

S. HRG. 111-207

**CLIMATE CHANGE AND GLOBAL SECURITY:
CHALLENGES, THREATS AND
DIPLOMATIC OPPORTUNITIES**

HEARING

BEFORE THE

**COMMITTEE ON FOREIGN RELATIONS
UNITED STATES SENATE**

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

JULY 21, 2009

Printed for the use of the Committee on Foreign Relations



Available via the World Wide Web: <http://www.gpoaccess.gov/congress/index.html>

U.S. GOVERNMENT PRINTING OFFICE

54-243 PDF

WASHINGTON : 2010

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2104 Mail: Stop IDCC, Washington, DC 20402-0001

COMMITTEE ON FOREIGN RELATIONS

JOHN F. KERRY, Massachusetts, *Chairman*

CHRISTOPHER J. DODD, Connecticut

RUSSELL D. FEINGOLD, Wisconsin

BARBARA BOXER, California

ROBERT MENENDEZ, New Jersey

BENJAMIN L. CARDIN, Maryland

ROBERT P. CASEY, JR., Pennsylvania

JIM WEBB, Virginia

JEANNE SHAHEEN, New Hampshire

EDWARD E. KAUFMAN, Delaware

KIRSTEN E. GILLIBRAND, New York

RICHARD G. LUGAR, Indiana

BOB CORKER, Tennessee

JOHNNY ISAKSON, Georgia

JAMES E. RISCH, Idaho

JIM DEMINT, South Carolina

JOHN BARRASSO, Wyoming

ROGER F. WICKER, Mississippi

JAMES M. INHOFE, Oklahoma

DAVID McKean, *Staff Director*

KENNETH A. MYERS, JR., *Republican Staff Director*

CONTENTS

	Page
Burke, Sharon, vice president, Center for a New American Security, Washington, DC	18
Prepared statement	21
Gunn, VADM Lee F., USN (Ret.), president, American Security Project, Washington, DC	12
Prepared statement	16
Kerry, Hon. John F., U.S. Senator from Massachusetts, opening statement	1
Lugar, Hon. Richard G., U.S. Senator from Indiana, opening statement	3
McGinn, VADM Dennis, USN (Ret.), member, Center for Naval Analysis Advisory Board, Lexington Park, MD	27
Prepared statement	29
Warner, Hon. John, former U.S. Senator, Alexandria, VA	5
Prepared statement	9

CLIMATE CHANGE AND GLOBAL SECURITY: CHALLENGES, THREATS, AND DIPLOMATIC OPPORTUNITIES

TUESDAY, JULY 21, 2009

U.S. SENATE,
COMMITTEE ON FOREIGN RELATIONS,
Washington, DC.

The committee met, pursuant to notice, at 2:35 p.m., in room SD-419, Dirksen Senate Office Building, Hon. John F. Kerry (chairman of the committee) presiding.

Present: Senators Kerry, Cardin, Casey, Shaheen, Kaufman, Lugar, and Corker.

OPENING STATEMENT OF HON. JOHN F. KERRY, U.S. SENATOR FROM MASSACHUSETTS

The CHAIRMAN. The hearing will come to order.

I apologize to everybody for being just a little bit late. We just had a business meeting of the committee, over in the Capitol, which is why the doors were shut, and why the Senators weren't here. We just passed out a slew of Ambassadors and various Assistant Secretaries, et cetera. So, we're on track, and I thank all the committee—subcommittee chairs for moving all of those folks as rapidly as they have.

We're here today to—Senator Lugar, incidentally—I normally don't start without him, but he is on his way over—he's right here. Terrific. Thanks, Dick.

We're here today to discuss a grave and growing threat to global stability, human security, and America's national security. As you're going to hear from all of today's witnesses, the threat of catastrophic climate change is not simply an academic concern for the future; it's already on us, happening now. As a matter of fact, I just came from a meeting earlier today with the Governor of Colorado, Gov. Bill Ritter, who was describing the impact on Colorado, which has lost a million acres of pine trees as a consequence of the pine beetle that needs a 3-week period each year, at the right time, to freeze. And that time is normally in the, sort of, early fall. Doesn't happen anymore. So, for the last 6 years or so, the absence of that freeze has allowed the infestation to take place, and literally millions of acres of forest have been lost, not just there, but north up into Canada, Alaska, and so forth. So, it is not academic. It is happening now. The effects are being felt globally in different ways.

Earlier this year, a 25-mile-wide ice bridge connecting the Wilkins Ice Shelf to the Antarctic land mass shattered, disconnecting

the shelf from the Antarctic Continent. In 4 years, the Arctic is projected to experience its first ice-free summer—not in 2030, as many earlier predicted, but in 2013. So, the threat is magnifying, growing, in the evidence that is coming at us.

Just as 9/11 taught us the painful lesson that oceans could not protect us from terror, today we are deluding ourselves if we believe that climate change will somehow stop at our borders.

Fortunately, America's most trusted security voices, including those here today, have been sounding the alarm. In 2007, 11 former admirals and high-ranking generals issued a seminal report, from the Center for Naval Analysis, where VADM Dennis McGinn serves on the Military Advisory Board. They warned that climate change is a "threat multiplier" with the potential to create sustained natural and humanitarian disasters on a scale far beyond those we see today. This is because climate change injects a major new source of chaos, tension, and human insecurity into an already volatile world. It threatens to bring more famine and drought, worse pandemics, more natural disasters, more resource scarcity, and human displacement on a staggering scale.

Places only too familiar with the instability, conflict, and resource competition that often creates refugees, and "IDPs" as we call them—internally displaced persons—will now confront these same challenges, with an ever-growing population of "EDPs"—environmentally displaced people. We risk fanning the flames of failed-stateism, and offering glaring opportunities to the worst actors in our international system. In an interconnected world, that endangers all of us.

Nowhere is the nexus between today's threats and climate change more acute than in South Asia, the home of al-Qaeda, and the center of our terrorist threat. Scientists are now warning that the Himalayan glaciers, which supply water to almost a billion people, from China to Afghanistan, could disappear completely by 2035. Water from the Himalayas flows through India into Pakistan. India's rivers are not only agriculturally vital, but they are central to the religious practice of that country. Pakistan, for its part, is heavily dependent on irrigated farming. Even as our Government scrambles to ratchet down tensions and prepares to invest billions to strengthen Pakistan's capacity to deliver for its people, climate change threatens to work powerfully in the opposite direction.

Worldwide, climate change risks making the most volatile place even more combustible. The Middle East is home to 6 percent of the world's population but just 2 percent of the world's water. A demographic boom and a shrinking water supply will only tighten the squeeze on a region that doesn't need another reason to disagree.

Closer to home, there is scarcely an instrument of American foreign policy that will be untouched by a changing climate. Diego Garcia Island, in the Indian Ocean, a vital hub for our military operations across the Middle East, sits on an atoll, just a few feet above sea level. Norfolk, VA, home to our Atlantic fleet, will be submerged by 1 meter of sea-level rise during this century alone. That's if we prevent the West Antarctic Ice Sheet and the Greenland Ice Sheet from melting. If they melt, you're looking at 16 to 23 feet of sea-level increase.

Now, these problems today, as we sit here now and measure them, are not insurmountable, but they are going to be expensive in some places, over time, and they risk compromising our readiness. The future has a way of humbling those who try to predict it too precisely, but, we do know from scientists and security experts, that the threat is very real. If we fail to connect the dots, if we fail to take action, the simple, indisputable reality is that we will find ourselves living, not only in a ravaged environment, but in a much more dangerous world.

We're honored to be joined today by a number of experts in this field of security, one that has not, frankly, been paid enough attention to, and has, in many ways, been absent from the debate. Today's hearing is meant to put it front and center where it belongs, with people whose credibility, frankly, is unmatched.

We're joined by an old friend, who needs no introduction in these halls, but I'll just say a few words. John Warner served five terms as a U.S. Senator from Virginia. He enlisted in the Navy at the age of 17, served as a sailor in World War II, fought as a marine in Korea, and rose to become Secretary of the Navy. I had the pleasure of being connected to him during that period of time while I was serving in Vietnam. Senator Warner became a friend, a colleague for 24 years, and one of the great gentlemen of this institution. When he retired—and I was rewarded his old office—Senator Warner's gift to his fellow Navy man was a binnacle, a tool that sailors use to point out the right direction and to light the path forward. And, of course, I couldn't ask for a better guide than Senator Warner's own words and his life, but now I've got his binnacle to remind me about all of those. I'm pleased that he continues to use his great credibility to speak directly to the American people about the urgency of this issue.

Each of the other witnesses are equally impressive. Admiral Lee—VADM Lee Gunn, a decorated, 35-year veteran of the United States Navy, now serving as president of the American Security Project—I think, in his last position on Active Duty was at the Pentagon, where he was the director of logistics and planning.

Sharon Burke is vice president for natural security at the Center for New American Security, where she directs the center's work on national security implications of global national resource challenges.

VADM Dennis McGinn is a member of the CNA Military Advisory Board and a former Deputy Chief of Naval Operations for Warfare Requirements and Programs.

So, we're lucky to have each of you here today, and grateful for your willingness to be here. I'm delighted to turn to my ranking member, whose leadership on issues of national security are well known to all of us.

Senator Lugar.

**STATEMENT OF HON. RICHARD G. LUGAR,
U.S. SENATOR FROM INDIANA**

Senator LUGAR. Well, thank you very much, Mr. Chairman.

I join you in welcoming our distinguished witnesses, and I join you in a special word of greeting to John Warner. We are so delighted that he is here today to be with us once again.

Let me just say that we have talked, in fact, about national security matters with John Warner before, when the Foreign Relations Committee and the Armed Services Committee got together, as we did occasionally, informally—sometimes formally. Therefore, we have some preparation for today's hearing. To adequately prepare our military forces for future threats, we need to understand how climate change might be a source of war and, certainly, instability. Climate change projections indicate greater risks of drought, famine, disease, and mass migration, all of which could lead to conflict. We also must ensure that our military infrastructure can adapt to new circumstances, a component of which is developing secure, alternative sources of fuel.

The United States is confronted by a cluster of national security threats that arise from our economic and cultural reliance on fossil fuels. First, we face a current dependence on oil, a large percentage of which is controlled by hostile or unstable regimes concentrated in the volatile Middle East. And this increases our vulnerability to natural disasters, wars, and terrorist attacks that can disrupt the lifeblood of the international economy, as well as our own. It also means that we are sending hundreds of billions of dollars each year to authoritarian regimes. This revenue stream emboldens oil-rich governments, and enables them to entrench corruption, fund anti-Western demagogic appeals, and support terrorism.

And second, we face the prospect of manipulation of oil and natural gas supplies by producers seeking political leverage. Nations experiencing a cutoff of energy supplies, or even the threat of a cutoff, may become desperate, increasing the chances of armed conflict, terrorism, and economic collapse.

Third, we face longer term prospects of declining global oil production. As we approach the point when the world's oil-hungry economies are competing for insufficient supplies of energy, oil will become an even stronger magnet for conflict.

And fourth, we face international crises arising out of drought, food shortages, rising seas, and other manifestations of climate change. Any of the threats in this cluster could be a source of catastrophe for the United States and the world.

Now, this list does not necessarily exhaust the possibilities, but it underscores one of the dilemmas for national security planners; namely, that these threats are not identical. Each has a unique time horizon, a unique threat intensity. Some steps, such as developing renewable fuels, may be useful in addressing the entire cluster of threats, but some steps that might be beneficial for climate change are not necessarily helpful in addressing other threats in the cluster.

For example, expanding offshore oil drilling and opening up the Arctic National Wildlife Region to oil exploration is generally opposed by climate change advocates. Yet, increasing domestic oil production could help hedge against midterm energy vulnerabilities. Similarly, encouraging nuclear power development overseas would produce climate change benefits, but the national security risks have to be managed very carefully. Further, region by region, military planners are likely to have divergent priorities, depending on the immediacy of various threat scenarios.

Thus, our task is not just to anticipate all possible national security threats that might emerge in the future due to climate change, and our dependence on fossil fuels; we have to develop timelines that compare the relative immediacy of these threats, and then we have to make rational choices about where and how to apply limited national security resources.

The American military is at the forefront of those working to develop energy resources that do not depend on the goodwill of unpredictable and sometimes hostile regimes. America is rich in coal, as are large developing nations, like China, India, and Ukraine. Coal remains a big part of the energy plans of many countries. The United States and the world are unlikely to be able to deal with climate change without progress on clean coal technologies or sequestration of carbon.

The Pentagon is experimenting with coal-to-gas and coal-to-liquid technologies to fuel America's military. As the Pentagon moves to expand the use of coal fuels, it should simultaneously work to develop cost-effective carbon sequestration methods, and cooperate with other agencies and entities engaged in this endeavor.

As I have mentioned in previous hearings, as we consider how to address climate change we should give priority to steps that would simultaneously yield benefits for other United States priorities, such as bolstering energy security, generating export markets for high-technology industries, strengthening our rural economy, improving our air quality.

I thank Senator Kerry, again, for holding this hearing, inviting this distinguished panel, and we look forward to your testimony.

The CHAIRMAN. Thank you very much, Senator Lugar.

Senator Warner, we'll begin with you. Again, thank you for being here with us, and we'll just run right down the line at the table.

STATEMENT OF HON. JOHN WARNER, FORMER UNITED STATES SENATOR, ALEXANDRIA, VA

Senator WARNER. Thank you, Mr. Chairman.

Interesting feeling, to be seated in this room where I spent 30 years of my life, from time to time, introducing and participating in the important work of this venerable and distinguished committee of the United States Senate, and I commend the leadership that it has today, and my two dear friends, the chairman and the ranking member, and thank you for your kind remarks on my behalf.

I say to my colleagues, the function of a hearing is for witnesses to come forth and try and help better inform the Senate through the committee structure and the members in attendance. But, listening to those very well prepared, and very well delivered opening statements, I can just about ease back in my chair, because you've covered much of what I have before me. And consequently, as a courtesy to the committee and to my colleagues, distinguished panel that they are—and I know all of them, and have worked with them for years—I'll be very brief and ask that my statement be made part of the record.

The CHAIRMAN. Well, your full statement will be made part of the record—

Senator WARNER. Thank you.

The CHAIRMAN [continuing]. As if read in full, Senator. But, let me just say to you, we're elected politicians, you're now a statesman, so we want to hear what you have to say. [Laughter.]

Senator WARNER. Well, don't count me out. I might try to get re-elected to something. [Laughter.]

The CHAIRMAN. Well, if you'd follow Senator Specter's example, we'll welcome that. [Laughter.]

Senator WARNER. I thought long and hard about what I wanted to say today, and I'm going to—in a few sentences—yeah, sure—in a few sentences, I'm going to summarize what I will cover extemporaneously and briefly.

I look upon the challenge before this committee—and I don't say this in any disrespect to my former colleagues on the other committees—but you have got to be the leaders, for this reason: This is one of the most complex issues that's ever been faced by the Congress of the United States. The ramifications are multifold. We're talking about emitters. It's almost every business—except the smaller ones, that are exempted—every business—manufacturing, transportation, everything in our country. Enormous consequences to our impact. We're talking about a cap-and-trade system, and the magnitude of that could well exceed the current markets we have for the New York Stock Exchange over the counter, the NASDAQ, and the like. This is huge. And, this committee's role—I say it—it's like fashioning and forging the axle, the centerpiece around which all the other issues and parts and spokes rotate. And it's essential—I hope that this Congress can reconcile its differences, find a common ground, provide a bipartisan solution to this issue, and put it in legislative form, that, No. 1, can be understood and accepted by the general public, because the weight of this issue is going to be on their backs and on their pocketbooks, and they've got to understand it.

Then the key to your forging this axle is working with the other nations to adopt policies, commitments, and then, eventually, “binding targets,” the term used by the Indian Prime Minister the other day. And, that's got to be a structure that's got to work, and not just serve America, but to serve the global community. Because the whole world, no matter where the people are, are affected by this situation.

So, your job is to work with the other committees. And I want to now commend Senator Reid and other leaders who have decided to take the several committees, synthesize their views, and bring to the floor a bill. Senator Lieberman, for whom I have tremendous respect and affection—we were loners, we did have Chairman Boxer, of that committee, who gave us the support—but I, as you well know, Senator Lugar, was the only Republican on that committee that signed on. I don't say that in derogation of my colleagues at all. It's just factual history. And, when we got to the floor, the rest is history.

But, we did lay a landmark. As we say in the Marines, we laid a beachhead. By the way, this is quite a Navy team, you know. One, two, three sailors—four, five up there—I don't know about the rest of you, but anyway, we laid a beachhead and the rest is history. You know what the House has done, and you're beginning to comprehend what the Senate—but, I come back—the United

States, hopefully, with the support of the Congress, having forged a legislation, with your leadership, can go to the international conference in Copenhagen, and become a leader, and step out in front, and take the position which we must take.

