

**DROUGHT, FLOODING AND REFUGEES: ADDRESS-  
ING THE IMPACTS OF CLIMATE CHANGE IN  
THE WORLD'S MOST VULNERABLE NATIONS**

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**HEARING**

BEFORE THE

SUBCOMMITTEE ON INTERNATIONAL  
DEVELOPMENT AND FOREIGN  
ASSISTANCE, ECONOMIC AFFAIRS, AND  
INTERNATIONAL ENVIRONMENTAL PROTECTION

OF THE

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**THURSDAY, OCTOBER 15, 2009**

U.S. SENATE, SUBCOMMITTEE ON INTERNATIONAL DEVELOPMENT AND FOREIGN ASSISTANCE, ECONOMIC AFFAIRS, AND INTERNATIONAL ENVIRONMENTAL PROTECTION, COMMITTEE ON FOREIGN RELATIONS

*Washington, DC.*

The subcommittee met, pursuant to notice, at 10:00 a.m., in Room SD-419 Dirksen Senate Office Building, Hon. Robert Menendez, Chairman of the Subcommittee, presiding.

Present: Senators Menendez [presiding], Cardin, Shaheen, Corker, and Inhofe.

**OPENING STATEMENT OF HON. ROBERT MENENDEZ,  
U.S. SENATOR FROM NEW JERSEY**

Senator MENENDEZ. Good morning. This hearing now comes to order. Let me thank my colleagues who are here, particularly Senator Corker, who is the ranking Republican on the committee, and for his help in making today's hearing possible.

This is a hearing that has literally been in the works for almost a year, but it seemed like every time we were ready to pull the trigger, one thing or another got in the way. So I want to thank Chairman Kerry and Senator Corker for their help in finally putting this hearing together.

Senator MENENDEZ. Before I begin, I want to say that I was amazed to see yesterday that in the context of climate change negotiations, Saudi Arabia is asking to be compensated for the resulting decrease in oil demand. Truly shocking that a country that as the head of OPEC, an organization designed to artificially raise the price of oil, would actually ask for compensation for reduced demand for that product. So just to be absolutely clear, this hearing is not about that. [Laughter.]

Senator MENENDEZ. This hearing is about helping vulnerable developing nations adapt to the worst effects of climate change, not helping oil-wealthy nations get a windfall.

Both the House climate bill and the Kerry-Boxer bill have funds designed to provide resources for nations who are most vulnerable to climate impacts. Such a fund is important for many reasons. The most obvious is that it is simply the right thing to do. Developed nations have created a planetary problem and we have a duty to

help those who are being impacted. But it is also essential to our national security, and it is essential if we expect to achieve an international climate treaty. Unfortunately, it is an issue that I do not think has received enough attention in the United States Senate.

To help us today discuss this issue, we have a whole host of very significant witnesses. Let me in my comments reference them.

Reverend Jim Ball is an evangelical Christian who is part of a coalition of faith leaders committed to this issue. He will describe the human suffering from climate change and how unjust it is for nations that have not contributed to the problem to bear so much of the hardship.

Peter O'Driscoll from ActionAid USA will also be exploring the dire human impacts we can expect from climate change and will be telling stories of real people's lives. It is easy to get caught up in the numbers. So I hope Mr. O'Driscoll can help us remain focused on the human scale of this problem.

As dire and as emotional as this issue can be, having a strong fund for international climate change adaptation is fundamentally important because it is in the national interest.

A couple of years ago, the CNA Corporation published a report cataloging how climate change is an important national security issue. General Wald, who is also on CNA's Military Advisory Board, will testify about how unchecked climate change will lead to flooding, drought, and food security concerns. This could lead to tens of millions of climate refugees that will be competing for scarce resources. Which, in turn, this could lead to unstable governments, conflict, increased humanitarian missions, and increased migration.

The example that most commentators point to show the kinds of impact climate change can have is Darfur. Severe drought led to the loss of grazing and farmland. This led to nomadic herders migrating in search of water. This migration led to conflict with the farming tribes occupying those lands. Climate change means that droughts like this will happen more frequently, and unless funding is found to plan for these changes in advance, it is inevitable we will also see increased conflict.

