

**COMMENTARY**

# National security and the accelerating risk of climate change

Vice Admiral Lee Gunn, U.S. Navy (Retired)\*†

Since 2006, retired U.S. admirals and generals have been examining our changing physical world and assessing the impact of those changes on the security of the nation. A Military Advisory Board (MAB, convened by the CNA Corporation, a non-profit research and analysis institution that operates the Center for Naval Analyses and Institute for Public Research) has issued two reports on the changing climate's national security implications. The first report, published in 2007, stated that the changing climate would be destabilizing in many parts of the world. Climate change, in fact, would be a "threat multiplier", the report claimed, and result in new and more urgent calls for the American military to provide humanitarian assistance and disaster relief (HADR) as well as help sustain order and ensure conditions that would permit trade and prosperity worldwide. The MAB recommended urgent action by the Defense Department to prepare for new missions in new places; and that the Defense Department explicitly recognize missions stemming from the changing climate. CNA's MAB then published three reports on energy, relating to climate change, one each on: the coming age of renewables, the nation's energy dependence, and the future of energy in terms of America's international competitiveness (CNA-MAB, 2009; CNA-MAB, 2010; CNA-MAB, 2011). In 2014, the Military Advisory Board noted that the climate was changing more quickly than had been forecast in 2007. Undertaking a new climate study, the board concluded that more needed to be done, and done quickly, to prepare for and confront the "catalyst for conflict" that the board now saw in climate change.

**Guest Editors' Note:** *The following commentary derives from a presentation by Vice Admiral Lee Gunn, U.S. Navy (Ret.), delivered by invitation at the American Association for the Advancement of Science Meeting, San Jose, California, February 13, 2015. Prior to his advisory role for the U.S. Military and national security community with the CNA Corporation (<https://www.cna.org>), he served for 35 years in the U.S. Navy. His last active duty assignment was Inspector General of the Department of the Navy where he was responsible for the Department's overall inspection program and its assessments of readiness, training, and quality of service. Serving in the Surface Navy in a variety of theaters, Gunn rose through the cruiser/destroyer force to command the Frigate USS Barbey, then commanded the Navy's anti-submarine warfare tactical and technical evaluation Destroyer squadron, DESRON 31. He later commanded Amphibious Group Three. As Commander of PHIBGRU THREE, he served as the Combined Naval Forces Commander and Deputy Task Force Commander of Combined Task Force United Shield, which conducted the withdrawal of U.N. peacekeeping forces from Somalia. Since retiring from active duty in the Navy, Gunn has been President of The Institute for Public Research at CNA Corporation. Gunn holds a Bachelor's degree in Experimental and Physiological Psychology from the University of California, Los Angeles and a Master of Science in Operations Research from the Naval Postgraduate School in Monterey, California.*

*His commentary addresses why members of the national security community regard climate change as a clear threat to national security now, and a threat that will only increase if climate change continues unchecked.*

**Keywords:** climate change; national security; preparedness

**Introduction**

This talk is part of a series of outreach briefings given by the retired generals and admirals of CNA's Military Advi-

sory Board across the country. Board members apply their military experience and perspectives to issues surrounding climate change, intending to elevate the conversation above the politicized shouting that too often drowns out civil inquiry.

The New York Times published an article in early 2015 about problems in Pakistan (Khan, 2015; Masood, 2015). At the time it seemed like almost every news outlet almost

\* CNA's Institute for Public Research, US

† CNA's Military Advisory Board, Arlington, VA, US  
[gunn.lee.f@outlook.com](mailto:gunn.lee.f@outlook.com)

every day described problems of one kind or another in Pakistan. And the fact today is that these articles often are explicit about the changes in water availability, the lack of clean water, and the consequences of climate change for the people of Pakistan.