Now, that's, in simplicity, what I have to say. But, I'll add this. It's my judgment that if we do those steps and give this thing an honest chance, and the rest of the community join us, the American public will go with you. But, if the American public, in a year or two, perceive that we're going it alone in the United States, and that the other nations of citizens aren't bearing part of their responsibilities and the burden and the cost, the American public could pull a plug on this legislation. That's—I don't mean to threaten—but, I have been around a little while, and I'm out on the hustings now, with my good friend, General—Admiral McGinn down here, speaking to people and listening very carefully.

Just for the purposes of ethics, I've got to point out that I'm now a partner in my old law firm, Hogan & Hartson. I left there 37 years ago to be Under Secretary of the Navy, and they kindly took me back. I'm also working on behalf of the Pew National Trust—Charitable Trust, and particularly the Pew Project on National Security, Energy, and Climate. I work exclusively with the executive branch. I do not do anything with regard to the Congress, to comply with title 18, section 207, but that title enables me, at your invitation, to testify, and that is what I do today. But, my remarks are those of my own and not necessarily of the law firm or the clients that I represent.

We've tried, at Pew, to bring together the concept—which is not originated with Pew; the other colleagues have—in their testimony, will give you the background. And it's—I view this thing as a tripod. It rests on climate change, on our future energy policy, and national security. And it's on that foundation that we've got to build this international relationship—and you forge that axle of the finest strength that you can possibly make it—around which all the other decisions have got to eventually be made.

Now, you pointed out very clearly, both of you, that our U.S. military could be drawn into these conflicts as a consequence of the instability their nations are now experiencing, and that instability can be further destabilized by the consequences of climate change, water shortage—whether that be climate or otherwise—energy, and the like. So, we're really talking about the men and women in uniform of our U.S. military.

Now, I was interested—yesterday, the Secretary of Defense said he's got to increase the size of the U.S. Army. The decision—were I here, I would support it wholeheartedly, because they're stretched, their families are stretched, and they have done valiantly under the concept of the All-Volunteer Force. And you, Senator Kerry, were in the military at the time we adopted the All-Volunteer Force. You came in, I think, at the time we had the draft. You weren't drafted—you got—

The CHAIRMAN. That's correct.

Senator WARNER [continuing]. Volunteers. But, that All-Volunteer Force is fragile, like everything else in life. But, it has withstood a tremendous stress of times, here, with two very significant combat actions we're in right now.

So, as we progress today, let's think of the men and women in uniform and their families, whose missions, today, tomorrow, and in the future, could be definitely affected by global climate change, energy shortages, and the like.

I was very proud to work with a number of people—Secretary of Defense Gates has spoken on this; ADM Denny Blair, colleague of ours in the Navy, has spoken on the need for this; a number of Active-Duty—Chairman of the Joint Chiefs has spoken on the necessity of this, and many retired, of which you referred to—the chair and the ranking member. So, I will not go into those statements.

But, I do want to go back, tell a little personal story about how I got into this thing, because when I was chairman of the Armed Services Committee, it really wasn't on my scope. But, I remember you, Senator Kerry. You used to convene meetings in S-207, with terrible sandwiches, I remember—

[Laughter.]

Senator WARNER [continuing]. And you'd bring in energy experts, other experts, to tell us what was coming. That was 5 or 6 years ago, you were looking at this issue. And I commend you. And I got interested. I went to those luncheons and receptions that we had and listened to the private sector, largely, tell us what was coming. And, sure enough, it's here today. So, that was one way I got started.

And then, I listened to your opening statement and that short story. In 1943, I was getting ready to go into the Navy. My father had been in World War I in the trenches as a medical doctor, and he said, "You haven't really had a man's job. Go get one. I'll pay your way, anywhere in the United States, but you've got to get enough money to get home or you're going to stay there."

So, in those days, youngsters didn't have a chance to travel like they do today, so I got the longest train ride I could get. And I got a job with the U.S. Fire Service in Coeur d'Alene, ID, as a firefighter and a trailblazer. So, I went out there. And the point is, we were taken back into those absolutely magnificent pristine forests, where we worked. And we fought fires, and indeed, personal risk is firefighting, I assure you. Not an easy job. And it's etched in my mind, the magnificence of that forest.

Fast-forwarding, about 5 years ago I went to Coeur d'Alene to give a speech, and I asked the Fire Service to take me back up there. And, Senator Kerry, I saw exactly what that Governor of Colorado told you. Those very trees and forests, among which I lived for 3 months with those other fellows in 1943, are decimated, dead, dying, because of that bark beetle and the lack of severity—the normal severity of the winter season to curtail their propagation. That is my example. So, those two things got me into this thing.

Now, in 2007, I was privileged, as a member of the Armed Services Committee—with Senator Clinton—and, the two of us—she, largely—initiated the first statute for the Pentagon to begin to look to future missions and roles as affected by climate change and energy. And I've attached that statute to this text I'm delivering here today, and it directs the Department of Defense, in its planning, to begin to plan to take on these added missions. Now, the severity

of those missions, the complexity, and the stress on the Armed Forces is directly correlated to how much we can achieve or not achieve, now and tomorrow, by way of reducing greenhouse gases and the cause for this instability throughout the world.

I won't go into the instability situation, because I want to defer to this panel. Having had the opportunity to resonate my voice in this Chamber many times, I think their first time, and I'm going to yield a good deal of my time to them.

But, I do strongly suggest that we take the lead and step out in Copenhagen. And the work that you do here, in putting that axle together, will largely depend on the success there.

The other thing I would recommend—and this is slightly afield of what—the jurisdiction of this committee—but, I would hope that maybe the Armed Services Committee and the Intelligence Committees could be invited to look at this legislation, being formulated by distinguished Leader Reid, and see whether or not they could also participate, because it directly relates to what we're speaking, today, and they have jurisdictions over the welfare of the men and women of the Armed Forces.

I think, Mr. Chairman, for the moment, I will conclude, yield the floor to these distinguished colleagues over here, and then rejoin in the question period.

I thank the members of the committee.

[The prepared statement of Senator Warner follows:]

PREPARED STATEMENT OF HON. JOHN WARNER, FORMER U.S. SENATOR,
ALEXANDRIA, VA

Senator Kerry, Senator Lugar, members of this committee, many of my longtime friends and colleagues, thank you for the invitation to provide this important committee with my thoughts on the pressing issues of a new energy future, global climate change, and the potential consequences to national security, of not only the United States, but the security of nations worldwide.

Since retiring from the Congress on January 3, I have been fortunate to join, as a partner, the firm Hogan and Hartson, where I started my legal career many years ago. I am honored to be working with the Pew Charitable Trusts on the Pew Project on National Security, Energy and Climate. However, today, the views that I offer are mine alone.

The Pew Project brings together science and military experts to examine new strategies for combating climate change, protecting our national security, increasing our energy independence and preserving our Nation's natural resources. Pew provides this information and outreach to the general public.

I spent 30 years in the U.S. Senate working on behalf of our men and women in uniform serving our country; in my last years, on issues related to the potential impact of climate changes on their future military roles and missions. Leading military, intelligence, and security experts have publically spoken out that if left unchecked, global warming could increase instability and lead to conflict in already fragile regions of the world.

If we ignore these facts, we do so at the peril of our national security and increase the risk to those in uniform who serve our Nation. It is for this reason that I firmly believe the United States must take a leadership role in reducing greenhouse gas emissions. Other nations are moving ahead and the United States must join and step to the forefront.

With the Pew Project, I am working with State and municipal governments, the administration, local organizations, and military, security, and climate experts in the United States to address the climate-energy-national security nexus. And I hope this work will educate the American public on these potential risks to our national security posed by global climate change.

Just last week, the Pew Project went to Missouri where we held two fora, one in St. Louis and one in Kansas City, examining the link between national security, energy and climate change. Tomorrow, I travel with the Pew Project to Charleston, SC, for similar events, and later in the summer and early in the fall, we are slated

to visit the States of Michigan, Virginia, and Indiana. Your witness today, retired VADM Dennis McGinn travels with me and is a most articulate, credible spokesman on the threats climate change and our energy policies pose to national security.

In my 30 years in the U.S. Senate, I have not seen an issue as complicated as the challenges posed by national security, energy, and climate change.

As the committee well knows, in the last Congress, I was privileged to work with an extraordinarily capable legislator, Senator Joe Lieberman—and with the chairman and members of the Senate Environment Committee—to produce the only climate change bill to reach the Senate floor.

Even before I teamed up with Senator Lieberman, this issue had my attention. I was privileged to serve for many years as the chairman of the Senate Armed Services Committee. In 2007, I was pleased, as a senior member of the Armed Services Committee, to cosponsor with then-Senator, Secretary of State Hillary Clinton, a provision in the fiscal year 2008 defense reauthorization bill that would require the Department of Defense to consider the effects of climate change on department facilities, capabilities, and missions. This provision, signed into law, requires future periodic revisions of long-range national strategic plans to take account of the impact on U.S. interests of global climate change.

Secretary Clinton and I included this language in the annual defense bill because we recognized at that time the strategic, social, political and economic consequences climate change could have on political instability in parts of the world.

Accordingly, I firmly believe that the challenge before us is to build a foundation resting on three legs: Energy, climate change, and national security. Eventual success requires all three legs to remain equally strong.

I want to credit the many national security experts who have expressed their concerns, which I share. Many senior retired officers, from all branches of our services, including my friend and thought partner, VADM Dennis McGinn, have come forward and joined in the public debate, expressing clearly their views in support of action on climate change.

One extraordinary soldier, the former Chief of Staff of the United States Army, GEN Gordon Sullivan, who chaired the Military Advisory Board of the Center for Naval Analysis, succinctly framed what we face: “The cold war was a specter, but climate change is inevitable. If we keep on with business as usual, we will reach a point where some of the worst effects are inevitable . . . back then, the challenge was to stop a particular action. Now the challenge is to inspire a particular action. We have to act if we are to avoid the worst effects.”

Today our Nation and much of the world is in the grips of an economic crisis without precedent. The brave men and women of our Armed Forces and that of other nations are engaged in two wars. Understandably there is a measure of legitimate fear in our hearts as to whether we should undertake at this time such an enormous and uncertain challenge as posed by the issues before us in this hearing. But I say, in the spirit of the generations, which showed the courage to find solutions to move our country forward, that it is our duty to replace fear with confidence.

We as a nation can do it again, provided we come up with sound solutions; solutions that can be understood and made acceptable to the American people. This is for the benefit of their children and grandchildren.

Our President has shown courage and committed to work with the Congress on this matter, and I hope the resulting legislation will rest on the tripod that I have described. Such action will lay the groundwork for the United States to go to Copenhagen in December as a leader.

When I testified before the House Energy and Commerce Committee earlier this year, I suggested that climate legislation should incorporate a specific role—equal to other departments and agencies—to the Department of Defense and the Intelligence agencies. They bring to this issue a very different and critical perspective, but also vast knowledge and resources to get this job done.

Looking back, we should have included such language in the Lieberman-Warner bill. We could have garnered more support. A reasonable objective analysis of polling data today shows that the American public is motivated toward action on climate change by the likelihood that more jobs will be created and our national security strengthened.

To be specific, in the arena of national security, one of the most critical components is maintaining stability in the world.

Many factors can lead to instability. To name a few associated with global climate change: Severe droughts, excessive sea level rise, erratic storm behavior, deteriorating glaciers, pestilence, shift in agriculture ranges.

These factors can result in water wars, crop failures, famine, disease, mass migration of people across borders, and destruction of vital infrastructure, all of which can further lead to failed nations, rise in extremist behavior, and increased threat of ter-

rorism. Much of this is likely to happen in areas of the world that are already on the brink of instability. In other words, climate change is a “threat multiplier” making worse the problems that already exist.

Global climate change has the potential, if left unchecked, of adding missions to the already heavy burdens of our military and other elements of our Nation’s overall national security.

To the extent we can plan today how best to minimize these contingent disasters means, the less we may have to call upon our Armed Forces tomorrow.

Whose military is best equipped, most capable to help with the evacuation of distressed areas? Who is going to be called upon to intervene in such humanitarian disasters? The United States military will be called to action. Such action will not only bear financial costs to our military, and thus our taxpayers, it will divert resources and troops from other areas of the world.

For those volatile nations that are not capable of dealing with the pressures of climate change, governments can fail and extremism and terrorism can fill the void.

In 2007, the Military Advisory Board (MAB) of the Center for Naval Analysis, a nonprofit think tank, issued a report titled “National Security and the Threat of Climate Change.” The MAB is comprised of many of the most distinguished and highest ranking retired military leaders in the United States. They made several of the conclusions I have shared with you in today’s remarks. To quote from that report, in the words of ADM T. Joseph Lopez, USN (Ret.), “You have very real changes in natural systems that are most likely to happen in regions of the world that are already fertile ground for extremism.”

Delaying action on global climate change will exacerbate these threat multiplying effects and will cost the United States more in the long run. The difference is that these later costs will not only be economic; there will be a human cost.

On the battlefield, we never wait until we have 100 percent certainty or wait for the conditions to be 100 percent ideal. We have to act when we have enough information to act. And I think the information we have is clear.

Again, I emphasize, the United States cannot and should not wait for other countries to take the lead. Certainly it is our desire to have all nations commit to economywide emissions targets; however, that policy may not be practical at this time. This reality must not be a basis for delaying the United States from stepping forward to take a greater leadership role.

Our international position must be to encourage developing nations to adopt a framework of policy commitments for a national program. These commitments could include sustainable forestry, renewable energy, and other programs that achieve emission reductions.

There is a critical role for the Senate Foreign Relations Committee in the development of our domestic legislative program and our international leadership role toward crafting an international treaty.

To foster early international participation, our domestic climate change program must provide for robust international offsets. Until advanced technologies become commercially available, we must take advantage of low-cost, readily available emission reduction opportunities wherever they are, which today often means in other countries.

International offsets provide the best chance to slow tropical deforestation and are a critical component of our domestic challenge to reduce compliance costs. Analysis from EPA and in nongovernmental analysis shows domestic compliance costs are dramatically reduced with the availability of international offsets. By purchasing emission reductions made abroad, U.S. companies save money, save jobs, and foster critical relationships in developing nations.

Climate change is a global problem that demands a global solution. But the United States is uniquely positioned to be a strong leader in the effort to reduce greenhouse gases, while also putting safeguards in place to protect our economy, jobs, and national security.

PUBLIC LAW 110–181, SEC. 951. DEPARTMENT OF DEFENSE CONSIDERATION OF EFFECT OF CLIMATE CHANGE ON DEPARTMENT FACILITIES, CAPABILITIES, AND MISSIONS

(a) CONSIDERATION OF CLIMATE CHANGE EFFECT.—Section 118 of title 10, United States Code, is amended by adding at the end the following new subsection:

“(g) CONSIDERATION OF EFFECT OF CLIMATE CHANGE ON DEPARTMENT FACILITIES, CAPABILITIES, AND MISSIONS.—(1) The first national security strategy and national defense strategy prepared after the date of the enactment of the National Defense

Authorization Act for Fiscal Year 2008 shall include guidance for military planners—

“(A) to assess the risks of projected climate change to current and future missions of the armed forces;

“(B) to update defense plans based on these assessments, including working with allies and partners to incorporate climate mitigation strategies, capacity building, and relevant research and development; and

“(C) to develop the capabilities needed to reduce future impacts.

“(2) The first quadrennial defense review prepared after the date of the enactment of the National Defense Authorization Act for Fiscal Year 2008 shall also examine the capabilities of the armed forces to respond to the consequences of climate change, in particular, preparedness for natural disasters from extreme weather events and other missions the armed forces may be asked to support inside the United States and overseas.

“(3) For planning purposes to comply with the requirements of this subsection, the Secretary of Defense shall use—

“(A) the mid-range projections of the fourth assessment report of the Intergovernmental Panel on Climate Change;

“(B) subsequent mid-range consensus climate projections if more recent information is available when the next national security strategy, national defense strategy, or quadrennial defense review, as the case may be, is conducted; and

“(C) findings of appropriate and available estimations or studies of the anticipated strategic, social, political, and economic effects of global climate change and the implications of such effects on the national security of the United States.

“(4) In this subsection, the term ‘national security strategy’ means the annual national security strategy report of the President under section 108 of the National Security Act of 1947 (50 U.S.C. 404a).”.

(b) IMPLEMENTATION.—The Secretary of Defense shall ensure that subsection (g) of section 118 of title 10, United States Code, as added by subsection (a), is implemented in a manner that does not have a negative impact on the national security of the United States.

The CHAIRMAN. Thank you very much, Senator Warner. And that’s an excellent suggestion, which we will follow up on with respect to the formulation of the amalgamated bill.

Admiral Gunn.