Whether we like it or not, the world is becoming a smaller place, and threat multipliers happening anywhere in the world will likely have impacts here. Having a strong adaptation fund to manage climate change impacts could, therefore, help us avoid much more serious security engagements down the road, and that is certainly in the national interest.

Another reason why a strong adaptation fund is in our national interest is because it will greatly strengthen our negotiating position for an international climate treaty. David Waskow from Oxfam America will be testifying about how such a fund will be an important aspect of climate negotiations.

We can all agree that this is a planetary problem that will need almost all nations to come together and commit to solving this issue. The domestic legislation working its way through Congress is essential to reduce worldwide emissions to the levels we need, but it is also a powerful statement to the rest of the world that we are ready to make a strong commitment and willing to work with

other nations who are also willing to be bold in their actions. For many nations, a strong commitment to international adaptation is an essential piece of the puzzle.

So if we think preventing billions of dollars worth of damage to our own shorelines is in the national interest, then we will need an international adaptation fund to accomplish that. Or if we think preventing drought in our nation's bread basket is in the national interest, then we will need an international adaptation fund to accomplish that.

I am very pleased to see that the climate debate is finally advancing. I hope this hearing can help the Senate appreciate just how important it is to our own national security and economic interests to address the impacts of climate change in the world's most vulnerable nations.

Now let me recognize the distinguished ranking member for any comments he may have.

**STATEMENT OF HON. BOB CORKER,  
U.S. SENATOR FROM TENNESSEE**

Senator CORKER. Thank you, Mr. Chairman, and I appreciate your desire to have this hearing and all that you have done to make it possible. I do enjoy working with you and I know we have been able to accomplish numbers of things together.

I want to welcome the panelists. I am typically very short on opening comments, and I look forward to the questioning after your testimony.

I do want to say that there is no question that there are adaptation issues that need to be dealt with. I know that we have funding within existing budgets that do some of that. Some of that certainly is not done in the most effective way.

And in no way to cast judgment at all on the testimony that you are going to give today, this is a more broad statement. One of the things that has troubled me about climate change legislation is, at the end of day, it ends up being all about money. The fact is, as Senator Menendez mentioned, Saudi Arabia now wanting money for this and that. It seems like that much of the climate change legislation that we look at here in Washington ends up being all about sending money out to either corporations or people that want various special things done within their States.

I want to come back, though, and say there is no question that we have adaptation issues to deal with, and there are some things that merit taxpayer monies. There are some things that do not. I witnessed firsthand in Sudan in Darfur the issues relating to the very thing Senator Menendez was referring to.

Again, I look forward to your testimony. I really do think this is going to be enlightening, and I do look forward to working with each of you and others to figure out a way to, in a more streamlined way, focus on this issue that I think is very important to our country.

So thank you.

Senator MENENDEZ. Thank you, Senator Corker.

Senator Shaheen?

Senator SHAHEEN. I do not have an opening statement.

Senator MENENDEZ. Okay.

So let me formally introduce our panel to the committee. Rev. Jim Ball. Since 2000, Rev. Ball has served as Executive Director of the Evangelical Environmental Network and, before that, was the Climate Change Policy Coordinator for the Union of Concerned Scientists. And I am proud to say that Dr. Ball received his Ph.D. in theological ethics from Drew University in New Jersey and also taught for a number of years at Montclair State University. Welcome.

David Waskow is the Climate Change Program Director at Oxfam America. Oxfam America is an international development and humanitarian organization that works with communities and partner organizations in more than 120 countries, including the United States itself, to create lasting solutions to poverty, hunger, and injustice. Thank you.

Dr. Kenneth Green is an environmental scientist by training, studied environmental policy for more than 10 years at think tanks in California and Canada prior to joining the American Enterprise Institute where he is a resident scholar. He has authored numerous articles, newspaper columns and book chapters on global warming. Welcome.