I have been there. And during the course of my Navy Career, I was in many places where the causes and consequences of environmental collapse were evident every day. Men and women in our armed forces are on the front lines, contending not only with direct military threats and confrontations but also with the consequences of crop failures, pollution, disease spread, mass human migrations, failed or failing states, and natural disasters, in many cases related in some way to the heating of the planet. Because men and women in uniform are so heavily engaged in dealing with the results of climate change, the Department of the Navy and Department of Defense have long been focused on helping people and nations avoid and contend with the resulting stresses. Americans expect leaders in defense to plan for every eventuality and to deal with every threat to our security. It should come as no surprise, then, that the Department of Defense and all the armed services are, in my view very far ahead of many other parts of the federal government in planning for and considering the causes and consequences of climate change, energy dependence and related issues.

Defense Department planning has paid off in big ways in the past. A good example was the planning undertaken in the years between World War I and II. Navy and Marine Corps leaders, in war games in 1933–1937 at the Naval War College in Newport, Rhode Island, planned the entire Pacific campaign against the anticipated threat from Imperial Japan. The services fought almost exactly that campaign across the Pacific from 1942 to 1945.

The company I have worked for since retiring from the Navy is that kind of forward-thinking, analytical outfit, too. CNA Corporation is a non-profit, non-partisan research and analysis enterprise tracing its roots to World War II in 1942, when a handful of professors from Columbia and MIT were asked by the Navy to go to sea and analyze naval operations in the face of the Nazi submarine threat in the Atlantic. That approach survives today in the Center for Naval Analyses, the defense research portion of CNA Corporation, where scientists, engineers, economists, talented folks all, go where the problems are and stay until they are solved. I have been privileged since retiring from the Navy to lead the Institute for Public Research at CNA, which furnishes the same independent, high-quality research to government leaders outside of the Defense Department. Teams at the Institute for Public Research work in education, homeland security, justice, air traffic, and in energy, water, and climate studies.

CNA has contributed to our national security for over seven decades; it was natural that in 2006 CNA convened a Military Advisory Board of eleven retired Admirals and Generals, which has now grown to 16 individuals, to study the implications of climate change from a national security

perspective. Here is a list of members as of December 2016 (<https://www.cna.org/mab/members>):

- **General Ronald E. Keys, USAF (Ret.), Chairman, CNA's Military Advisory Board**  
*Former Commander, Air Combat Command*
- **Vice Admiral Lee F. Gunn, USN (Ret.), Vice Chairman, CNA's Military Advisory Board**  
*Former Inspector General of the Department of the Navy*
- **Brigadier General Gerald E. Galloway, Jr., USA (Ret.), Vice Chairman, CNA's Military Advisory Board**  
*Former Dean at the United States Military Academy, West Point; Dean at the Industrial College of the Armed Forces, National Defense University*
- **Cheryl Rosenblum, Executive Director, CNA's Military Advisory Board**
- **Admiral Frank "Skip" Bowman, USN (Ret.)**  
*Former Director, Naval Nuclear Propulsion Program; Former Deputy Administrator-Naval Reactors, National Nuclear Security Administration*
- **General James T. Conway, USMC (Ret.)**  
*Formerly 34th Commandant of the Marine Corps*
- **Lieutenant General Ken Eickmann, USAF (Ret.)**  
*Former Commander, Aeronautical Systems Center, Wright-Patterson AFB*
- **Lieutenant General Lawrence P. Farrell, Jr., USAF (Ret.)**  
*Former Deputy Chief of Staff for Plans and Programs, Headquarters U.S. Air Force*
- **General Donald J. Hoffman USAF (Ret.)**  
*Former Commander, Air Force Materiel Command*
- **General Paul Kern, USA (Ret.), Chairman, CNA's Military Advisory Board**  
*Former Commanding General, U.S. Army Materiel Command*
- **Rear Admiral Neil Morisetti, British Royal Navy (Ret.)**  
*Former U.K. Foreign Secretary's Special Representative for Climate Change  
Former Commandant, U.K. Joint Services Command and Staff College*
- **Vice Admiral Ann Rondeau, USN (Ret.)**  
*Former President of National Defense University  
Former Deputy Commander, U.S. Transportation Command*
- **Lieutenant General Keith J. Stalder, USMC (Ret.)**  
*Former Commanding General, U.S. Marine Corps Forces, Pacific*
- **Rear Admiral David W. Titley, USN (Ret.)**  
*Former Oceanographer and Navigator of the Navy*
- **General Charles F. "Chuck" Wald, USAF (Ret.)**  
*Former Deputy Commander, Headquarters U.S. European Command (USEUCOM)*
- **Lieutenant General Richard C. Zilmer, USMC (Ret.)**  
*Former Deputy Commandant for Manpower and Reserve Affairs, Headquarters Marine Corps; Former Commanding General of Multi-National Force, Al Anbar, Iraq*