**STATEMENT OF VADM LEE F. GUNN, USN (RET.), PRESIDENT,
AMERICAN SECURITY PROJECT, WASHINGTON, DC**

Admiral GUNN. Mr. Chairman, Senator Lugar, members of the committee, thank you very much for the opportunity to appear before you today to share my assessment of the national security risks facing the United States because of changes expected in the Earth’s climate.

I’d like to say a few words now, and submit a lengthier statement for the record.

The CHAIRMAN. Absolutely. All statements will be placed in full, and if you summarize, that’s terrific.

Admiral GUNN. Mr. Chairman, this committee’s attention to the national security implications of climate change adds an important dimension to the public debate, a piece that, in my opinion, has been missing for too long.

Addressing the consequences of changes in the Earth’s climate is not simply about saving polar bears or preserving the beauty of mountain glaciers; climate change is a threat to our national security, as has been said here earlier. Taking it head on, is about preserving our way of life.

I know that there remain some who are still not convinced by the science of climate change. I’m convinced. Many remain to be persuaded by science that humans are at least contributing in impor-

tant ways to the warming of the globe. I'm not in that group, either. But, leaving aside the merits of the science, permit me to offer this observation from my 35 years of service in the U.S. Navy: threats and risks never present themselves with 100-percent certainty. By the time they achieve that level, as GEN Gordon Sullivan, former Army Chief of Staff has observed, something bad will have happened on the battlefield.

Mr. Chairman, members of the committee, something bad is happening already in our climate. Something worse will happen if we don't act with urgency, as a nation, and as a global community, to meet this threat.

The consequences of climate change will be found, and are being found, around the world. New climate conditions will lead to further human migrations and create more climate refugees, including those crossing our own borders. The stress of changes in the environment will increasingly weaken marginal states. Failing states will incubate extremism.

In South Asia, the melting of Himalayan glaciers, as has been mentioned, jeopardizes fresh water supplies, for more than 1 billion human beings. In North America, agriculture could be disrupted by increases in temperatures and shifting weather patterns that limit rainfall. Globally, major urban centers could be threatened by rising sea levels.

Malaria and other tropical diseases are moving into new areas, and outbreaks are increasing in frequency as the planet warms and weather patterns change. As America debates climate change, its effects threaten to undo the good work in fighting malaria, which has benefited from this committee's leadership.

All of this is just the foretaste of a bitter cup from which we could expect to drink, should we fail to address—urgently—the threat posed by climate change to our national security.

I'm here today as president of the American Security Project, a bipartisan initiative that, more than a year ago, identified climate change as one of the four principal national security challenges of the 21st century.

But, the American Security Project is not the only group of national security thinkers and operators concerned with the threat posed by climate change. Since retiring from the Navy, I have served as president of the Institute for Public Research at CNA. CNA is a not-for-profit analysis-and-solutions institution heavily involved in helping leaders understand and deal with complex operational and public policy issues.

In 2007, CNA organized a Military Advisory Board, mentioned by the chairman, composed of 11 retired generals and admirals. Admiral McGinn will include in his testimony a further discussion of that group. This Military Advisory Board concluded unanimously, though, that climate change poses a serious threat to America's national security. They saw changes in the Earth's climate as—as the chairman has told us—threat multipliers for instability in some of the most volatile regions of the world, while also adding to tensions in regions whose stability we now take for granted.

In 2008, the final defense national security strategy of the Bush administration recognized climate change among key trends that will shape U.S. defense policy in the years ahead. Additionally, the

National Intelligence Council completed its own assessment last year of the threat posed by climate change. The national security community is rightly worried about climate change, because of the magnitude of its expected impacts around the globe, even in our own country.

Mr. Chairman, Senator Lugar, it's easy to get lost in the abstractions when you talk about climate change and national security. I'd like to reduce this to specific and practical defense applications.

A changing and uncertain climate will, in my view, demand we adapt to new conditions affecting: First, why we apply our Nation's power, in all its forms, around the world; second, how and where, specifically, our military is likely to fight and operate; and third, the issues driving alliance relationships. To us, it means with whom we are likely to be on the battlefield, and will they be on our side, or will they be our opponents.

First, why we apply power: Climate change will force changes in why the United States fights, gives aid, supports governments, provides assistance, and anticipates natural, and man-made disasters. It will do so because climate change threatens unrest and extremism as competition for dwindling resources, especially water, spreads. Weak or poorly functioning governments will lose credibility and support of their citizens. Under these conditions, extremists will increasingly find willing recruits.

In particular, climate change will certainly expand the number of humanitarian relief and disaster assistance operations facing the international community. America's men and women in uniform will be called on increasingly to help in these operations directly and to support the operations of legitimate governments and non-governmental organizations, alike.

To how we fight: Climate change will force changes in how we operate our forces around the world. Changes will affect ground operations and logistics, as well as operations at sea and in the air. Sea-level rise threatens large investments in U.S. facilities around the world. Desertification and shifts in the availability of water can change logistics patterns drastically for all our forces.

As was mentioned earlier, the British Indian Ocean Territory, the island of Diego Garcia, is a critical staging facility for United States and British naval and air forces operating in the Middle East and Central Asia. It sits just a few feet above sea level at its highest point. Rising sea levels may swamp a part of Diego Garcia, and deny the United States this critical operating hub for its Armed Forces. There are myriad other examples of contingencies for which our national security team must prepare.

These challenges are not insurmountable, but they will be expensive, as Senator Warner has suggested, to address, and have to be thought through carefully, lest they impact readiness. In any case, confronting changes in the military's operating environment and mission set may lead to somewhat different decisions about U.S. force structure, in my opinion. Consider that it takes 20 or more years to build a new aircraft for the U.S. Air Force or for the Navy, and that Navy ships are designed to last 30 to 50 years. With these extended timeframes, a basing structure secure from threats posed by climate, as well as more traditional foes, is a real national security consideration. We must anticipate new and revised missions

for our military forces, and factor those into our calculations of the consequences of climate change for America's national security.

Then to alliances: The Arctic is a prime example of how alliances will be forced to adapt to the realities of climate change. Just a few years ago, the scientific community, as the chairman said, was predicting that the Arctic wouldn't be ice-free until the middle of the century. Now the predictions put that date at 2013.

In the Arctic, the loss of sea ice has caused concern for the U.S. Navy for nearly a decade. What naval planners know is that loss of sea ice at the North Pole has the potential to increase commercial and military activity by other powers. As if we needed any evidence of this, look no further than the 2007 expedition by Russia—to plant its flag in the seabed at the North Pole. Not surprisingly, Canada, Norway, Denmark, and the United States, all nations bordering on the Arctic, responded critically to Russia's actions.

New climate conditions, new geographic realities, changes in economic and commercial circumstances, and pressures of migrating populations, all will test old alliances. Some changes may create new international friendships, on the other hand, friendships that will depend on America's ability to help smooth the turmoil associated with those climate changes. Supporting other nations' successes will continue to be an important part of our military's role in U.S. national security.

Mr. Chairman, Senator Lugar, we at the American Security Project have also thought about the regional impacts of climate change on our security. I would like to submit some of our ideas about the security implications of those regional effects as part of my written statement, for the record.

The CHAIRMAN. It will be put in the record.

Admiral GUNN. I would like to close with one final thought. Climate change poses a clear and present danger to the United States of America. But, if we respond appropriately, I believe we will enhance our security, not simply by averting the worst climate change impacts, but by spurring a new energy revolution.

This spring, a second CNA Military Advisory Board—which, again, Admiral McGinn will address, as an esteemed member of that board—reported on a year-long consideration of energy and security issues. The report, entitled "Powering America's Defense: Energy and the Risks to National Security," suggests strongly that national security, linked to energy security and economic growth, which undergird all of our Nation's power, can be achieved by taking action now, to avert the worst consequences of climate change.

It is for all these reasons, taken in their totality, that the American Security Project will be launching a major initiative in the coming months, to analyze and educate the public about the national security implications of these threats. We will be convening national security and climate change experts from around the country. We'll be talking to corporate leaders who see the business case for action, and we will be working hard to continue the work you have already begun to educate the general public on the dire consequences of inaction.

The imperative, then, is for leadership and action on a global scale. The United States must act. The United States must lead.

Thank you.

[The prepared statement of Admiral Gunn follows:]

PREPARED STATEMENT OF VADM LEE F. GUNN, USN (RET.), PRESIDENT, AMERICAN SECURITY PROJECT, WASHINGTON, DC

Mr. Chairman, Senator Lugar, members of the committee, thank you for the opportunity to appear before you today to share my assessment of the national security risks facing the United States because of changes expected in the Earth's climate.

I'd like to say a few words now and submit a lengthier statement for the record.

Mr. Chairman, this committee's attention to the national security implications of climate change adds an important piece to the public debate—a piece that, in my opinion, has been missing for too long.

Addressing the consequences of changes in the Earth's climate is not simply about saving polar bears or preserving the beauty of mountain glaciers. Climate change is a threat to our national security. Taking it head on is about preserving our way of life.

I know that there remain some who are still not convinced by the science of climate change. I am convinced. Many remain to be persuaded by science that humans are at least contributing in important ways to the warming of the globe. I am not in that group either. But leaving aside the merits of the science, permit me to offer this observation from my 35 years of service in the United States Navy: Threats and risks never present themselves with 100 percent certainty. By the time they achieve that level, as GEN Gordon Sullivan, former Army Chief of Staff, has observed, something bad will have happened on the battlefield.

Mr. Chairman, members of the committee, something bad is happening already in our climate. Something worse will happen if we don't act with urgency—as a nation and as a global community—to meet this threat.

The consequences of climate change will be found, and are being found now around the world. New climate conditions will lead to further human migrations and create more climate refugees, including those who cross our own borders. The stress of changes in the environment will increasingly weaken marginal states. Failing states will incubate extremism.

In South Asia, the melting of Himalayan glaciers jeopardizes fresh water supplies for more than 1 billion human beings. In North America, agriculture could be disrupted by increases in temperatures and shifting weather patterns that limit rainfall. Globally, major urban centers could be threatened by rising sea levels.

Malaria and other tropical diseases are moving into new areas and outbreaks are increasing in frequency as the planet warms and weather patterns change. As America debates climate change, its effects threaten to undo the good work in fighting malaria which has benefited from this committee's leadership.

All of this is just the foretaste of a bitter cup from which we can expect to drink should we fail to address, urgently, the threat posed by climate change to our national security.

I am here today as the President of the American Security Project—a bipartisan initiative that, more than a year ago, identified climate change as one of four principal national security challenges in the 21st century.

But the American Security Project is not the only group of national security thinkers and operators concerned with the threat posed by climate change. Since retiring from the Navy, I have served as President of the Institute for Public Research at CNA. CNA is a not-for-profit analysis and solutions institution heavily involved in helping leaders understand and deal with complex operational and public policy issues.

In 2007, CNA organized a Military Advisory Board composed of 11 retired generals and admirals (Admiral McGinn has reported/will report on that Board's views) who concluded unanimously that climate change poses a serious threat to America's national security. They saw changes in the Earth's climate as a "threat multiplier" for instability in some of the most volatile regions of the world, while also adding to tensions in regions whose stability we now take for granted.

In 2008, the final National Defense Strategy of the Bush administration recognized climate change among key trends that will shape U.S. defense policy in the years ahead. Additionally, the National Intelligence Council completed its own assessment last year of the threat posed by climate change.

The national security community is rightly worried about climate change because of the magnitude of its expected impacts around the globe, even in our own country.

Mr. Chairman, Senator Lugar, it is easy to get lost in abstraction when we talk about climate change and national security. I'd like to reduce this to specific and

practical defense implications. A changing and uncertain climate will, in my view, demand we adapt to new conditions affecting:

- Why we apply our Nation's power (in all its forms), around the world;
- How and where specifically our military is likely to have to fight;
- The issues driving alliance relationships (and whom are we likely to find on our side on the battlefield).

WHY WE APPLY POWER

Climate change will force changes in “why” the United States fights, gives aid, supports governments, provides assistance, and anticipates natural and man-made disasters. It will do so because climate change threatens unrest and extremism as competition for dwindling resources, especially water, spreads. Weak or poorly functioning governments will lose credibility and the support of their citizens. Under these conditions, extremists will increasingly find willing recruits.

In particular, climate change will certainly expand the number of humanitarian relief and disaster assistance operations facing the international community. America's men and women in uniform will be called on increasingly to help in these operations directly and to support the operations of legitimate governments and non-governmental organizations alike.

HOW WE FIGHT

Climate change will force change in how we operate our forces around the world; changes will effect ground operations and logistics as well as operations at sea and in the air. Sea level rise threatens large investments in U.S. facilities around the world. Desertification and shifts in the availability of water can change logistic patterns drastically for all our forces.

The British Indian Ocean Territory, the island of Diego Garcia is a critical staging facility for U.S. and British naval and air forces operating in the Middle East and Central Asia. It sits just a few feet above sea level at its highest point. Rising sea levels may swamp Diego Garcia and deny the United States this critical operating hub for its Armed Forces. There are myriad other examples of contingencies for which our national security team must prepare.

These challenges are not insurmountable. But they will be expensive to address and have to be thought through carefully lest they impact readiness. In any case, confronting changes in the military's operating environment and mission set may lead to somewhat different decisions about U.S. force structure, in my opinion. Consider that it takes 20 or more years to build a new aircraft for the U.S. Air Force or Navy and that Navy ships are designed to last 30 to 50 years. With these extended timeframes, a basing structure secure from threats posed by climate as well as more traditional foes is a real national security consideration. We must anticipate new and revised missions for our military forces and factor those into our calculations of the consequences of climate change for America's national security.

ALLIANCES

The Arctic is a prime example of how alliances will be forced to adapt to the realities of climate change. Just a few years ago, the scientific community was predicting that the Arctic wouldn't be ice-free until the middle of this century. Now the predictions put that date at 2013; just 4 years from now.

In the Arctic, the loss of sea ice has caused concern in the U.S. Navy for nearly a decade. What naval planners know is that loss of sea ice at the North Pole has the potential to increase commercial and military activity by other powers. As if we needed any evidence of this, look no further than the 2007 expedition by Russia to plant its flag in the seabed at the North Pole. Not surprisingly, Canada, Norway, Denmark, and the United States—all nations bordering on the arctic—responded critically to Russia's actions.

New climate conditions, new geographic realities, changes in economic and commercial circumstances, and pressures of migrating populations; all will test old alliances. Some changes may create new international friendships that will depend on America's ability to help smooth the turmoil associated with those changes. Supporting other nations' successes will continue to be an important part of our military's role in U.S. national security.

Mr. Chairman, Senator Lugar, we at the American Security Project have also thought about the regional impacts of climate change on our security. I would like to submit some of our ideas about the security implications of those regional effects as part of my written statement for the record.

I would like to close with one final thought.

Climate change poses a clear and present danger to the United States of America. But if we respond appropriately, I believe we will enhance our security, not simply by averting the worst climate change impacts, but by spurring a new energy revolution.

It is for all of these reasons, taken in their totality, that the American Security Project will be launching a major initiative in the coming months to analyze and educate the public about the national security implications of these threats. We will be convening national security and climate change experts from around the country, we'll be talking to corporate leaders who see the business case for action, and we will be working hard to continue the work you've already begun to educate the general public on the dire consequences of inaction.

This spring a second CNA Military Advisory Board (covered more completely by one of its esteemed members, Admiral McGinn) reported on a year-long consideration of energy and security issues. The report, entitled "Powering America's Defense: Energy and the Risks to National Security," suggests strongly that national security, linked to energy security and economic growth, which undergird all of our Nation's power, can be achieved by taking action now to avert the worst consequences of climate change.

The imperative, then, is for leadership and action on a global scale. The United States must act. The United States must lead.

The CHAIRMAN. Thank you very much, Admiral. Important testimony, and we appreciate it very much.

Ms. Burke.

**STATEMENT OF SHARON BURKE, VICE PRESIDENT, CENTER
FOR A NEW AMERICAN SECURITY, WASHINGTON, DC**

Ms. BURKE. Thank you, Mr. Chairman, Senator Lugar.

It's obviously a great honor for me to be here on behalf of my colleagues from the Center for a New American Security. And it's also a great honor because we consider this hearing a sign of important progress. This hearing is looking at climate change in a bipartisan way by people with such sterling defense credentials. It's a great leap forward. And, Senator Warner, I wish to reassure you that my father was a Marine, so I have a right to be part of the naval hegemony today. [Laughter.]

My testimony is going to focus on three reasons why it's so important to characterize climate change as a national security challenge. And, of those three, first I would say, most simply because the world is changing, the strategic environment is changing. Second, because there is a direct relationship between climate change and security. And finally, because of the ways in which national security will be part of the solution as we figure out how to go forward.