Peter O'Driscoll became ActionAid USA's Executive Director in May of 2006. ActionAid is an international anti-poverty agency working in 50 countries taking the sides of poor people to end poverty and injustice together.

And General Charles F. Wald is the Former Deputy Commander of the United States European Command. With more than 35 years of service, General Wald was a command pilot with more than 3,600 flying hours, 430 combat hours, flying missions over Vietnam, Cambodia, Laos, Iraq, and Bosnia. He is currently Director and Senior Advisor to the Aerospace and Defense Industry Practice at Deloitte and a member of the CNA Military Advisory Board.

Thank you all very, very much.

We will ask you to try to keep your testimony to about 5 minutes or so. We are going to include your entire statements for the record, and this will give us enough time to have some good Q&A sessions after that. Let us start with you, Rev. Ball.

**STATEMENT OF REV. JIM BALL, PH.D., SENIOR DIRECTOR, CLIMATE CAMPAIGN, EVANGELICAL ENVIRONMENTAL NETWORK, WASHINGTON, D.C.**

Rev. BALL. Thank you, Chairman Menendez and Ranking Member Corker, for having this hearing on international adaptation. I am the Reverend Jim Ball with the Evangelical Environmental Network, and it is an honor to be here.

My testimony will offer an evangelical Christian perspective on the need for significant funding for international adaptation. So, yes, we are talking about money here, Senator Corker. The views expressed here are my own. However, over 270 senior evangelical Christian leaders like Rick Warren who are part of the Evangelical Climate Initiative support strong action on international adaptation, as do 89 percent of evangelicals, according to a recent poll.

Climate change is a natural disaster intensifier. It makes floods fiercer, hurricanes harsher, droughts dryer. The one thing the world does not need are more victims of natural disasters like the

father and his family during the 2005 Niger famine found hundreds of miles from the nearest feeding station. "I'm wandering like a madman. I'm afraid we'll all starve."

The reason such stories should not simply touch us as compassionate individuals but rouse us as a country is because of the scale of the impacts which have important implications for our economic and national security.

Given that these impacts will fall hardest on the poor in poor countries, those who have done the least and yet will suffer most, it should not surprise you that the Bible speaks to our responsibility to help them. When asked what is the most important thing in life, Jesus said it is to love God and love our neighbors as ourselves. These two commandments are what the church has called The Great Commandments, and from a Christian perspective, they are what our lives should be about.

In Luke's version, an expert asks Jesus a follow-up question, and Senators, you should be familiar with follow-up questions. Who is my neighbor? This sets up the parable of the Good Samaritan about a man who was robbed, beaten, and left for dead. A priest and a Levite passed by on the other side. But one of the hated Samaritans helps him. By having the Samaritan be the one who demonstrated love through his actions, Jesus in effect says that everyone is our neighbor, even or especially others we hold in contempt.

Here is the connection to climate change. The priest and the Levite were not the ones who robbed the man, just like in our time we did not create the poverty of the poor, a situation that makes them much more vulnerable to the impacts of climate change. But the priest and the Levite did pass by on the other side. Righteousness and love are the presence of good acts, not simply the absence of bad ones. By not helping the man in the ditch, the priest and the Levite made his plight worse and failed to love God.

Today, collectively, we are in fact making the plight of the poor worse through our contribution to climate change. And knowing their plight and not doing what we can to help to overcome it is like passing by on the other side, something no morally mature individual or nation can do. We must be Good Samaritans.

Let me provide a few examples of adaptation. Climate-intensified flooding will impact the ability to grow crops. A simple practical solution made from resources readily at hand are floating gardens, which have been successfully demonstrated in one of the poorest areas of Bangladesh. One of the moms helped, named Tara Begum, states, "This has made a great difference to my life. Now I have enough food in the floods, and I can give some to help my relatives as well."

As for drought, simple rainwater harvesting techniques can be highly effective. A widow in a Sri Lankan village, Nandawathie, has capitalized on the opportunities provided by increased water, by growing and selling vegetables at her doorstep. With this additional revenue stream, she applied for a loan to install solar power in her house. Nandawathie also feels safer not having to fetch water. Her children have less diarrhea, and her daughter has more time for school work.