In 2007 the board published National Security and the Threat of Climate Change (CNA-MAB, 2007). By recognizing and presenting climate change as a looming, and indeed current, threat to our national security, these officers (with lifetimes of defense and security experience) introduced an entirely new dimension to Americans' conversations about climate change.

Here is how it has worked. For each study CNA asks retired admirals and generals to volunteer to work with the CNA research staff over a period of time. For the first study, 2006–2007, they analyzed the scientific climate data, the policy and planning information, the state of Defense Department climate preparations, and reached a consensus evaluation based on their military experience. My sense is that much of the information they collected and analyzed came from the people in this room [at the 2015 AAAS Meeting in San Jose, California]. Again, it was the science of climate change that was blended with a lot of military experience to conclude that while much was being done in the security establishment to confront the consequences for climate change, much more work would be needed. To date, some 35 retired admirals and generals (I am one of them) have participated in one or more of the five studies done by CNA's Military Advisory Board <https://www.cna.org/mab/>.

Each study begins with a question for the board. The first work began, for instance, with the questions: Is the physical environment changing substantially and, if so, is the rate of change sufficiently rapid that it could constitute a security threat to the United States? During that study, and as has happened in other, subsequent studies, additional and related questions have arisen as the research went on. The added question in our first study I will paraphrase as: Is the U.S. Department of Defense (DoD) reacting to the threat if it exists and, if not, should DoD factor the changing environment and climate into planning, budgeting, and programming the forces of the future?

The board then refines the question and, in consultation with the CNA research staff, develops an appropriate research program. Researchers conduct a thorough literature review, assess security implications against the body of defense work done over seven decades by the CNA Corporation's staff, add original research where needed, and produce a preliminary product for the board. MAB members review the product over the course of multiple full-day meetings, and write a draft report. That report is then reviewed more broadly by the CNA research staff and directors, finalized, and published as a CNA MAB report.

That first report, National Security and the Threat of Climate Change (CNA-MAB, 2007), was followed by three others, and they are all available on the CNA Corporation website, (<https://www.cna.org/mab/reports>). The second, third, and fourth reports (CNA-MAB, 2009; CNA-MAB, 2010; CNA-MAB, 2011) all had to do with energy and the economy in one way or another. One report addressed one of the thorniest defense department problems: the effects of having to shift from fossil fuels to more environmentally friendly forms of energy for transportation. Another addressed our security vulnerabilities

associated with our dependence on foreign sources of fuel, and the last of these considered the security importance of American competitiveness and the opportunities associated with moving to a new, advanced, clean energy economy.

The fifth report, which we published in May of 2014 (CNA-MAB, 2014) updated our first one. In 2007, the MAB had based its conclusions on (then) current predictions from the scientific community about the rates of change the world would see in the years ahead. By 2013–2014, though, we were seeing the climate change more rapidly than predicted and the MAB concluded that it was important to raise the alarm about our security again. So again, we saw changes in the world around us accelerating. And in the course of keeping up our studies on energy, the environment, and economy in the intervening years we recognized it was important to update the first report.

What I am going to do now is shift the perspective a bit. I have brought eleven slides with me today (see supplemental material Slides S1). These are examples of the kind of viewgraphs that the other members of the Military Advisory Board and I take throughout the country for conversations with Americans. Of course, much of what is in these images is already accepted by the audience in this room and in many cases, as I indicated, maybe some of you generated the information and the research that underpins what we learned in the course of reaching our conclusions.