So, first, the world is changing—the global strategic environment is changing. The Center for a New American Security is looking at what we're calling "natural security," or the ways in which natural resources constitute national security challenges. The modern global economy depends on access to energy, minerals—nonfuel minerals—potable water, and arable land to meet the rising expectations of growing world populations. And that access is by no means assured. In some cases, we're not even sure how vulnerable the global supply chains are. At the same time, increasing consumption of these resources has consequences, such as climate change, which will challenge the security of the United States and nations all over the world. Therefore, natural security ultimately means sufficient, reliable, affordable, and sustainable supplies of natural resources for the modern global economy.

Now, in this context, resource challenges are important, but so are the connections among resource challenges. So, consider, for example, that the United States, as we attempt to address the inherent geostrategic weakness of our reliance on oil, some of the proposed solutions may just swap in other vulnerabilities and dependencies. For example, substituting coal for oil would affect climate change consequences. Ethanol affects food prices, which have helped provoke unrest over the last few years in some 40 countries. Plug-in electric or hybrid vehicles, with current technologies, often depend on lithium, but consider that lithium is also a resource with very concentrated supply. Bolivia, for example, has more than 50 percent of global reserves of lithium. Solar photovoltaic panels may require minerals, such as gallium, for which the United States is 99 percent dependent on imports. And, we don't even know how much gallium there is in the world. Although, we do know that China supplies almost 40 percent of current United States consumption.

At the same time, there are ways in which conservation, water rights negotiations, and other environmental strategies can complement and enhance national security strategies, and ways in which national security strategies are unlikely to succeed without addressing such concerns. And I think we're seeing that right now in the economic development component of our strategies in Iraq and Afghanistan.

So, as a natural security concern, climate change, in particular, is going to be important as a national security concern. Climate change will affect national security in the very broadest sense, including economic growth, trade partnerships, the security of international shipping lanes, social stability, and international terrorism. More narrowly, global climate change may spur sudden-onset and slow-onset disasters. "Sudden" being hurricanes and floods, for example, and "slow" being such phenomena as droughts and famines. This will happen around the world, which leads to humanitarian crises that will require military and other governmental responses.

Climate change will alter the military operating environment, as well, requiring advance planning and ongoing reevaluation of operating conditions.

But, climate-change national-security missions may go beyond the humanitarian and disaster relief missions that we've heard about today in this hearing, and I think a good case in point is Somalia. Drought, famine, and other climate-related stressors there, which may or may not be a result of global climate change, have played a part in the disintegration of that country. As part of the resulting chaos, U.S. forces have been attacking terrorist positions within the country, including al-Qaeda affiliates; they've been escorting humanitarian convoys; they've been countering piracy off the coast—which has been in the papers a great deal. But, they've also been assisting regional neighbors in dealing with the destabilizing effects of violence, refugee movements, and arms trafficking. So, the national security community may well have a direct role to play in any of these areas.

But, there are other ways that our community will be part of the solutions—of climate change solutions. First, as the United States

struggles with how to cut emissions of greenhouse gases 80 percent by 2050, the defense community will be critical. DOD is the single largest energy consumer in the Nation, as you mentioned, Senator Lugar; and although there is no single measure of the Department's carbon footprint, there's no question that it's one of the world's largest emitters of greenhouse gases. Also, the size of the Department's budget and its extensive need, both for transportation fuels and for electricity, but also for information, this creates a very important demand pull.

And, by information I mean that as the Department of Defense plans for military operations for humanitarian and disaster relief or for contingencies such as those in Somalia, Department planners will need certain kinds of information about what the trends are—the demographic trends, the security trends. And, to date, to the extent that groups such as mine have looked at how the United States will adapt to expected climate changes, that kind of information has not been available because there's been no demand for it. So, the Department has a very important role to play in providing a demand signal for information, as well as for innovation.

Now, the United States also has a range of capabilities that no other nation has. And we've heard about the humanitarian and disaster relief missions today in this hearing. Consider that the 2004 tsunami relief, and the conditions that devastated Indonesia, to get a sense of the scale involved in such efforts. The Department of Defense logged more than 10,000 flight hours and transported more than 24 million pounds of relief supplies and equipment to the devastated areas. Men and women from every service—the Navy, Marines, the Army, the Air Force, and the Coast Guard—participated in that relief effort. There is no other nation that can do this. We are the only nation that has these capabilities, and that will come into play, going forward.

I think the national security community is also in a very strong position to advocate for the value of preparedness, of resilience, of a greater investment in everything from stronger flood control to better governance in weak states. And that will be an important part of the response, going forward, as well.

More generally, one of the important roles that the military has to play is that, in poll after poll, the military is the most trusted institution in this country. Public recognition by defense and military officials that climate change is a threat and something that we have to take seriously, as well as other natural resources challenges, will help Americans more properly understand the nature of the challenge we're facing. So, these gentlemen at the table today, Senator Warner, Vice Admiral Gunn, and Vice Admiral McGinn, they have a very important role to play in bringing the country along.

Indeed, I think, looking forward, that the consequences of climate change, the global consequences, are likely to entail some very hard choices for the United States in how and where and when to respond with humanitarian assistance and military assets, as well as the aid that will promote resilience to climate changes. And this is not going to be limited to global contingencies. We've had hurricanes, wildfires, and floods, and are likely to have more wildfires in Colorado, as a result of what Governor Ritter told you, Senator

Kerry, about the damage to forests there from the pine beetle. We've seen these contingencies here at home in recent years, and in many instances, we've needed the National Guard and Reserves, and, in some cases, Active-Duty Forces to respond at home, as well.

At some point in the near future, the Nation is going to need guidance from the Commander in Chief and the National Command Authority as to how we're going to deal with these challenges, and which contingencies will require or warrant a U.S. response and investment. And, as my organization, the Center for a New American Security, has written extensively, we also feel very strongly that there is a need for a national strategy to help guide the nation through these very difficult tradeoffs and choices that we'll be facing in the future. We've seen some very promising signs out of this administration, that they will be crafting such a strategy, and we sincerely hope that this committee and Congress, both sides of the aisle, will be involved in that process.

Thank you, again, for the opportunity to be here.

[The prepared statement of Ms. Burke follows:]

PREPARED STATEMENT OF SHARON BURKE, VICE PRESIDENT FOR NATURAL SECURITY,
CENTER FOR A NEW AMERICAN SECURITY, WASHINGTON, DC

Mr. Chairman, Senator Lugar, on behalf of my colleagues at the Center for a New American Security, I thank you for this opportunity to testify on the threats, opportunities, and geostrategic challenges of global climate change. My organization, the Center for a New American Security, has made it part of our mission from our inception to look at the ways in which energy and climate change affect national security, and how to best integrate such concerns into the national security community. So while it is certainly my honor to be here today in such company, I and my colleagues are also greatly encouraged in our work by this hearing. We consider this an important demonstration of the fact that global climate change is now taken seriously as a strategic challenge for the Nation by both political parties and by key military and civilian defense leaders.

Indeed, my testimony today will focus on why it is so important to characterize climate change as a pressing national security challenge. First, the choices we make today, particularly the amount of energy we choose to consume, will determine the climate consequences we will face in the future, so this is very much about our actions right now. Second, national security capabilities can take decades to build: we need to design the ideas and equipment and recruit and train the personnel to protect and defend the Nation 10 to 40 years in the future, and it is clear that climate change will shape our future.

There is no question, of course, that climate change is not solely a security issue—there are driving economic, environmental, and public health concerns associated with climate change, as well, and all of these concerns need to be addressed in tandem. There are compelling reasons, however to focus on the intersection of national security and climate change, which I will discuss today.

- First, the global strategic environment is changing in ways that have broad implications for U.S. security and stability, and natural resources are an increasingly important driver in that change. I will therefore begin my remarks by talking about the importance of what the Center for a New American Security calls “natural security.”
- Second, in addition to the overall strategic climate, climate change is directly a military problem in that it will affect the operating environment, geostrategic landscape, and future military missions.
- Finally, there are ways in which the national security community will play an important part in addressing global climate change.

THE CHANGING GLOBAL STRATEGIC ENVIRONMENT: THE CASE FOR “NATURAL SECURITY”¹

Over the last 2 years, CNAS has developed a body of work on the highly intertwined national security and foreign policy implications of energy and climate change. Indeed, as CNAS examined these questions, we came to understand that not only are energy and climate change inextricably linked, they are connected to challenges associated with other natural resources, most notably nonfuel mineral supplies, water, land use/food supply, and biodiversity.

Consider, for example, that as the United States attempts to address the inherent geostrategic weakness of its reliance on oil (and the role the U.S. military, as a significant consumer of hydrocarbons, plays in that vulnerability), some of the proposed solutions may just swap in other dependencies, also with security consequences. There are those who suggest we substitute coal for imported oil, and the United States does have relatively abundant supplies of coal. Absent a major breakthrough in carbon capture and sequestration technologies, however, such a switch would greatly exacerbate global climate change and the related security concerns. Another solution the Nation has invested in, corn-based ethanol, can have implications for global food prices, which provoked unrest in some 40 countries in the last 3 years. Transportation, as the heart of U.S. oil supply dependency, merits special attention, and proposed solutions include increased reliance on plug-in electric or hybrid vehicles. Currently, such vehicles depend on minerals such as lithium for their batteries, and these resources are sometimes as highly concentrated as is oil (Bolivia, for example, has more than 50 percent of global reserves of lithium). Solar photovoltaic panels require a range of materials and minerals, such as gallium, for which the United States is 99 percent reliant on imports, and for which there is no information about the global reserves-to-production ratio. And though we do not know how much gallium exists in the world, we do know that China supplies almost 40 percent of U.S. consumption.²

At the same time, there are ways in which conservation, water rights negotiations, and other environmental strategies can complement and enhance national security strategies, and ways in which national security strategies are unlikely to succeed without addressing such concerns. For example, President Obama has stated repeatedly that peace in Afghanistan will be contingent on economic, civic, and political development as much as military successes. A 2009 UNEP report found, however, that most of Afghanistan’s natural resources are severely degraded and that any recovery would depend on restoration of these resources.³ Achieving U.S. goals in the region may well depend on our ability to tie natural resources into national security. For that matter, negotiations about climate change will be central to the relationship between the United States and China going forward.

In the 21st century, the security of nations will increasingly depend on the security of natural resources, or “natural security.” The modern global economy depends on access to energy, minerals, potable water, and arable land to meet the rising expectations of a growing world population, and that access is by no means assured. At the same time, increasing consumption of these resources has consequences, such as climate change and biodiversity loss, which will challenge the security of the United States and nations all over the world. Natural security ultimately means sufficient, reliable, affordable, and sustainable supplies of natural resources for the modern global economy. This will require the United States to both shape and respond to emerging natural resources challenges in a changing strategic environment.

These concerns are not necessarily new, even in the context of war—access to resources has always been a concern. In World War II, for example, American civilians contributed their pots, pans, and car tires to help the war effort, while both Allied and Axis forces struggled with oil shortages. Today, however, strategic concerns surrounding natural resources are set in a different context, because the global strategic environment is increasingly different. Russia, China, and other emerging (or reemerging) states are part of an extraordinary rebalancing of global wealth and power, which will characterize the 21st century, according to the National Intelligence Council (NIC). These shifts are already evident: More people in more places in the world are seeing improved living standards, with access to modern tech-

¹This section is drawn from the Center for a New American Security publication, “Natural Security,” published in June 2009, which can be retrieved at <http://www.cnas.org/node/2712>.

²National Research Council, “Minerals, Critical Minerals, and the U.S. Economy, Committee on Critical Mineral Impacts of the U.S. Economy” (Washington, DC: The National Academies Press, 2008).

³Silja Halle, ed., “From Conflict to Peacebuilding: The Role of Natural Resources and the Environment,” United Nations Environment Programme (February 2009).

nologies. More than half the world's population, for example, now has access to a cell phone. Cell phones may displace or supplement land lines in many parts of the world, but for millions of people, it is the first time they have had telephone service; this represents a wholly new and unprecedented demand for services and materials. According to the NIC, such global shifts, taken together, mean that by 2025 "unprecedented economic growth, coupled with 1.5 billion more people, will put pressure on resources—particularly energy, food, and water—raising the specter of scarcities emerging as demand outstrips supply."⁴

In this new strategic environment, how nations actually define and achieve security is changing. Indeed, there has been some concern, in both the environmental and defense communities, about the appropriateness of "securitizing" natural resources challenges such as climate change (i.e., overusing the security framework to understand challenges that are not at their heart about security), but that concern is misguided. The concern, more appropriately, should be about "militarizing" such challenges. Climate change, for example, may not be a threat that soldiers can attack and defeat but it is likely to affect the safety and prosperity of every American, both through its effects on global stability and on our local environments.

It follows, then, that if security threats are not always military in nature that military means are not the only way to achieve security, a point Secretary of Defense Robert Gates has made repeatedly (including explicitly about natural resources). "The challenges confronting our nation cannot be dealt with by military means alone," Gates noted in May 2009. "They require instead whole-of-government approaches."⁵ So security itself and how the Nation achieves security are being redefined.

As part of this redefinition, it is worth considering the ways in which "natural security" will shape the strategic environment and affect U.S. foreign policy, economic, and military goals.⁶ First, nations that consume imports of natural resources may be vulnerable to disruptions of supplies, with broad economic and security consequences. The United States, for example, depends on imports of many strategic commodities, particularly oil and non-fuel minerals, for a range of economic and defense uses. This import dependence is not in and of itself necessarily a threat or even a challenge, and ideally is a force for great global prosperity and stability for nations on either end of the transaction.

Import dependence can become a strategic liability, however, when the sources are highly concentrated, demand is rising, or substitutes for the commodities are limited. In such circumstances, such as the Arab oil embargo of 1973, the political and geostrategic motives or stability of the suppliers can become a significant problem. In other cases, countries with ample supplies can affect market dynamics and drive out other producers; the United States, for example, has not mined tungsten since 1995, even though the United States has 5 percent of global tungsten reserves and imported about 10,000 metric tons in 2007. Tungsten is used in a range of applications, including important defense applications (steel hardening and toughening). One reason for U.S. import dependence is that the United States simply cannot compete on pricing with China, which possesses two-thirds of the world's tungsten reserves.⁷ In other cases, resource rich nations may choose to use their wealth as a tool of economic and political power; Russia, for example, has used natural gas exports to influence Ukraine, but also Turkmenistan, Iran, Turkey, and all of western and Eastern Europe. The Presidents of both Venezuela and Iran have explicitly linked energy wealth to their ability to counter U.S. foreign policy goals.

A complicating factor for import dependence is the lack of information about global supply chains. Lack of reliable data on reserves-to-production ratios for oil or natural gas can directly affect the market. For example, markets played an amplifying role in the oil price shock of 2007–08; at the time, it was unclear why prices were escalating so much, so fast. In retrospect, oil production had stagnated in the face of sharply growing Chinese demand, but it is still unclear why production stag-

⁴C. Thomas Fingar, NIC Chairman, "Global Trends 2025: A Transformed World," National Intelligence Council (November 2008).

⁵Secretary of Defense Robert M. Gates, "Opening Statement to the Senate Appropriations Committee," (30 April 2009).

⁶There has long been a serious debate about the depletion of natural resources, and the ways in which "peak oil" and other absolute scarcity may drive security concerns in the future and even cause wars—or whether the adaptability of human society will render such concerns moot. Yet that particular debate hits only one aspect of the problem. CNAS believes that long before the debate about absolute, geological scarcity and human adaptability is settled, there are likely to be urgent strategic concerns about natural security. See John Tierney, "Betting the Planet," *The New York Times Magazine* (2 December 1990).

⁷U.S. Department of Defense, "Reconfiguration of the National Defense Stockpile Report to Congress," (April 2009).

nated.⁸ Sharply rising oil prices certainly played a part, and perhaps a dominant part, in the ongoing global economic crisis, with pervasive security and stability implications.⁹ In the case of minerals, there is uncertainty about global supply chains. The United States, and this includes for militarily significant systems, does not actually know if we are vulnerable to supply disruptions of some strategically important minerals.¹⁰ Planning for and managing such uncertainty can be a security challenge. Note also that supply chains are physically vulnerable: The entire energy supply and distribution infrastructure—from pipelines to shipping chokepoints to the vast domestic electric grid—is highly vulnerable to sabotage, natural disasters, and disrepair.