And now for funding. Many in the religious community have called for there to be, in comprehensive legislation, an allocation

equivalent to \$3.5 billion annually, starting in 2012, which moves rapidly toward \$7 billion annually by 2020. Unfortunately, the allocation or funding in Waxman-Markey is woefully inadequate. Such funding levels must be increased significantly to capture the full support of the religious community. We have the means. Let us now summon the will.

Thank you.

[The prepared statement of Rev. Ball follows:]

PREPARED STATEMENT OF THE REVEREND JIM BALL, PH.D, SENIOR DIRECTOR,  
CLIMATE CAMPAIGN, EVANGELICAL ENVIRONMENTAL NETWORK<sup>1</sup>

A CHRISTIAN PERSPECTIVE ON INTERNATIONAL ADAPTATION

*Preamble*

Thank you, Chairman Menendez and Ranking Member Corker, and thank you to the subcommittee members, for having this hearing on international adaptation, or addressing the impacts of climate change in the world's most vulnerable nations. I am the Rev. Jim Ball, Senior Director of the Evangelical Environmental Network's Climate Campaign, and it is an honor to testify before you today. My testimony will offer an evangelical Christian perspective on the need for significant funding for international adaptation.

The views expressed here are my own. However, over 270 senior evangelical Christian leaders who are part of the Evangelical Climate Initiative have stated that "as a society and as individuals we must also help the poor adapt to the significant harm that global warming will cause."<sup>2</sup> In addition, a recent poll by Public Religion Research found that 89% of evangelicals support the U.S. helping the poor adapt to climate-intensified natural disasters, and 79% support helping with food and water shortages caused by climate change.<sup>3</sup>

*Introduction*

For many who have cared for the poor in poor countries by supporting relief and development organizations in their efforts to fight hunger, disease, natural disasters, and poverty, it may be disconcerting to discover that the pollution coming out of our vehicles and from our factories and power plants will lead to an insidious reversal of such efforts due to the impacts of climate change. Most of us have grown up thinking of pollution as a local or perhaps regional problem, not a global one. How could pollution coming out of cars in Chattanooga, for example, help cause hunger in Africa? But when such pollution is added to millions of vehicles and smokestacks around the world releasing heat-trapping global warming pollution, it results in climate change, a natural disaster intensifier. It makes floods fiercer, hurricanes harsher, and droughts dryer. The one thing the world certainly doesn't need are more victims of natural disasters, like the father and his family during the 2005 Niger famine found hundreds of miles from the nearest feeding station. "I'm wandering like a madman. I'm afraid we'll all starve."<sup>4</sup> At one of the feeding stations, a mother lamented as she watched her young daughter die. "As far as I'm concerned, God did not make us all equal. I mean, look at us all here. None of us has enough food."<sup>5</sup>

*The scale of the impacts*

The reason such stories should not simply touch us as compassionate individuals but rouse us as a country is because of the scale of the impacts of climate change. These impacts have important implications for our economic and national security and therefore addressing them is in our national interest. As Senators Kerry (D-MA) and Graham (R-SC) have recently stated in a *New York Times* op-ed: "many scientists warn that failing to reduce greenhouse gas emissions will lead to global instability and poverty that could put our nation at risk."<sup>6</sup> My thanks to both of

<sup>1</sup>The purpose of the Evangelical Environmental Network is "to declare the Lordship of Christ over all creation." For more information, go to: [www.creationcare.org](http://www.creationcare.org).

<sup>2</sup>See the Evangelical Climate Initiative's statement at <http://christiansandclimate.org>.

<sup>3</sup>See <http://www.faithinpubliclife.org>.

<sup>4</sup>Hilary Anderson, BBC, "Niger Children Starving to Death," July 20, 2005; <http://news.bbc.co.uk>.