***“We never have 100 percent certainty. We never have it. If you wait until you have 100 percent certainty, something bad is going to happen on the battlefield.”***

—General Gordon R. Sullivan, USA (Ret.),  
Chairman, Military Advisory Board,  
Former Chief of Staff, U.S. Army (CNA-MAB, 2007)

To recap: Over the last eight years now, a group of skeptical soldiers, sailors, airmen, marines, and coast guardsmen, all admirals and generals have convened to study trends and issues in climate and energy. We have become convinced that climate change and American energy independence issues are serious national security issues and we have equipped ourselves, we believe, to go forth and talk with people across the country about our conclusions. This is important because many people in the audiences we are able to address would not listen to the same message if it were carried by different messengers, that is, people who were believed to have some sort of political motivation or other agenda. I have got to tell you that I have served with the other 34 members of the MAB now for almost eight years. After all that time, I still don't know the political affiliation of most of my colleagues. It has never been an issue. The idea through all these studies has been that we were and are all worried about the future in which we were going to send young American men and women into stressful situations stemming from changes to our climate or America's dependence on foreign sources of fossil fuels. Whether the effects of climate change are felt in extreme droughts or floods, sea level rise, increasingly

violent storms, the results will often include turmoil. In the face of this turmoil, America's military will often be, as it often has been, called upon to render aid or establish or maintain stability. Humanitarian assistance and disaster relief in particular is very likely to be increasingly required because the U.S. military has proven to be extraordinarily good at doing those things. And so we, as retired service members are worried about the engagements and conditions that young Americans will face in the future as they represent their country around the world and deal with the consequences of climate change.

My last war was in Somalia. Climate change and agricultural conflict contributed to massive displacement of Somalis. I have visited Somali refugee camps in northern Kenya and seen the desperation and the fertile recruiting ground these are for terrorist organizations. When young people, primarily men, have no future, no prospects, no hope, and are offered an alternative to living in the refugee camps and looking at that kind of bleak future, terrorist alternatives are seductive.

So, as part of this talk I will present this small set of slides that exemplify the visuals we use in our conversations on climate change and national security across the country. I will skim the surface because, as I say, this an audience of the converted, you pretty much agree with the MAB that climate change and energy dependence are threats to our national security. But I want to emphasize that until we issued our reports in 2007, there were few members of the national security establishment whose voices were heard in this conversation. Even so, the Defense Department was already out in front in adapting to and anticipating ways of dealing with leading the changes in the kinds of missions, means, and procedures that will be required to deal with climate change, not only as a stimulus for military activity of one kind or another but also in looking at the combat effectiveness of today's and tomorrow's equipment and people by adapting early to climate change.

Here is a partial list of the more than 30 people who have participated in the CNA reports on climate change, primarily retired three- and four-star officers:

**Military Advisory Board, 2007–2014** (over 30 members – rotational)

- General Gordon Sullivan, USA (Ret)
- General James Conway, USMC (Ret)
- Admiral "Skip" Bowman, USN (Ret)
- General Paul Kern, USA (Ret)
- General "Chuck". Wald, USAF (Ret)
- General Ron Keys, USAF (Ret)
- Vice Admiral Lee Gunn, USN (Ret)
- Rear Admiral Dave Titley, USN (Ret)
- General Don Hoffman, USAF (Ret.)
- Vice Admiral Ann Rondeau, USN (Ret.)
- Sherri Goodman

Gordon Sullivan, for example, has been a consistent member over the years; he was former Chief of Staff of the United States Army. Other officers of that stature have participated too; for example, General Jim Conway, former Commandant of the Marine Corps.

The first report in 2007 said that climate change was a "threat multiplier." That term has been repeated in the press and in government policy documents and discussions thousands of times. The 2008 Quadrennial Defense Review by the U.S. Defense Department, in particular, adopted the term. Of course we are pleased by this because in the 2007 report we prodded the Defense Department, as well as the nation as a whole to understand the threat of climate change and to grasp the seriousness of it from an urgent national security perspective.