Concentration of supply can also be a problem for the supplier nations, leading to instability in a variety of ways, including conflict over land use between pastoralists and farmers in Darfur or tensions over water rights in the Levant. But there is a more fundamental way in which resources can be destabilizing, variously described as the “resource curse,” the “paradox of plenty,” and other terms. While commodities, such as oil and critical minerals, can bring in significant funds, in many parts of the world these proceeds come through state-owned companies and go directly into state coffers. This has a tendency to promote corruption, undermine accountability, increase vulnerability to market forces outside the country’s control, spur tension, and, in some cases, depress long-term growth. It can even facilitate armed rebellion: As one economist has noted, “where natural resources abound in rural areas they are uniquely vulnerable because they are difficult to defend, lucrative, and immobile,”¹¹ thus attracting rogue groups and vigilantes. Even when commodity prices are low, the “resource curse” can be tremendously destabilizing, as seen with the prospects of civil unrest in Zambia in early 2009, stemming from sharply falling copper prices.¹²

In addition to these vulnerabilities of supply, high consumption rates are creating other weaknesses. More countries are competing for the same strategic resources, at a time when access to those resources increasingly will be compromised by climate change and loss of biodiversity. This has the potential to directly promote tension, mass migration, and even interstate conflict, as well as more natural and humanitarian disasters, such as last year’s devastating cyclone in Burma and the collapse of food supplies in Haiti, which led to the fall of the government. As disaster rates rise, the U.S. military and civilian assistance agencies are likely to be called upon increasingly to conduct and support humanitarian and disaster relief operations, similar to Operation UNIFIED ASSISTANCE, which responded to the Indian Ocean tsunami. These disasters will vary in scale and location and the United States and other developed nations will be unable to bring relief in all cases. Social unrest and state instability may result, which will likely increase and contribute to supply disruptions and influence U.S. strategic priorities.

Finally, while these issues—from natural disasters to geostrategic tensions—demonstrate the importance of natural security to the future of the Nation, climate change in particular is what CNA has called a “threat multiplier,”¹³ and so war-rants today’s focus on how climate change is a national security problem—and as a challenge with national security solutions.

WHY CLIMATE CHANGE IS A NATIONAL SECURITY PROBLEM

Climate change may well be a predominant national security challenge of the 21st century, posing a range of threats to U.S. and international security. There will be, for example, direct threats to the lives and property of Americans from wildfires, droughts, flooding, severe storms, and other climate-related events. Evidence suggests there will also be less direct, second-order effects, such as the spread of various water- and vector-borne diseases into areas where they do not currently flourish. At the same time, there will be pervasive new challenges, such as that of mass migrations of threatened populations within or into the United States as coastal regions flood and agricultural breadbaskets shift or even disappear. Climate-induced

⁸James D. Hamilton, “Causes and Consequences of the Oil Shock of 2007–2008,” Brookings Papers on Economic Activity (Washington, DC: The Brookings Institution, Spring 2009).

⁹See Hamilton (2009) and Blair (25 February 2009).

¹⁰National Research Council, “Managing Materials for a Twenty First Century Military,” (Washington, DC: The National Academies Press, 2008).

¹¹Paul Collier, “Natural Resources, Development and Conflict: Channels of Causation and Policy Interventions,” Oxford University and the World Bank (28 April 2003): 5–6.

¹²Karin Brulliard, “Zambia’s Copperbelt Reels From Global Crisis: Downturn in Commodities Trade Leads to Devastating Mine Closures,” The Washington Post (25 March 2009): A1.

¹³The CNA Corporation, “National Security and the Threat of Climate Change,” 2007, <http://securityandclimate.cna.org/>.

disasters in other parts of the world, such as East Asia or Europe, may affect everything from crucial trade relationships to the safety of U.S. troops and their dependents based in those regions. Indeed, the direct effects on the military may include challenges to infrastructure (i.e., military installations affected by droughts, wildfires, floods, sea level rise, and cyclonic storms), the need to adjust or adapt to changing conditions, such as longer and more pronounced heatwaves, more pervasive and stronger storms at sea, changing undersea conditions, and supply chain challenges for food, fuel, and water, and the rise in climate-related missions, such as humanitarian and disaster relief.

Promoting a better understanding among military leaders of the causes and consequences of climate change is an essential first step for anticipating and responding to these challenges. There is still some skepticism within the community on the definition of “climate change,” and no clear picture of the defense community’s role in dealing with these issues. At the same time, many military personnel remain ambivalent regarding the relative importance of climate change. Some officers do perceive the security risks, or see synergies with combating terrorism and improving the U.S. ability to project soft power. From this perspective, American efforts to limit climate change will engender positive benefits in terms of other U.S. national security objectives. Other defense experts worry that increasing defense efforts regarding climate change will lead to underfunding of other priorities. More broadly, many feel that while climate change is a serious danger to the United States and our global interests, it is not primarily a military threat that can be met with military means. In this view, insufficient civilian capacity is the major problem.

Compounding the multiplicity of these views, the way in which the scientific community expresses “scientific uncertainty” can complicate the military’s response to this threat. While there are certainly many valid and important debates about the consequences of climate change, the way these debates translate to a military community is that now is not the time to plan or respond, but rather to wait until the scientists figure out whether there are near-term or long-term consequences. There is an urgent need to communicate the science in terms of risk management and plausible scenarios; the defense community, after all, has spent billions of dollars building weapons and training personnel to deal with risks and plausible threats in the future.

By law, the Department of Defense is required to incorporate climate change into all major assessments and planning processes, and while this has helped create a new community of interest and expertise, not all elements of the defense community seem equally prepared to execute this requirement. For example, the June 2008 National Defense Strategy offers a fairly perfunctory albeit helpful statement that climate change and energy security need to be incorporated into planning scenarios, but the recent Joint Operating Environment casts doubt on whether climate change itself is real. There are regional combatant commanders (generally those not currently engaged in combat operations) who have begun to address climate change issues directly, as well, but more as a platform for engagement with regional militaries than as a national security challenge. There is no intramilitary consensus on the future role the U.S. Armed Forces must play in preparing for the national security implications of climate change, and whether, or to what extent, this should affect future force structure decisions.

WHY CLIMATE CHANGE HAS NATIONAL SECURITY SOLUTIONS

As climate change manifests, the United States is likely to come under pressure from the international community in two key ways. First, as a major, historic contributor to climate change, the United States will be expected to take action to cut emissions. Second, nations around the world will look to the United States for help in responding to natural disasters, if for no other reason than that the United States is now and is likely to remain the only nation with sufficient capability to respond to major humanitarian and natural disasters. The national security community will have a crucial role to play in both areas.

First, as the United States struggles with how to cut emissions of greenhouse gases 80 percent by 2050, the defense community will be crucial. DOD is the single largest energy consumer in the Nation, accounting for 110 million barrels of oil and 3.8 billion kWh of electricity in 2006, at a cost of \$13.6 billion. Although there is no single measure of the Department of Defense’s “carbon footprint,” there is no question it is one of the world’s single largest emitters. Also, the size of the Department’s budget and extensive needs for fuels to support military missions can create a significant “demand pull” that can drive the research and response regarding climate change.

The U.S. national security community will also be important in dealing with the consequences of climate change, bringing valuable resources and capabilities (e.g., intelligence, medical, strategic lift, and other transport) to efforts to manage the consequences of climate change, particularly humanitarian and disaster relief missions. The United States generally has a range of capabilities that most other nations do not have, and no other nation has in sufficient quantities for the contingencies currently anticipated by climate models. Within that U.S. capability, the U.S. Department of Defense is better resourced than many civilian agencies and more equipped to operate in unstable or challenging environments. The 2004 tsunami that devastated Indonesia provides a sense of the response a single disaster can entail: DOD logged more than 10,000 flight hours and transported more than 24 million pounds of relief supplies and equipment to the devastated area. Men and women from every service—the Navy, Marines, the Army, the Air Force, and the Coast Guard—participated in the relief effort.¹⁴

Climate change missions may go beyond humanitarian and disaster relief, as well, with Somalia as a case in point. Climate-related stresses, such as drought and famine, have played a part in the disintegration of Somalia into anarchy. As part of the resulting chaos, U.S. forces have been attacking terrorist positions within the country, including al-Qaeda affiliates, escorting humanitarian relief convoys, countering piracy off the coast, and assisting regional neighbors in dealing with the destabilizing effects of refugees and arms trafficking.

Indeed, the global consequences of climate change are likely to entail hard choices for the United States in how and where and when to respond with humanitarian assistance, military assets, and aid to promote resilience. Indeed, as Hurricanes Katrina, Rita, and Ike and recent flooding and wildfire responses have demonstrated, some of these choices will be on the home front and will engage the National Guard, Reserves, and Active Duty Forces. At some point, likely in the new future, the Nation is going to need guidance from the Commander in Chief as to which contingencies will require or warrant a U.S. response, or investment in preparedness and resilience.

In the meantime, there are a number of actions the civilian and military leadership of the Department of Defense can take to prepare the Nation for a climate challenged future.

- The U.S. military, according to annual polls, is the single most trusted institution in the country. Public recognition of the threat that climate change—and other resource challenges—presents will help Americans more properly understand the nature of the challenge.
- The types of information the military needs in order to plan and budget for future contingencies—such as vulnerability assessments that layer climate projections, demographic changes, and state fragility—may not currently exist. The raw data may actually be available, but to date there has not been sufficient demand for such information. The U.S. national security community can provide a powerful demand pull in academia, national assets, and private research institutions for such information.
- One of the key ways to address global climate change will be through innovation, including a transformation in how the Nation uses energy. How to stimulate such significant innovation is an open question, however, with answers likely to involve extensive public-private cooperation. The Department of Defense can play an important part in this process by stimulating and spurring innovation, although it should be clear that this is not a question of applying defense dollars against civilian needs, but rather solving military challenges. The cost of fuel, the vulnerability of supply chains, and the geostrategic realities of global energy supplies are all valid military concerns.
- Emphasize the need to invest in prevention, preparedness, and resilience. Military responses, whether to disasters or state failure such as that in Somalia, are expensive and put lives at risk. To the extent that investments in state stability and infrastructure (such as flood control or improved irrigation) can lessen future military contingencies, DOD leadership should advocate for and make such investments.
- The national security community should participate in and push for a refinement in the whole-of-government preparation for and response to global climate change. For the Nation to deal adequately with this challenge, there will need to be strong executive leadership, bipartisan cooperation, and a unifying national strategy. Moreover, this strategy must not only look at energy and cli-

¹⁴U.S. Pacific Command, “DOD Relief Efforts Factsheet Summary,” as of February 14, 2005. Available at <http://www.pacom.mil/special/0412asia/factsheet.html>.

mate change, mitigation and adaptation, but also at how all these issues link together.

Focus on issues of natural resources and security has waxed and waned for several decades, but given the global development and modern economic trends apparent today, it is a critical time for the U.S. security community to deepen its understanding of the intersection of natural resources and security and the connections among the various issues involved. Climate change is a vital starting point.

The CHAIRMAN. Thank you, Ms. Burke.
Admiral McGinn.

**STATEMENT OF VADM DENNIS MCGINN, USN (RET.), MEMBER,
CENTER FOR NAVAL ANALYSIS ADVISORY BOARD, LEX-
INGTON PARK, MD**

Admiral MCGINN. Mr. Chairman, Senator Lugar, members of the committee, ladies and gentlemen, it is an honor to appear before you today to share my views, which are based on 35 years of service to our Nation in the U.S. Navy, along such great guys as Lee Gunn and under the command of a former Secretary of the Navy, Senator Warner.

Since early last year, I've had the privilege of serving, with some of our Nation's most distinguished and retired military leaders, on the CNA Military Advisory Board. This Military Advisory Board has produced two reports. The first examined the national security threats of climate change, and has just been mentioned several times in previous testimony. And the most recent analyzed the national security threats of America's current and future energy posture.

Clearly, we are in the midst of the most serious global financial crisis of our lifetimes. After a year of examining our Nation's energy use, it is clear to all members of our Military Advisory Board that our economic, energy, climate change, and national security challenges are inextricably linked and require comprehensive solutions.

In 2007, the report which was mentioned before, "National Security and the Threat of Climate Change," concluded that climate change poses a "serious threat to America's national security," and acts as a "threat multiplier for instability." And this occurs in some of the world's most volatile regions, adding tension to even stable regions, worsening the likelihood of terrorism, and most likely dragging the United States into conflicts over water and other critical resource shortages.

Climate change has the potential, as has been already mentioned, to create sustained natural and humanitarian disasters on a scale far beyond what we see today, and at a greater frequency. These disasters will foster political instability, where societal demands for the essentials of life exceed the capacity of fragile governments to cope with them.

Since that 2007 report by the Military Advisory Board, an independent National Intelligence Estimate on global climate change has confirmed our findings. And as you pointed out, Mr. Chairman, there has been an acceleration in the effects of climate change that have been documented by a whole array of credible scientific studies.

Some, however, may look at various discussions on climate analysis as a reason for delaying taking action. We believe that would

be the wrong path because, as has been noted before, waiting for 100 percent certainty during a crisis can be disastrous, especially one with the huge national security consequences of climate change. The trends are clear and the need for action is compelling.

It will take, as Senator Warner pointed out, the industrialized nations to demonstrate leadership and a willingness to change, not just to solve our current economic problems, but to address the daunting issues of global climate change. And here, the United States has the greatest responsibility to lead. If we don't make changes, then others will not. Furthermore, other nations will use our inaction as an excuse for maintaining the status quo.

The CNA Military Advisory Board most recently examined our national energy posture with a second report entitled, "Powering America's Defense: Energy and the Risks to National Security." We found that America's current energy posture constitutes a serious and urgent threat to national security—militarily, diplomatically, and economically. This latest report finds that our energy dependence—not just on foreign oil, but all oil; and not just oil, but all fossil fuels—posed significant security threats to the military mission and to the Nation. Our growing reliance on fossil fuels jeopardizes our military and exacts a huge price tag in dollars and, potentially, lives. We are, only now, just beginning to understand how large that real price tag is.

Our fossil fuel dependence in the United States does the following: undermines our moral authority in diplomacy and weakens U.S. international leverage; entangles the United States with hostile regimes; undermines our economic stability. In our judgment, a business-as-usual approach constitutes a threat to our national security from a set of converging risks. First, a global market for fossil fuels which is shaped by finite supplies, increasing demand, and rising costs—economic costs and environmental costs. Second, a growing competition and very high potential for conflict over the basics of fuel and water resources. Third, destabilization in virtually every part of the globe, driven by ongoing climate change. Unless we take significant steps to prevent, mitigate, and adapt, climate change will lead to an increase in conflicts in many strategic regions.

It is in this context, a world shaped by climate change and competition for fossil fuels, that the United States must make new energy choices. We call on the President and Congress to make achieving energy security in a carbon-constrained world a top priority. It requires moving away from fossil fuels and diversifying our energy portfolio with low-carbon alternatives. It requires putting a price on carbon with thoughtful and significant action now.

Mr. Chairman and members of the committee, with that spirit of opportunity foremost in mind, if we act with boldness and vision now, future generations of Americans will look back on this as a time when we came together as a nation and transformed these daunting challenges and worries about energy and climate into a better quality of life and a more secure future for our world.

Thank you, Mr. Chairman and members. I look forward to your questions.

[The prepared statement of Admiral McGinn follows:]

PREPARED STATEMENT OF VADM DENNIS MCGINN, USN, (RET.), MEMBER, MILITARY ADVISORY BOARD, CNA, LEXINGTON PARK, MD

Mr. Chairman, members of the committee, ladies and gentlemen, it is an honor to appear before you today to discuss the critically important topics of climate change and global security. Thank you for the opportunity to share my views which are based on over 35 years of service to our Nation in the United States Navy and as a senior executive involved on a daily basis with the science and technology of energy, transportation, and the environment.

Since early last year I have had the privilege of serving with some of our Nation's most distinguished and senior retired military leaders on the CNA Military Advisory Board.

This board has produced two reports, the first in April 2007 and the latest in May of this year, focused on the very topic of this hearing. The first examined the national security threats of climate change, and the most recent analyzed the national security threats of America's current and future energy posture.

Before I get to the details of these reports, I have to acknowledge the elephant in the room. We are in the midst of the most serious global financial crisis of our lifetimes. After a year of examining our Nation's energy use, it is clear to all members of our military board that our economic, energy, climate change and national security challenges are intertwined and codependent. Our past pattern of energy use is responsible, in no small measure, for our economic situation today. If we do not adequately address our Nation's growing energy demand and climate change now, in wise and visionary ways, future financial crises will most certainly dwarf this one.

And, as I will describe during this testimony, our national security is dramatically impacted by both our energy use and climate change.

First—the national security impacts of climate change.

In 2007, after a year-long study, the CNA Military Advisory Board produced a report called "National Security and the Threat of Climate Change" which concluded that climate change poses a "serious threat to America's national security," acting as a "threat multiplier for instability" in some of the world's most volatile regions, adding tension to stable regions, worsening terrorism and likely dragging the United States into conflicts over water and other critical resource shortages. On the most basic level, climate change has the potential to create sustained natural and humanitarian disasters on a scale and at a frequency far beyond those we see today. The consequences of these disasters will likely foster political instability where societal demands for the essentials of life exceed the capacity of governments to cope.¹

Climate change is different from traditional military threats, according to CNA Military Advisory Board member VADM Richard Truly because it is not like "some hot spot we're trying to handle. It's going to happen to every country and every person in the whole world at the same time."²

Not only will global warming disrupt the environment, but its effects will shift the world's balance of power and money.³

Drought and scant water have already fueled civil conflicts in global hot spots like Afghanistan, Nepal, and Sudan, according to several new studies. The evidence is fairly clear that sharp downward deviations from normal rainfall in fragile societies elevate the risk of major conflict.⁴

And as you know, The Intergovernmental Panel on Climate Change—the world's leading scientific panel on climate change—including more than 200 distinguished scientists and officials from more than 120 countries and the United States—predicts widening droughts in southern Europe and the Middle East, sub-Saharan Africa, the American Southwest and Mexico, and flooding that could imperil low-lying islands and the crowded river deltas of southern Asia.⁵

Since the April 2007 CNA Military Advisory Board report was published, a National Intelligence Assessment on global climate change confirmed our findings.

