U.S. will increase demand for National Guard, and reserves. The frequency, severity and probability that these events may happen simultaneously will also likely increase demand for active duty forces to provide defense support for civilian authority (DSCA). This causes us concern because, in a leaner military, many of our capabilities reside in the Guard and reserve and if they are being used domestically they are less available to respond to worldwide crisis. We saw this impact following tropical storm Sandy.

Globally there will be increased demand for humanitarian response and disaster relief in response to extreme weather. Witness more than 13,000 military troops that responded to Typhoon Haiyan in the Philippines late last year. As importantly, climate change will be a catalyst for conflict in fragile areas and U.S. military involvement could be an option in response to the conflicts.

In addition to more demand, which in itself will stress readiness, our bases will be increasingly at risk from the effects of climate change. Our bases are where we generate readiness. It is where we train, garrison, repair, maintain and prepare to deploy. Our bases are vulnerable to sea level rise, extreme weather including drought, which restricts training because of the threat of wildfire, and in the future increased precipitation in the form of rain and snow may limit training. It is not just the bases, but also the surrounding communities, which house and support the military. If our sailors, soldiers airmen and marines can't get to the base because the road is flooded then we can't generate readiness.

Finally, climate change will cause the military to be deployed to harsher environments. Higher temperatures will stress equipment and people, while at the same time the opening of the Arctic present a whole new set of challenges where the military will be expected to respond to everything from search and rescue, to disasters (weather and man-made) to resolution of conflict and protection of vital interests.

IV. National Power Affected by Climate Risks

The final area I want to cover is how climate change will impact the elements of national power, here at home.

National security is more than just having a strong or capable military. American's security is determined by multiple elements of national power: diplomacy, information, military and economic, at a minimum. When deployed strategically, they can constitute "smart power." On the vulnerability side, National Power can also be assessed by degradations to a nation's political, military, economic, social, infrastructure, and information systems. The MAB has addressed how projected climate change could degrade our National Power and particularly focused on military, infrastructure, economic, and social support systems.

Strain on Military Readiness and Base Resiliency. As discussed earlier, the projected impacts of climate change could be detrimental to military readiness, strain base resilience both at home and abroad, and may limit our ability to respond to future demands. The projected impacts of climate change will strain our military forces in the coming decades. More forces will be called on to respond in the wake of extreme weather events at home and abroad, limiting their ability to respond to other contingencies. Projected climate change will make training more difficult, while at the same time, putting at greater risk critical military logistics, transportation systems, and infrastructure, both on and off base.

Risks to Critical Infrastructure. The impacts of projected climate change can be detrimental to the physical components of our national critical infrastructure, while also limiting their capacities.

The nation depends on critical infrastructure for economic prosperity, safety, and the essentials of everyday life. Projected climate change will impact all 16 critical infrastructure sectors identified in Homeland Security planning directives. We are already seeing how extreme heat is damaging the national transportation infrastructure such as roads, rail lines, and airport runways. We also note that much of the nation's energy infrastructure—including oil and gas refineries, storage tanks, power plants, and electricity transmission lines—are located in coastal floodplains, where they are increasingly threatened by more intense storms, extreme flooding, and rising sea levels. Projected increased temperatures and drought across much of the nation will strain energy systems with more demand for cooling, possibly dislocate and reduce food production, and result in water scarcity. Since much of the critical infrastructure is owned or operated by the private sector, government solutions alone will not be able to address the full range of climate-related challenges.

Economic Costs. The projected impacts of climate change will threaten major sections of the U.S. economy.

According to the 2014 National Climate Assessment, "The observed warming and other climatic changes are triggering wide-ranging impacts in every region of our country and throughout our economy…." Most of the U.S. economic sectors, including international trade, will be negatively affected by projected climate change. Major storms, such as Superstorm Sandy, cost the US an estimated $50 Billion in damages.

On the other hand, as we recognize these risks, communities such as New York and New Jersey are adapting and making this region more resilient to extreme events in the future.

Local Communities Affected Too. The projected impacts of climate change will affect major sections of our society and stress social support systems such as first responders. As coastal regions become increasingly populated and developed, more frequent or severe storms will threaten vulnerable populations in these areas and increase the requirements for emergency responders in terms of frequency and severity of storms. Simultaneous or widespread extreme weather events and/or wildfires, accompanied by mass evacuations, and degraded critical infrastructure could outstrip local and federal government resources, and require the increased use of military and private sector support.

Conclusion: The time for action is NOW. Projected climate change may cause increased instability around the world; we are not prepared for the pace of climate change as evidenced by our lack of capability and capacity to respond to the opening of the Arctic; climate change will likely impact our military readiness and support

systems as well as cause increased demand for forces, both at home and abroad, and finally climate change will impact elements of our national power here at home. Let me leave you with these comments by my fellow MAB General and Flag Officers:

> At the end of the day, we validate the findings of our first report and find that in many cases the risks we identified are advancing noticeably faster than we anticipated. We also find the world becoming more complex in terms of the problems that plague its various regions. Yet thinking about climate change as just a regional problem or—worse yet—someone else's problem may limit the ability to fully understand its consequences and cascading effects. We see more clearly now that while projected climate change should serve as catalyst for change and cooperation, it can also be a catalyst for conflict.
>
> We are dismayed that discussions of climate change have become so polarizing and have receded from the arena of informed public discourse and debate. Political posturing and budgetary woes cannot be allowed to inhibit discussion and debate over what so many believe to be a salient national security concern for our nation.

In their forward to the CNA MAB report, former Secretary of Defense Panetta and former Secretary of Homeland Security Michael Chertoff summarized our most important message for the Committee:

> "The update serves as a bipartisan call to action. It makes a compelling case that climate change is no longer a future threat – it is taking place now. . . . actions to build resilience against the project impacts of climate are required today. We no longer have the option to wait and see."

Thank you for your attention and focus on what is one of the most important issues to our Nation's future security and well-being.