Even in stable parts of the world, places where governance is good and peoples' needs are, for the most part, being met, changes in our climate will either create or add to stresses and tensions. We argue also that climate change, national security, and energy dependence are closely connected; they constitute a related set of challenges to our nation. In our 2014 report, we described those challenges further. The preface to that 2014 report was signed by Republican Michael Chertoff—the former Secretary of Homeland Security—and Democrat Leon Panetta, then the Secretary of Defense. They said:

*"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... The update makes clear that actions to build resilience against the projected impacts of climate change are required today. We no longer have the option to wait and see... We commend its reading in full and its recommendations to the Administration, to Congress, and to the American people."* (CNA-MAB, 2014)

Climate change is no longer only a future threat. It is happening now and we have got to get on with dealing with it now. This is something Americans absolutely must address today. And, in our view of the world from a security perspective, only Americans and American leadership are capable of contending with both the causes and consequences of climate change. Americans must be mobilized immediately, as generations of Americans have mobilized in the past, to face the most important climate change threats to our national security.

So what is new now? Why did our Military Advisory Board revisit and how did we revisit that 2007 report in 2014? We did it because we saw, as I said earlier, that things were changing more quickly than even we had anticipated after our year-long study in 2006 and 2007. We found in 2014 that climate change is already becoming a "catalyst for conflict." We had said in the earlier report that the potential existed for climate change to begin to cause trouble, but by 2014 we were seeing evidence of that trouble (**Figure 1**). Again, it is no longer a future threat, and we do not have the option to wait and see how bad things get. The fact that the danger is here already has been new news to many of the audiences we are privileged to talk with around the country.

There are, of course, international implications to these rapid changes as well. We are able now to point to Syria, for example (Kelley et al., 2015), where arguably many of the problems that have led to this terrible conflict



**Figure 1: Recent impacts of climate change in the United States.** **A)** The 2012 Waldo Canyon wildfire at the edge of the U.S. Air Force Academy in Colorado Springs, Colorado (*GPS World*, 10 July 2012); **B)** The effects of four years of exceptional drought in Lake Folsom in Folsom, California (*PSD News*, 8 December 2014, California Department of Water Resources photo); **C)** Now routine flooding in Norfolk, Virginia (Hyun Leo Kim, *The Virginian Pilot*); **D)** Tilted railroad tracks and cracked buildings from subsidence caused by melting permafrost in Alaska (Left – NASA and the United States Geological Survey; Right – Vladimir Romanski, the Geophysical Institute, University of Alaska, Fairbanks). DOI: <https://doi.org/10.1525/elementa.227.f1>

and enormous loss of life began with a five-year drought of historic proportions. Farmers moved to the cities in droves. An already stressed urban infrastructure and services in the cities were inadequate to deal with this wave of migrants. While these factors alone did not cause the tensions that are playing out in the conflict in Syria, they surely contributed.

We said in 2007 and we say again today that the Arctic is of great importance to the military; the potential there for conflict—or for co-operation—is great. We must work to ensure that co-operation, rather than conflict, prevails (Staff, 2015; White et al., 2013).

We wanted in this most recent report to ensure people understand that there is even greater consensus among scientists today than in 2007 about the causes and consequences of climate change (Cook et al., 2013). We wanted also to reemphasize the importance of not only anticipating and dealing with the consequences of climate change but of moving to a new energy economy based not on fossil fuels but on renewable energy sources. That is, we needed to emphasize the importance of both adapting to changes already locked in, but also mitigating future climate change that will introduce even more problems.

Population growth is of course a factor, too: when MAB members talk to audiences beyond Washington, and especially those in the middle of the country, many folks say, “Hey, the climate’s changed before, what’s different now?” And we readily agree that, of course the climate has changed in the past. But for the last 12,000 years we have had a relatively stable climate to enjoy throughout the

world; the climate and resulting weather have been pretty predictable. Also, we were hunters and gatherers 12,000 years ago, and now the climate is changing faster than it ever has before in human history. In the meantime, we have built many, many things we care a whole lot about very close to the world’s coasts. Nearly half the population of the world today lives within 50 miles of a seacoast, so this is an entirely different set of circumstances that the people of our planet face as the climate changes more and more quickly around us. Twelve thousand years ago, there were perhaps a few millions of us. When I was born, there were roughly two-and-a-half billion people on earth. And now, I tell audiences, there are over seven billion and we are headed to at least nine (Gerland et al., 2014; PRB, 2015; UNDESA, 2013); nine billion people who will continue to rely on the Earth for support and sustenance. That is what is different about this change in the planet’s climate.