¹ CNA Report on "National Security and the Threat of Climate Change." <http://securityandclimate.cna.org/report/National%20Security%20and%20the%20Threat%20of%20Climate%20Change.pdf> (April 16, 2007).

² "Military on Climate Change." Washington Post (April 15, 2007).

³ Informed Reader column "How Global Warming Will Play With Investors." Wall Street Journal (March 9, 2007).

⁴ Andrew Revkin, "Global Warming Called Security Threat." New York Times (April 15, 2007) <http://www.ciesin.columbia.edu/pdf/waterconflict.pdf>.

⁵ <http://www.ipcc.ch/SPM6avr07.pdf>, James Kanter and Andrew C. Revkin, "Scientists Detail Climate Changes, Poles to Tropics." New York Times (April 7, 2007). Anne Jolis and Alex Macdonald, "U.N. Panel Reaches Agreement On Climate Change Report." Wall Street Journal (Apr. 6, 2007).

And the scientific community has begun issuing reports showing that climate change is occurring at a much faster pace than originally believed. The Arctic is a case in point. Two years ago, scientists were reporting that the Arctic could be ice-free by 2040. Now, a growing number of climatologists are telling us it could happen within just a few years.

Some may look at this changing analysis as a reason, or an excuse, for delay. We believe that would be the wrong path. As military professionals, we were trained to make decisions in situations defined by ambiguous information and little concrete knowledge of the enemy intent. We based our decisions on trends, experience, and judgment, because waiting for 100 percent certainty during a crisis can be disastrous, especially one with the huge national security consequences of climate change. And in this case, the trends are clear. Climate trends and scientific metrics continue to suggest, in an increasingly compelling way, that the global environment is changing.

In thinking about the best ways to deal with this growing threat, we need to keep clearly in mind the close relationship between the major challenges we're facing. Energy, security, economics, and climate change—these are all connected. It is a system of systems. It is very complex. And we need to think of it in that way and not simply address small, narrow issues, expecting to create the kind of change needed to fundamentally improve our future national security. Interconnected challenges require comprehensive solutions.

It will take the industrialized nations of the world to band together to demonstrate leadership and a willingness to change—not only to solve our current economic problems, but to address the daunting issues related to global climate change. And here, I'd say the United States has a responsibility to lead. If we don't make changes, then others won't. We need to look for solutions to one problem that can be helpful in solving other problems. That's one of the things we uncovered in our work—there are steps that can help us economically, militarily, diplomatically. And those steps fit with the direction the world is heading in considering climate solutions. Those are good and much-needed connections.

As retired Marine Corps Gen. Anthony Zinni, former commander of U.S. Central Command said “The intensity of global temperature change can be mitigated somewhat if the U.S. begins leading the way in reducing global carbon emissions.” He concluded, “We will pay now to reduce greenhouse gas emissions today . . . we will pay the price later in military terms and that will involve human lives.”⁶

Building on a key finding in the 2007 report, that climate change, national security, and energy dependence are inextricably intertwined, the CNA Military Advisory Board most recently devoted over 1 year to examining our national energy posture and this past May released a report entitled: “Powering America's Defense: Energy and the Risks to National Security.”

This report found that America's energy posture constitutes a serious and urgent threat to national security—militarily, diplomatically, and economically.

Moving beyond recent studies on the dangers of imported oil, our new report finds that not just foreign oil—but all oil—and not just oil but all fossil fuels, pose significant security threats to military mission and the country, and are “exploitable by those who wish to do us harm.”

We found that our overreliance on fossil fuels does the following:

- Jeopardizes our military and exacts huge price tag in dollars and lives. Our inefficient use of oil adds to the already great risks assumed by our troops. It reduces combat effectiveness. It puts our troops—more directly and more often—in harm's way. Ensuring the flow of oil around the world stretches our military thin—and these are the same men and women already fighting wars on two fronts.
- Cripples our foreign policy and weakens U.S. international leverage. Our dependence on oil—not just foreign oil—reduces our leverage internationally and sometimes limits our options. I say all oil, because we simply do not have enough resources in this country to free us from the stranglehold of those who do. We find ourselves entangled with unfriendly rulers and undemocratic nations simply because we need their oil. And we cannot produce enough oil to change this dynamic—we have to wean ourselves from it.
- Entangles the United States with hostile regimes. In 2008 we sent \$386 billion overseas to pay for oil—much of it going to nations that wish us harm. This is an unprecedented and unsustainable transfer of wealth to other nations. It puts us in the untenable position of funding both sides of the conflict and directly undermines our fight against terror.

⁶Washington Post, “Military on Climate Change.” (April 15, 2007).

- Undermines our economic stability. We are in the midst of a financial crisis, and our approach to energy is a key part of the problem. We are heavily dependent on a global petroleum market that is highly volatile. In the last year alone, the per-barrel price of oil climbed as high as \$140, and dropped as low as \$40. And this price volatility is not limited to oil—natural gas and coal prices also had huge spikes in the last year. While these resources may be plentiful, they are increasingly difficult to access, and have associated local environmental impacts, such as slurry spills and smog. The economic and environmental costs are steep. There are many who say we cannot afford to deal with our energy issues right now. But if we don't begin to address our long-term energy profile in significant ways now, future economic crises will dwarf this one.

We also found that continuing the United States energy usage in a business-as-usual manner creates an unacceptably high threat level from a series of converging risks, which include:

- A market for fossil fuels shaped by finite supplies, increasing demand and rising costs.
- Growing competition and conflict over fuel resources.
- Destabilization driven by ongoing climate change.

As our first report showed, unless we take dramatic steps to prevent, mitigate, and adapt, climate change will lead to an increase in conflicts, and an increase in conflict intensity, all across the globe. It's in this context—a world shaped by climate change and competition for fossil fuels—that we must make new energy choices.

Our second report concludes that we cannot pursue energy independence by taking steps that would contradict our emerging climate policy. Energy security and a sound response to climate change cannot be achieved by pursuing more fossil fuels. Our Nation requires diversification of energy sources and a serious commitment to renewable energy. Not simply for environmental reasons—for national security reasons.

We call on the President and Congress to make achieving energy security in a carbon-constrained world a top priority. It requires concerted, visionary leadership and continuous, long-term commitment. It requires moving away from fossil fuels, and diversifying our energy portfolio with low carbon alternatives. It requires a price on carbon. And perhaps most importantly, it requires action now.

By clearly and fully integrating energy security and climate change goals into our national security and military planning processes, we can benefit the safety of our Nation for years to come. In this regard, confronting this energy challenge is paramount for the military—and we call on the Department of Defense to take a leadership role in transforming the way we get, and use, energy for military operations, training, and support. By addressing its own energy security needs, DOD can help to stimulate the market for new energy technologies and vehicle efficiencies.

But achieving the end state that America needs, requires a national approach and strong leadership at the highest levels of our government.

Some may be surprised to hear former generals and admirals talk about climate change and clean energy, but they shouldn't be. In the military, you learn that force protection isn't just about protecting weak spots; it's about reducing vulnerabilities well before you get into harm's way. That's what this work is about.

As a member of our board, Gen. Robert Magnus, former Assistant Commandant for the Marine Corp said "Our only choice is whether we're going to make the decisions forcefully and in a timely manner. We could lag and then we'll find ourselves in a much more serious situation, when all of these other costs come on us."

Climate change, national security, and energy dependence are an interrelated set of global challenges. Without swift and serious legislative action and investment, the United States will continue barreling headlong toward the catastrophic national security, economic and human suffering effects of climate change.

I conclude by quoting from the foreword to our May 2009 CNA Military Advisory Board report: "The challenges inherent in this suite of issues may be daunting, particularly at a time of economic crisis. Still, our experience informs us there is good reason for viewing this moment in history as an opportunity. We can say, with certainty, that we need not exchange benefits in one dimension for harm in another; in fact, we have found that the best approaches to energy, climate change, and national security may be one in the same."

If we act with boldness and vision now, future generations of Americans will look back on this as a time when we came together as a nation and transformed daunting challenge and worry into opportunity, a better quality of life and a more secure future for our world.

The CHAIRMAN. Thank you very much, Admiral.

Thank you, all of you, for your important testimony here today.

Let me begin the questioning very quickly, because I know we have a number of interested colleagues.

Ms. Burke, the Center for a New American Security, I understand, has been engaged in a broad range of scenario development—what may occur, how it may occur, and how that may impact us. And, in fact, you've created, sort of, war games, based on global climate change and security issues. Can you share with us the primary outcomes and lessons learned from those efforts? Maybe describe to my colleagues what you did.

Ms. BURKE. Yes, sir, I'd be delighted. And I think these are very important tools. In a situation like this, where there are so many unknowns, you can test some of the possible futures, which is exactly what we did.

Last summer, we had players come from China, from India, from Europe, and the United States, and play out a future scenario, set in 2015. The scenario was that it's become very clear that climate change is real, is caused by human activity, no one—there's not any doubt any more, at that point, and many climate-related disasters are happening that people attribute to climate change. I'm sorry to say, we also posited a future in which the world has not been able to do very much to cut emissions. Nonetheless, it's clear that 2015 is a breakpoint, and our premise was to see if this group, assembled under those circumstances, could reach some kind of a breakthrough, particularly on technological innovation, emissions cuts, collaboration on disaster relief and humanitarian relief, and also other kinds of assistance.

What we found was very interesting and is being played out right now in the lead-up to the Copenhagen negotiations, is that they were not able to reach any kind of an agreement. You would think that is a disheartening result, but that result also may suggest where some of the opportunities and challenges lie.

For example, what we just saw with Secretary Clinton's visit to India tracked very closely with what we saw in the game, which is that the Indians were not willing to make any concessions whatsoever; and it's understandable; in the circumstances. In the context of the game, however, there was room for negotiation in the fact that the Indians perceived their vulnerability to natural disasters as a high negotiating priority. Of course, other countries did not necessarily think India's vulnerability was a high priority. It's an opportunity for collaboration and for tradeoffs.

So, through this game, I would say that we identified a number of opportunities. I think my biggest takeaway was actually one of the questions we wanted to test in the first place: If the United States makes a marked change in its position, and wants to be a leader on climate change, and is willing to make real concessions, did it matter, in the context of those other major emitters? What we found is that it mattered, in the sense that it gave the United States more credibility, but also that it mattered far more what China is willing to do—or unwilling to do, as the case may be. And China—and keep in mind, we had Chinese nationals there, playing in the game—was unwilling to do anything, without being paid or enabled in doing it, period. They were extremely conservative about

agreeing to any tradeoffs. I suspect that's the way it's going to be in the real negotiations.

The CHAIRMAN. Well, thank you. That's very interesting.

General Zinni, former CENTCOM commander, has said—and I, sort of, paraphrase him; I don't have the exact language in front of me—but, he said, basically, that climate change is going to result in real risk to our troops, and it will involve a "human toll."

Do you agree with that, Admiral McGinn? Admiral Gunn? John Warner?

Admiral MCGINN. Yes, sir. I am familiar with General Zinni's thoughts on this, and I think he's quite right. He said several things in the 2007 report that I think are relevant to this hearing. The first was that there is a real cost to this—this climate change—and it will be measured in human lives. And whatever other cost that the Nation has to bear in dealing with it will shrink in comparison, they'll seem very, very infinitesimal in comparison to the costs that we must pay in the future, when our backs are against the wall.

The other point that he made so forcefully—and this is particularly significant coming from a former commander of the U.S. Central Command—is that this will create the conditions—and indeed, accelerate the conditions—as a breeding ground for international terrorism.

The CHAIRMAN. Ms. Burke, I think you've already answered, to some degree.

Admiral Gunn.

Admiral GUNN. I think, following on Admiral McGinn's comments, a couple of things are worth noting. One is that, stemming from the issues about which I testified, and the other comments of those on the panel, I think it's easy to believe that anticipation and preparation can therefore result in the saving of many lives. Lives are at risk at all levels, from the agrarian economies all the way through the fully developed world, among civilians and people who are more directly involved in defense issues. And I think that the answer—one of the answers, when we're asked the question, "What the heck is the approach that you recommend?" has got to be, that we have to understand the threat, we have to anticipate a range of consequences for those threats, and we have to prepare for those most likely, and we have to do it quickly.

The CHAIRMAN. Senator Warner.

Senator WARNER. Thank you, Mr. Chairman.

I look back on my days here—one of my most interesting trips was with Secretary of Defense Bill Cohen, and I took a trip with Zinni through the region when he was the commander out there. I come back to the word "commander" and the troops. Commander in Chief is the President. And the President, I think, has done a very credible job in showing leadership on this issue, and I anticipate he'll even be stronger in that leadership in the time to come. And that's why I, respectfully, urge both the chair and the ranking member to take into consideration the public acclaim and confidence in the men and women in the Armed Forces, and particularly those in uniform who have to do the fighting, and they deserve a title in this bill. You call it an "amalgamated bill." There should be a title in there on the subject that this chairman and

ranking member and the committee are addressing today, and we're participating in—witnesses. It's going to take a lot of engines pulling this train to get this legislation through. And I think you've got a title on energy, and a title on security, and a title on diplomacy, which this committee will work on. All of those things are needed to pull this thing through, given the depth of the fear and concern that lingers on this issue now, in our public. We've got to convince them.

The CHAIRMAN. Good advice.

Senator LUGAR.

Senator LUGAR. Ms. Burke, I'm curious whether, at your institute or in these games that you have described—were there metrics that you were able to develop that indicated what kind of change was occurring in this country, quite apart from China or India or Russia or other places? In other words, when we talk about a baseline, and up or down 5 or 10 percent, how do you determine the baseline?

Ms. BURKE. Well, sir, we were very ably assisted in finding that baseline by Oak Ridge National Laboratory. They provided actual projections, based on real observations, and also climate mathematical models, for what was likely to happen. We did apply this analysis at a regional level, as well. We were able to make some projections about what would happen, as far as resource scarcity and migration, in each country represented in the game. And these were complex projections: Oak Ridge National Laboratory had a demographer on staff, for example, who helped us figure out where people were likely to move in the future. We actually had very credible projections, based on Oak Ridge's research, for what might happen in each of these regions.

Senator LUGAR. The reason I ask is, not only is there a problem of a general public credibility, but it seems to me, aside from the testimony of the scientists and the military, people we've talked about, hopefully there will come, someday, some type of graphic, such as we used to see, as to how the national debt is going up. A person can go out and see the figures rising. One can say, "Well, how could you know, to the dollar?" Probably not. But, there was a general indicator. The public had something to look at. The problem that I find, with my constituents, is that a majority are not really convinced there is that much of a problem.

Now, we will have this hearing today, with knowledgeable people like yourselves, and one can say, "Well, after all, whether our constituents understand it or not, or whether they believe it, we have a responsibility—and I accept that fact. But, this will only go so far. As Senator Warner has suggested, let us say Copenhagen occurs and, as you suggested, the response of the Indians, for the moment, was not very pleasant for Secretary Clinton, but this has been true, really, with all of us dealing with the Chinese. And they are very knowledgeable, and they are doing a lot of things, in nuclear energy. During the Olympics, temporarily, they got some of the pollution out of the capital so that the athletes could operate. Although, it came back, in due course.

Now, the problem here, for them, is enormous, given the numbers of people and the history of the country. And we understand that. But as Senator Warner suggested, maybe the timeframe is

not right—1 year, 2 years, 3 years. We proceed along, and the United States public, who was not altogether convinced to begin with, says, “Listen, we’re being taken.” Now, this is likely to bring, as it already has in the House legislation, people who say, “Well, we’re going to exact some penalties on those Chinese and on the Indians.” Trade penalties, for example. Those who were already protectionists in our country, would say, “American jobs have been going to these places for a long time,” and “This is a good chance to cure a couple of things, as a matter of fact.” And before long, we’re off to the races. Meanwhile, we’re also sending Secretary Geithner over there, meeting Chinese students, who are skeptical now, about how the dollar is working out. In other words, “Should we diversify our portfolio?” Well, we say, “Certainly not. We need every one of your buyers of U.S. Treasury bonds,” because we’ve got huge trillion-dollar debts to pay.