The security picture is becoming even more complex. In my opinion, the Westphalian notion of the nation-state is becoming less and less important.; and we are seeing the fragmentation of societies and return to tribalism, at least in part as a response to the stresses of climate change. But, rather than a return to tribalism, global cooperation is the answer.

As for the major changes underway in the Arctic (Scudellari, 2013), again, we tell people that the Arctic is potentially an area for conflict; at least as importantly from a climate perspective, the very existence of ice in the Arctic is an extremely important factor in retaining the ice sheets in Greenland. The Arctic and Greenland are

linked, and may well share ice-free futures if global warming continues. The temperature interaction of these two regions is crucial. Among the wild cards of global warming leading to really significant sea level rise, as many of you undoubtedly know, will be the melting of the Greenland Ice Sheet.

There are, in fact, two enormous ice formations, one supported by the mountains of Greenland and one by the Antarctic Continent. If, as the planet and the seas continue to warm, the volume of water in these two are added to those seas, we will experience a rise of sea levels at a rate and to a degree well beyond our experience in human history (White et al., 2013).

Among America's domestic implications of climate change are those I mentioned earlier: more stress on the military, more obligations and missions, and more difficulty in conducting training exercises in the United States itself. Many training days are lost now to wildfires and to flooded ranges throughout the United States. Climate change also threatens our own economy and infrastructure specifically, so our alarm should not be limited to its international implications.

### Recommendations about the role of the United States military in dealing with climate change

The Military Advisory Board made the six major recommendations listed below (CNA-MAB, 2014):

- The United States should take a leadership role in preparing the world for the projected impacts of climate change.
- Supported by national intelligence estimates, the U.S. military's Combatant Commanders should factor in the impacts of projected climate change across the full spectrum of their planning and operations.
- The United States should accelerate and consolidate its efforts to prepare for increased access to and potential military operations in the Arctic.
- Climate adaptation planning should consider the water-food-energy nexus to ensure comprehensive decision-making.
- The projected impacts of climate change should be integrated fully into the National Infrastructure Protection Plan and the Strategic National Risk Assessment.
- In addition to DoD's conducting comprehensive assessments of climate change on mission and operational resilience, the Department should develop, fund, and implement plans to adapt and place a greater emphasis on the projected impacts of climate change on both DoD facilities and associated community infrastructures.

We should lead. The U.S. combatant commanders across the world—there are six of them responsible for geographic regions—should factor climate change into their planning in very important ways. We as a nation and as a leader in maintaining the world's stability and prosperity should be ready for access to the Arctic and operations there. Recently there were a couple of efforts by major compa-

nies to drill for oil in the Arctic; not only was the weather discouraging to them, but the lack of search and rescue capability, from either the United States or Canada, was also a discouraging factor for them. We should understand the water-food-energy nexus. The projected impacts of climate change should be fully incorporated in the documents produced periodically by the government in preparation for the future. And we should develop, fund, and implement plans to adapt to and mitigate climate change within the Department of Defense.

### Supplemental material

- **Slides S1.** National Security and the Accelerating Risk of Climate Change. DOI: <https://doi.org/10.1525/elementa.227.s1>

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### Competing Interests

The author has these additional activities, some of which involve research and speaking on topics related to climate change, energy, water and national security:

Chairman, The Board of Advisors to the Presidents of the Naval Postgraduate School and the Naval War College (a federal government board constituted under the Federal Advisory Committee Act).  
Member, and Executive Committee member of the Board of Directors of the American Security Project, a non-profit, non-partisan think tank.  
Chairman, The Gunn Group, a newly founded non-profit dedicated to advising public and private enterprises on energy, water, climate and national security.  
Independent consultant to the CNA Corporation.

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