I mention all of this, not to confuse the issue before us today, but to say that this is crucial, right at the beginning, to have some understanding among the major polluters, of which we are one of the three, along with China and India. Others contribute, but this is where the big three is. And if two of the three are indicating, “not us, not now, you’ve had a century to develop so compensate us if you’re that concerned about it.” And the American public says, “What do you mean, compensate? Money to the Chinese, to the Indians, in one form or other? Not on your life.”

I’m just wondering if there is some way, despite the testimony or the gravity of military people or institutions such as yours, Ms. Burke, that we can get some degree of measurement of what we are doing right now, quite apart from what we might suggest to the Chinese. Because I have heard testimony here, which was not convincing, that their guidelines are very reliable. Ten percent from where? Can you comment at all on this general series of questions?

Ms. BURKE. Yes, sir. First of all, your first point, that we need some kind of environmental indicators—leading environmental indicators, if you will—we just had a meeting with policymakers and scientists, last night, where I think that was the general consensus, that we have leading economic indicators and we need leading environmental indicators.

Senator LUGAR. Good.

Ms. BURKE. And, I think there are plenty of actual observations to base that on. And if you’ve been to Rocky Mountain National Park recently, you’ll see what Governor Ritter has been talking about. Two-thirds of the trees on the west side of the park are dead. Perhaps people don’t need as much convincing as they used to.

As for China, their position is understandable, and our position is understandable. The United States has engaged in difficult diplomacy before, over things far more consequential, even, such as thermonuclear war. We can do this with the Chinese. It’s not going to be easy. It’s not going to be easy to convince the American people. But this is in our national security interests, and it’s also in theirs. And I think, again, people need less convincing than they used to. China is starting to experience public unrest, as well, over some of their environmental problems, and people are starting to see the consequences of climate change there, as well. There is

going to be some room to move, particularly, when it comes into investing in clean technologies and an energy transformation.

Again, China and the United States, as the two biggest consumers of energy in the world, have a lot of commonality of interests in finding a way around our energy security problems. Many of the needed investments are going to be in energy sources and technologies other than fossil fuels. There's a commonality of interests there that can pull us together, not just the divisions, which we are going to have to talk a great deal about.

Senator LUGAR. Thank you very much.

The CHAIRMAN. Thank you, Senator Lugar.

Senator Casey.

Senator CASEY. Mr. Chairman, thank you very much. And I want to thank our panel, and, first of all, want to extend a welcome, again, to Senator Warner. Welcome back, I should say.

I want to say, in a personal way, there are a lot of things we could say about Senator Warner's leadership in the Senate over 30 years, but as someone who has been here 2½ years, in my first 2 years, you tend to look to people who have been there a while for good examples. And I think I can speak for other new Senators and say he was a great example of—in terms of his work ethic, in terms of the way he served his State and the country, but especially, in terms of his own ability to show us how to display mutual respect and to keep the Senate on a path which was one of constructive camaraderie, and good examples of bipartisanship. We're grateful for that.

Senator WARNER. Thank you very much, Senator.

Senator CASEY. Because we benefit from that, and the country does, as well. And I want to thank you for your leadership on this issue, both in the Senate and now, as a statesman, maybe not fully retired yet. We're grateful for that.

And, I guess to the panel—I won't take all of my time, but I wanted to focus on two issues. Like a lot of people, I learned about this issue in ways you don't expect. I happened to be reading an article in Time magazine a couple of years ago—I think it was 2005—and there was one sentence that jumped off the page—and I was not in the middle of this issue in the way that Senator Kerry has been for a couple of decades now, in the middle of the science, and the middle of the advocacy about the urgency of this issue of global warming and the effects on human life—but in this article in Time magazine, one sentence said the following—and I'm paraphrasing, but this is pretty close to what it said, that “in 30 years, the percent of the Earth's surface that was the subject of drought had doubled.” That's all it said. And at that—when I read that, almost at that moment, or soon thereafter, I thought to myself, “Well, if the percent of the Earth's surface subject to drought has doubled, drought means starvation, and starvation means darkness and death.” That's all you need to know. And, ever since that time, that's what this issue has meant to me, that this is a threat to human life, when people starve.

It's only more recently, I think, that many of us, including the American people, I think, have made other connections between this issue and national security. So, your testimony and your wit-

ness and your scholarship and your advocacy gives us the opportunity to make that connection.

The question I have is related to some of the work we've all done on monitoring what's happening in Pakistan, just one country, which has layers of problems or challenges or threats, whether it's the nuclear challenge or whether it's the challenge posed by the Taliban and, therefore, impacting the nuclear threat. All of you pointed to this, the connection between drought and threats to places like Pakistan.

I'd like to ask you a two-part question. One is, describe this connection briefly. And, two, Do you think there are better ways that we can make these points in the Senate, in terms of public advocacy or outreach campaigns, other than the work you've done? I know you've tried to bring the scholarship to light. But, I guess I would ask you to just walk through that threat, and then suggestions for how we can continue to make this a more urgent matter with the American people.

Senator WARNER. Well, first I would add, the complexity of this subject is just awesome. And I sort of jokingly talk to my colleagues—Ms. Burke, who's an outstanding advocate, as you saw here just moments ago, and I have debated a little bit. We've got to keep it simple, so that the public understands it, because they're paying the bills. I find the public is quite inquisitive about this whole concept of "getting green." And if you put the question to them, "Well, what if we do nothing? What are the consequences?" then you begin to really get—stimulate some of their thinking. And I often use that as a little rhetorical comeback. I just think that this is the time that Congress has got to forcefully lead. That's what the—we can't follow the public, we've got to lead the public. And if we can keep this thing—to a common understanding, I think we can get the train out of the station and start it. And then it's going to be up to, really, basically, diplomacy, to keep the train running, so that we all bear an equal share of the burden on this thing.

So, we've got to start, we've got to jump out front, and we've got to lead. Remember that old phrase about the Frenchman that said—he asked his staff, "Look out the window. Which way is the crowd going, so I can run out there and jump in front of it." What was that? Somebody knows better—that phrase. [Laughter.]

Senator CASEY. Good advice. [Laughter.]

Admiral.

Admiral GUNN. I said, during my testimony, something that was almost flip, about beautiful vistas being maintained and the other motivations for dealing with climate change and global warming. Too often, that kind of argument becomes the topic of discussion in public discourse. And I agree that the preservation of small wildlife is important. I agree very much with what's been said here today about the loss of forests. I think these and the increasing desertification are terribly important manifestations of the problem that's facing us. But, I think that creating a sense of urgency about dealing with them, about appreciating and preparing for these problems, is only going to come from characterizing them as important components of national security. I think talking about the way Americans, in uniform and out, have been required to be engaged

around the world already, and increasingly will be by various dimensions of this problem, is a way to link the American people to the kinds of actions that they need to authorize us to take on their behalf.

Senator CASEY. Thank you.

I know I'm out of time, but maybe what we can do is if both of you could just submit something for the record. That might be faster.

[The requested information follows:]

WRITTEN RESPONSE SUBMITTED FOR THE RECORD BY MS. BURKE

While there are many cases in which climate change will combine with economic, political, and social factors in ways that pose national security challenges to the United States, Pakistan is an especially stark example.

Today, Pakistan is the only state with nuclear weapons ranked at highest risk for state failure in the Fund for Peace/Foreign Policy Failed States Index. By this ranking, even North Korea is more stable. Pakistan's instability, internal governance, economic fragility, and social divisions are of constant concern to the United States and our allies. Pakistan wrestles with conflicts among a variety of factions within its borders, and its government does not have a monopoly on control of its territory. The internal situation contributes to stress with Pakistan's neighbors, as well. Beyond this instability, the United States is directly vulnerable to many of the effects of Pakistan's troubles. With a porous border between Afghanistan and Pakistan, the terrorists and insurgent groups that the United States and NATO are working to weaken and suppress have gained control of territory in both countries and use their ease of movement between the two to their advantage. The ongoing instability in Pakistan is also affecting logistics lines supplying U.S. and NATO troops in Afghanistan.

Severe natural resource issues plaguing the country are part and parcel of Pakistan's challenges. Its freshwater availability has declined, and in combination with a growing and urbanizing population, potable water per capita has dropped from 5,000 to 1,500 cubic meters in the past 50 years. This water situation is in part due to decreasing rainfall, and the resulting increases in drought and aridity of recent years are affecting Pakistan's agricultural sector and thereby jeopardizing the livelihoods of about 45 percent of the population. The water and agriculture troubles speak to bigger environmental management concerns, including the highest deforestation rate in South Asia.

Climate change projections show that all of these problems are likely to grow worse. The shrinking Himalayan glaciers will affect—possibly drastically—freshwater supplies, food production, and even the ability to produce electricity (one-third of the country's energy is supplied by hydropower). The economic, social, political, and therefore security implications are stark.

The example of Pakistan shows clearly that failing and fragile states are difficult, multifaceted problems for U.S. security. Indeed, environmental considerations are an inherent part of the U.S. strategy for Afghanistan, with its emphasis on tools such as economic stability and agricultural productivity. Stabilizing the region and defeating the threat our troops are there to face may well require addressing the natural resource situation and considering how climate change might affect the chances for long-term success.

WRITTEN RESPONSE SUBMITTED FOR THE RECORD BY VICE ADMIRAL MCGINN

Climate change and energy security are inextricably linked national security threats, and the threats will escalate if we do nothing. Not only will global warming disrupt the environment, but its effects will shift the world's balance of power and money.¹ Acting now will thus play a vital role in determining our national security—militarily, diplomatically, and economically.

Here's how climate change poses national security risks, and why we must prepare now to prepare for and mitigate these risks:

In 2007, the CNA Military Advisory Board produced a report called "National Security and the Threat of Climate Change" which concluded that climate change acts as a "threat multiplier for instability" in some of the world's most volatile regions, adding tension to stable regions, worsening terrorism and likely dragging the United States into conflicts over water, crops, fuel and other critical resource short-

ages. On the most basic level, climate change has the potential to create sustained natural and humanitarian disasters on a scale and at a frequency far beyond those we see today. Drought and scant water have already fueled civil conflicts in global hot spots like Afghanistan, Nepal and Sudan, according to several new studies. The evidence is fairly clear that sharp downward deviations from normal rainfall in fragile societies elevate the risk of major conflict.²

And climate change-induced conflict will likely intensify. The Intergovernmental Panel on Climate Change—the world’s leading scientific panel on climate change—including more than 200 distinguished scientists and officials from more than 120 countries and the U.S.—predicts widening droughts in southern Europe and the Middle East, sub-Saharan Africa, the American Southwest and Mexico, and flooding that could imperil low-lying islands and the crowded river deltas of southern Asia.³ Without steps now to prepare for and mitigate regional conflicts caused by shortages of vital resources, the U.S. military risks become dangerously overextended.

We must also change our energy posture to ensure our national security and to reduce climate change. Last May, CNA released a report entitled: “Powering America’s Defense: Energy and the Risks to National Security.” This report found that America’s energy posture constitutes a serious and urgent threat to national security—militarily, diplomatically and economically.

The new report finds that not just foreign oil—but all oil—and not just oil but all fossil fuels, pose significant security threats to military mission and the country, and are exploitable by those who wish to do us harm. Our overreliance on fossil fuels does the following:

- Stretches our military thin by requiring our military to ensure flow of oil around the world, putting at increased risk the same men and women already fighting wars on two fronts.
- Jeopardizes military operations in the air, at sea, or on the ground, which are in many ways driven by the limits of the range and performance of vehicles and how they consume fuel. Fossil fuel inefficiency, for example, leaves our military vulnerable to attack because of the long supply lines needed to deliver fuel to our ground combat operations. In Afghanistan, our supply lines sometimes stretch for miles. The more efficient use of fuel we develop, we will reduce casualties and increase combat effectiveness.
- Cripples our foreign policy and weakens U.S. international leverage. Our dependence on oil—not just foreign oil—reduces our international clout and sometimes limits our diplomatic and economic options. This involves all oil, because we simply do not have enough resources in this country to free us from the stranglehold of foreign oil producers. We find ourselves entangled with unfriendly rulers and undemocratic nations simply because we need their oil.
- Funds our enemies. In 2008, we sent \$386 billion overseas to pay for oil—much of it going to nations that wish us harm. This is an unprecedented and unsustainable transfer of wealth to other nations. It puts us in the untenable position of funding both sides of the conflict and directly undermines our fight against terror.
- Undermines the economic stability on which our national security depends. We are in the midst of a financial crisis, and our approach to energy is a key part of the problem. We are heavily dependent on a global petroleum market that is highly volatile. In the last year alone, the per-barrel price of oil climbed as high as \$140, and dropped as low as \$40. And this price volatility is not limited to oil—natural gas and coal prices also had huge spikes in the last year. While these resources may be plentiful, they are increasingly difficult to assess, and have associated local environmental impacts, such as slurry spills and smog. The economic and environmental costs are steep. There are many who say we cannot afford to deal with our energy issues right now. But if we don’t begin to address our long-term energy profile in significant ways now, future economic crises will dwarf this one.

Our fragile electricity grid also poses national security risks. Nearly all our state-side military installations depend on the national grid, which is currently vulnerable to terrorist attack and mechanical malfunction. An upgraded electrical grid would increase the security of communications and combat operations.

By clearly and fully integrating energy security and climate change goals into our national security and military planning processes, we can increase the safety of our nation for years to come. By addressing its own energy security needs, the Department of Defense can also help to stimulate the market for new energy technologies and vehicle efficiencies. This will in turn give our nation the global competitive advantage we need to ensure the economic security that is key to our national security.

We call on the President and Congress to make achieving energy security in a carbon-constrained world a top priority. It requires concerted, visionary leadership and continuous, long-term commitment. It requires moving away from fossil fuels, and diversifying our energy portfolio with low carbon alternatives. It requires a price on carbon. And perhaps most importantly, it requires action now. For either we act now, and strengthen our stature as a global leader, or wait—and incur a far greater price later.

¹ Informed Reader column “How Global Warming Will Play With Investors,” Wall Street Journal (March 9, 2007).

² Revkin, Andrew “Global Warming Called Security Threat,” New York Times (April 15, 2007) <http://www.ciesin.columbia.edu/pdf/waterconflict.pdf>.

³ <http://www.ipcc.ch/SPM6avr07.pdf>. Kanter, James and Andrew C. Revkin. “Scientists Detail Climate Changes, Poles to Tropics,” New York Times (April 7, 2007). Jolis, Anne and Alex MacDonald, “U.N. Panel Reaches Agreement on Climate-Change Report,” Wall Street Journal (Apr. 6, 2007).

Senator CASEY. Thank you very much.

The CHAIRMAN. Thank you, Senator Casey.

Senator Corker.

Senator CORKER. Thank you for being here.

And, Senator Warner, I almost hate for my voice to come out over the microphone after listening to you, and your eloquent way of talking. And thank all of you for your public service.

I have to think, with all the folks that are affiliated with the Navy, and daughters of Navy, that when you look at the issue of us and India and China, all of which are nuclear countries, and we know that, obviously—that it has to be awfully frustrating, since so many of your colleagues, for 50 years or so, have served on submarines that were powered by nuclear, that we’re having a discourse in this country about nuclear today and that we’ve been so far behind. France is one of the few countries that is able to adequately meet the agreement they dealt with at Kyoto.

So, let me just—if you would, talk to me about your frustrations there. And wouldn’t we be—our country is a country that likes to build for the future, and lead—and would we not be, really, well off as a country, if we’re concerned about climate change? Some of my colleagues are talking about building 100 new nuclear facilities over the next 20 years. To embrace that fully, and to also cause India and China, with our leadership and new technologies, to embrace that fully, so that, instead of looking at a wall that diminishes economically in some ways—I know that China and India, some of their—their greatest threat is really, today, not climate change, by any means, but it’s poverty within their own countries. Right? I mean, they’re concerned about their populations and the instability that comes with people’s standard of living. And I just wonder if you might comment on that. I—surely, it has to frustrate you, coming from where you come from, that this country is not embarking on a massive project, and working with China and India to do the same—nuclear countries, already—to build many, many nuclear facilities to combat this issue that you’re so concerned about.

Senator WARNER. Well, I’ll lead off, Senator. I was privileged to—when I was Under Secretary—Secretary of the Navy for 5 years, we had practically 100 nuclear plants—basically at sea, several on shore, for testing, and so forth—operating. And the safety record of the United States Navy is second to none. And it can be done. The technology is known. And I think it’s essential that part of this climate change legislation—energy—slash energy—contain provisions

on moving America ahead with nuclear energy. It clearly—the environmental community will have to acknowledge, the least possible emitter of CO₂. And if CO₂ is the enemy, then we should start with that factor that can contribute very positively.

And talk about India—it was rather interesting—the Secretary of State is—one of her agenda items was some exchange of technology. Perhaps we can assist in building some of those plants in India. And I think, we've got look at the—this committee will look at international offsets. As we go forward, hopefully, with this bill, our industrial base will be looking for offsets. We may be able to strengthen our relationship with these developing countries by finding offsets that they—the domestic companies here can purchase from abroad.

So, there are a lot of things that can be done, and health can be improved, but—if we don't do anything, Senator, what's going to happen is, the EPA is going to be saddled with trying to set up a regulatory regime to control parts of this—not all; they can't do it all—parts of it. And that one agency is ill-equipped—I think they'd be the first to acknowledge—to take on the magnitude of this task.

This legislation is imperative. Absolutely imperative. And it should have a major section on nuclear, and that comes down to the dollar bill. We've got to figure out ways to help them finance these startup plants.

Senator CORKER. Does anybody have differing testimony? I'll move on—OK.

Admiral MCGINN. In support of what Senator Warner has said, Senator, you know, it's been said many ways that there's no silver bullet to solve these challenges of economic security, energy security, and national security. But, one of my colleagues on the Military Advisory Board said, “but there may be silver buckshot.” And I think one of those shot are, in fact, nuclear power. It's not going to answer all of our needs, in terms of either climate change or energy security, but it can be part of a solution.

I would note that all of those buckshots are, in fact, made of silver, however, and they carry a fairly hefty price tag, so we have to be very, very careful in going about the cost-benefit/risk analysis, where we put money into—American money into these various technologies. Others that are absolutely necessary—energy efficiency, across the board, and our transportation sector—and I'm applying this to our military operations, as well—all of the clean technologies of solar and wind, biomass, et cetera, and some of the more emergent things, like cellulosic ethanol. All of those are also silver buckshot, and we need to apply them in the right measure, at the right time.

Senator CORKER. You know, obviously, what brings you to this committee today is looking at strategic risk that we face as a country. And I know that climate change is one that we've—you've focused on today. But, Ms. Burke, I know you mentioned Somalia, and I wonder if this concerns you also. I was just in Darfur, and spent some time with the Sudanese Government also talking about the agreement between the north-south. The more imminent issue is large populations—regardless of climate change—large populations that are using water resources in a concentrated way. And no matter what happens with the issue of climate change, the mas-

sive population growth that's occurring is creating tremendous instability in those parts of the world that have limited resources. And I'm just wondering if it frustrates you that that more imminent issue that's right before us today, that is a powder keg, especially—I know Senator Kerry has had leadership on this issue—that if we don't deal with the issue of population growth and limited resources and density over aquifers, that we have even more imminent issues. I'd just like for you all to comment on that.

Ms. BURKE. Yes, sir. Population is certainly part of the picture, and it's one of the reasons that there is so much pressure on all these resources.

What is truly sad in these circumstances is that there are a lot of management strategies that could make those situations better. And, in fact, Senator, your home State of Tennessee has been grappling with these issues, itself. I think you had a border war with Georgia over water, didn't you?

Senator CORKER. It was a skirmish. [Laughter.]

Ms. BURKE. Yes, sir.

Senator CORKER. It's pretty well settled, yes.

Ms. BURKE. Yes. These are really difficult issues, and the growing populations are definitely putting pressure, but also, it's the growing expectations of these populations, for the same things that we enjoy, including things like cell phones, that require certain minerals. And incidentally, also, nuclear power requires water and other resources. These—all of these things fit together. The demands of growing world population are going to be a challenge.

Senator CORKER. Actually, I'd—there was a—I know my time is up—there's new technologies that, hopefully, are going to be deployed in Tennessee, which is a leader in our country as it relates to energy, for nuclear reactors that are actually air-cooled. So, it's one of those—it's going to be one of those few components that doesn't actually consume water, and actually, as you know, it's a system that puts it back in rivers, but when this air-cooled—it's not even—it's not even doing that.

So, I thank you for your testimony and your leadership. I do know there's a lot of unintended consequences, some of which Senator Lugar pointed to. I was just recently looking at the conflicts, firsthand, in Ukraine and other places, with fuel-switching that takes place with policies, and then, all of a sudden, countries like Russia, sort of, holding the valve to Europe. I hope that we will move through this in a thoughtful manner, and I certainly thank you for your testimony.

Senator WARNER. Senator, could I just say, first, thanks for making that trip. I went to that region with Senator Levin during the Somalia problems. Severity of the drought in that whole part of Africa has precipitated so much of this instability, certainly Somalia's. Isn't that an example that we can, frankly, tell the naysayers on climate change, "Explain that." You talk about that aquifer. It's down deep, and it's going deeper and deeper, because Mother Nature's not replenishing, from the surface, the water to go back into that aquifer. That's an example of the need to recognize climate change is with us today.

Senator CORKER. If I could, just to set the record straight, it's actually not near as much that issue as it is, again, concentrations

of population that are taking the water out more rapidly than it naturally can be replenished. But, certainly those are complicating factors, and I appreciate you bringing it up.

The CHAIRMAN. Let me just say, having been there laying the path for you, Senator, that there's been a 30-percent reduction in rainfall in that part of the area. And there has been—I forget the percentage, but a very significant percentage of increase of desertification as a result. So, that has actually displaced people. And then the tribal component gets involved. So—Time magazine, I think, a couple years ago, had a headline saying, “How to Prevent the Next Darfur: Get Serious About Climate Change.” That's what they said. You know, the dots are connected here.

Let me ask those of you with the military experience here, Is this going to require us to rethink the nature of our force structure, and the missions themselves, and therefore the training and recruitment, et cetera? And, if so, is this a part of the Quadrennial Review now?

Senator WARNER. Mr. Chairman, that was a statute that Senator Clinton and I put in. It's requiring the Quadrennial Review to specifically project the future.

The CHAIRMAN. Specifically to project this.

Senator WARNER. And it's right in the law. It is in the 2008 authorization.

The CHAIRMAN. I remember you said that earlier, but I appreciate that.

Senator WARNER. Yes.

The CHAIRMAN. Yes. And what about the force—I mean, what do you envision as a consequence of this? You know, I saw what we did in the earthquake assistance that we provided in Pakistan a few years ago. And, more recently, we've been very involved in trying to get supplies into Pakistan for the displaced persons from the Swat Valley. I mean, if that is replicated many times over in various places, it would appear that unless we create some separate force our military forces are going to be highly involved in this kind of response action which requires a different kind of delivery system, different kind of lift, different kind of training, and so forth. Is that accurate—

Senator WARNER. I would—

The CHAIRMAN [continuing]. Admiral?

Senator WARNER [continuing]. Certainly say it's dead-on. But, I yield to my colleagues, right here, who've spent 30-plus years in uniform. Let them be on the record, too.

The CHAIRMAN. Admiral Gunn.

Admiral GUNN. You may remember Operation Sea Angel, immediately following Desert Storm. I'll just remind people what that was about. ADM Steve Clarey was bringing back two Marine Expeditionary Brigades from Desert Storm, aboard 19 amphibious ships, plus escorts. And their objective was just to go home. They were proceeding through the Indian Ocean, and one of those horrible typhoons struck Bangladesh. They turned left, at the National Command Authority's direction, followed the typhoon into the Bay of Bengal, and provided what I believe, prior to the Tsunami relief effort, was the largest relief effort undertaken, certainly by the U.S. Navy and the Marine Corps together. And I think—you are

aware of what's aboard an amphibious force like that, that's usable. I mean, reverse osmosis water purification units, trucks, tracked vehicles, landing craft, air-cushion vehicles, helicopters, bridging units, and a medical capability that was prepared for and used in a war.

By the way, Operation Sea Angel was named, not by the U.S. Defense Department, but by the Bengalis. Their description was "Angels from the Sea" for the Americans who arrived.

My point is that a lot of what we're going to have to be able to do is come-as-you-are mission fulfillment. We have forces that are very nicely suited for that. I think we're going to need some special-purpose forces, as well, of course. But, there's always going to be that fine balance to strike. And I think it's a mistake to underestimate what we already own that has capability in this area.

Admiral MCGINN. I would add, Senator, that roles and missions are in the process of being evaluated, and will change in response to the climate change scenarios that have been discussed.

There are three words that come to mind in dealing with climate change, from a national security standpoint: prevent, mitigate, and adapt. And I think, in particular, the U.S. military services can play key roles in those last two, the mitigation and adaptation. And they can do this in a way that isn't just a response to humanitarian assistance, disaster-relief scenario, as Admiral Gunn pointed out. Certainly, that will be part of their roles and mission. But, I think, in a preventative way, in a way that works with our allies and people who we would want to have as allies in critical regions of the world, to share with them the kinds of technology, perhaps in renewable energy or energy efficiency, putting electricity where there is none, but doing it in a way that isn't the way we did it in a fossil-fuel-driven Industrial Revolution, but, rather, in new ways.

The example I would cite was when we first went into Eastern Europe after the fall of the Berlin Wall, the Telecommunication Revolution didn't try to replicate copper, and string wires for telephones all over Eastern Europe—leaped over the copper and went right to wireless. And I think this is a good argument for nations, such as China and India, who ascribe, rightfully so—or aspire, rightfully so—to a higher standard of living and quality of life. And they don't have to do it the same way that we did it in the past hundred years. There are better ways to do it, without the tremendous costs to the globe of doing this.

The CHAIRMAN. Couldn't agree with you more.

Senator Shaheen, I apologize for interrupting the flow over to you. I'm sorry.

Senator SHAHEEN. It's OK. I snuck back in.

I would actually like to follow along this line of questions, because I certainly agree that the military has a very important role to play as we look at responding to the threats from global warming. And—I forget what three key words you used.

Admiral MCGINN. They were "prevent, mitigate, and adapt."

Senator SHAHEEN. I guess the concern that I have, particularly right now, and given the urgency of what we need to do, is whether or not—given our commitments in Iraq and Afghanistan, if we have the capacity to engage our military in this fight. And—so, that would be my first question.

And if the answer to that is—I guess, either way, “yes” or “no”—what do we need to do to ensure that we do have that kind of support available to us?

Admiral MCGINN. Senator, I would like to start by saying that Iraq and Afghanistan provide fantastic opportunities for us to start shifting into these new areas, these new missions.

The Marine Corps, to cite one of the services—and all the services are working very hard in this regard—is conducting studies and actually sending technology forward to Afghanistan to lighten the load for the expeditionary force of the Nation—the Marine Corps—and to do it with things that bring a much greater level of energy efficiency, and bring in renewable energy, where it makes sense to do so.

Obviously, job one has to be to carry the fight to the enemy, to carry the message to the people of Afghanistan, and to win. But, you can do that in ways that are revolutionary, in some sense. It isn't just pure fossil fuel—bigger diesels, bigger tanks. It's thinking through, What is the end state that we want to achieve? And I think we are—have learned, and we will continue to learn, a great deal, especially in such an austere environment, such a tenuous environment, as Afghanistan. I am not advocating that as a test bed or experiment. Certainly not. But, I think—I would commend the Marine Corps and Army and other services for the tremendous innovations they're doing as they start to think about, How can we do this job better, not just simply the old ways, depending on large amounts of fossil fuel?

Ms. BURKE. And, Senator—

Senator SHAHEEN. Yes, Ms. Burke.

Ms. BURKE [continuing]. If I may, I think that, also, what Admiral McGinn said leads to another, broader consideration, which is—as of today, it looks as though the F-22 program will be canceled. This is just the latest reminder that the Department of Defense is reconsidering the “American way of war.” That's very much true on the ground, in the moment, in Afghanistan and Iraq. And the competencies it requires, to have security in those places, both the military competencies and then the larger whole-of-government effort that the President's been describing, are the same competencies that you need to have in order to be able to respond to the kinds of climate change contingencies we're talking about—failing states, antipiracy operations and so on. These are the kinds of consequences we'll see.

So, as a matter of fact, there is a confluence of what we need and of what the security future looks like for us.

So, there's that, and then also, at the same time, I think that the military—and these gentlemen would know far better than I—always has to be prepared for the next war and the next contingency, even if it's in the J3 and the J5, in the strategy and planning parts of the military. Even when we're fighting a war, we must be thinking about what comes next, and preparing for it, or we won't be ready for it. You also talked about that, Admiral, that the planning window for military infrastructure and equipment is 10 to 20 to 40 years out. So, if we're not thinking about what comes next in a climate change future, we won't be ready. And that's as

serious a responsibility for the Nation and the Department of Defense as is fighting the wars that we're in today.

Senator WARNER. A short answer to your question—did you want to go ahead?

VOICE. No, no, please, sir.

Senator WARNER. Historically, this country has always helped the others. Our forces have marched forth from our shores hundreds of times since 1776, never to take a square foot of anybody else's land, simply in the cause of freedom and in the cause of humanity. Every President comes in, with that big American heart, to help those less fortunate than we. And our military is the only military in the world that has the lift capability, as Admiral Gunn said, sea capability, and medical, all in units that are mobile and can get into, one way or another, the remote places where catastrophic challenges to life and limb occur in great dimensions. So, our military stands by, and I must compliment them. Frankly, the law is on the books, they are doing the planning right now to take care of such future missions as this President and his successors may decide.

Senator SHAHEEN. Well, certainly I would agree that they have an admirable record of service. And having been a Governor, as you pointed out, I've seen what the National Guard was able to do in times of crisis in the State of New Hampshire and across—of course, across the country. I guess I would hope that we can avoid, as much as possible, the need to mitigate and prepare.

So, much of the—some of the discussion this afternoon has been around the costs of responding to climate change, and I guess I'd like to talk a little bit about the costs of not responding, of not doing enough now, and having to be in a catastrophic situation, years from now, maybe even only a couple of years from now. Have you all looked at the cost? Has Pew, for example, Senator Warner, looked at the cost of failing to act, and what that will mean?

Senator WARNER. Yes. Pew works in conjunction with many other organizations. I think America is fortunate that so many of the nonprofit—or, not-for-profit groups—Sharon's group, the Pew group, the admiral's group—they're all working together. And Pew has made some analytical studies, but it is extremely difficult to correlate the figure and the number.

So, at this time, I'd have to tell you, there's not a lot of hard data out there of the cost of doing nothing. But, you certainly can start with health. We know that CO₂ is detrimental. We know that CO₂ is permeating the oceans now, and destroying the food sources to—in the chain of reproduction of the fish. And that, of course, is a valuable food all over the world. You can go to area after area and see that changes are taking place. The scientific data may be difficult to understand, but it's before your eyes. And I just—I'm so pleased—I just hope that you, personally, can work in support of a good bill. A fresh mind around here is a good thing to have among us.

Senator SHAHEEN. Well, thank you. And, you know, I personally think this is something that we've got to address. And I have the good fortune of coming from a state where we've already joined the Regional Greenhouse Gas Initiative in the Northeast, and we're seeing positive effects from that, and also from a State where we

are seeing the impact, now, of climate change, where we're seeing it in our forests, we're seeing it in maple-sugaring, in the amount of snow that we're getting, and how fast ice-out on our lakes happens. So, it's very clear, I think, to people in New Hampshire, that this is a challenge that we face, and we'd better respond to it.

My concern is how we convince—as you all spoke to, the urgency of trying to get the American people to understand what we're talking about, and also of getting some of our colleagues here to recognize that this is something we've got to address, despite the regional differences that we may have.

Senator WARNER. Thank you.

Senator SHAHEEN. So, thank you. And thank you all very much for being here.

Senator WARNER. Thank you.

The CHAIRMAN. Thank you very much, Senator Shaheen.

I appreciate, not just that, but the rest of your work on the committee, very, very much.

I must say, Senator, when I first came here, I sat way down there. I used to argue, adamantly, the value of a fresh face and new ideas. And Senator Lugar, I think, was chairman. Now he and I both argue the value of experience. [Laughter.]

And I think you've been there.

We are very grateful to all of you. This has been a helpful hearing, an important one, I think, in laying some foundation, and raising some good questions which we need to pursue.

We're going to leave the record open until Friday.

Yes, Admiral.

Admiral MCGINN. Senator, if I could make one final observation.

The CHAIRMAN. Sure.

Admiral MCGINN. As a newly minted admiral serving over in Europe as a NATO officer in the early 1990s, I was so encouraged, as an American, to hear about a thing called "Nunn-Lugar." It was bold, it was visionary, and it was bipartisan. It took from the uncertainty—in some ways, chaos—of the post-cold-war—cold-war world, and made an initiative that recognized uncertain dangers; not fully understanding the full scope of the danger, just knowing that there was. And I think that, if we go back to that time in this Nation's history, we need the same kind of bipartisan effort and vision and boldness to deal with this uncertainty that is affecting now—and most certainly will, in significant ways, in the future—our Nation's security.

And, Senator, thank you for your vision and boldness in—along with that of your colleagues—in putting that forward. As a private citizen now, and as a man in uniform back then, it is greatly appreciated.

The CHAIRMAN. Thank you. Appreciate that.

Well, we're working hard to see if we can get Senator Lugar to be a partner in this effort. And I know he's doing his due diligence. And we'll see where we come out.

Thank you all. Thanks for being here.

We stand adjourned.

[Whereupon, at 4:20 p.m., the hearing was adjourned.]