<sup>5</sup>*Ibid.*

<sup>6</sup>Sen. John Kerry and Sen. Lindsey Graham, "Yes We Can (Pass Climate Change Legislation)," *New York Times* (Oct 10, 2009): <http://www.nytimes.com>.

these Senators for their leadership on this issue (and for speaking at the launch of the Evangelical Climate Initiative in 2006). Here are some of the projected consequences for the poor:

- 40–170 million at risk of hunger and malnutrition.<sup>7</sup>
- 1–2 billion people already in a water stressed situation could see a further reduction in water availability.<sup>8</sup>
- 100 million impacted by coastal flooding; millions more by inland flooding.<sup>9</sup>
- 90–200 million could become more vulnerable to malaria,<sup>10</sup> 1.4 billion could become at increased risk of dengue fever,<sup>11</sup> and the number of children vulnerable to diarrheal diseases—the number one killer of children—will increase significantly.<sup>12</sup>
- Approximately 20–30% of God’s creatures could be committed to extinction by 2050, making climate change the largest single threat to biodiversity.<sup>13</sup>
- The creation of 200 million “climate refugees” by 2050.<sup>14</sup>
- Billions could be at increased risk for violent conflicts, including in areas sensitive to energy security and the growth of terrorism.<sup>15</sup>

#### *Important Christian teachings*

Given that climate impacts will fall hardest on the poor in poor countries, those who have done least to cause this problem and yet will suffer the most, it should not surprise you that the heart of the moral teaching of the Bible speaks to our responsibility to overcome climate change.

In several accounts in the Gospels people ask Jesus what is the greatest commandment in the Law. In effect, they were asking: if there is one thing our lives should be about, what is it? What is the most important thing in life?<sup>16</sup>

Jesus quotes Dt 6:4–5, something that observant Jews of his time recited in the morning and in the evening: “Hear, O Israel, the Lord our God, the Lord is one. Love the Lord your God with all your heart and with all your soul and with all your mind and with all your strength” (Mk 12:29–30). Jesus immediately says, “And the second is like it: ‘Love your neighbor as yourself.’” (Mt 22:39, quoting Lev 19:18). To make things perfectly clear, Jesus adds: “All the Law and the Prophets hang on these two commandments” (Mt 22:40).<sup>17</sup>

Why does Jesus add the second commandment to love our neighbors as ourselves? He does so because you can’t love God unless you love your neighbor, because while God loves you, He loves your neighbor, too. These two commandments joined to-

<sup>7</sup>IPCC, 4th Assessment Report (AR4), Working Group Two (WG2), pp. 298–300.

<sup>8</sup>Nigel Arnell, “Climate Change and Water Resources: a Global Perspective,” Ch. 17 in *Avoiding Dangerous Climate Change*, H.J. Schellnhuber, et al. eds., p. 167. Arnell’s projections are utilized heavily by the IPCC.

<sup>9</sup>IPCC, AR4, WG2, p. 334.

<sup>10</sup>M. van Lieshout et al., “Climate Change and Malaria: Analysis of the SRES Climate and Socio-economic Scenarios,” *Global Environmental Change* 14 (2004): 87–99; IPCC AR4 WG2 Ch 8, pp. 408–410.

<sup>11</sup>S. Hales, et al., “Potential effect of population and climate changes on global distribution of dengue fever: an empirical model,” *Lancet*, 360 (2002): 830–834. The IPCC utilizes the work of Hales et al. See IPCC AR4 WG2 Ch 8, pp. 408, 410.

<sup>12</sup>World Health Organization (WHO), A. J. McMichael, et al., eds., *Climate Change and Human Health: Risks and Responses* (WHO: Geneva, 2003): p. 85; <http://www.who.int>. See also IPCC AR4 WG2 Ch 8, p. 401.

<sup>13</sup>IPCC, AR4, WG2 p. 213.

<sup>14</sup>United Nations Development Program (UNDP), Human Development Report Office, Oli Brown, *Human Development Report 2007/2008 Fighting climate change: Human solidarity in a divided world* Human Development Report Office, Occasional Paper, Climate change and forced migration: Observations, projections and implications (Geneva, 2007): p. 20; <http://hdr.undp.org>. See also National Intelligence Council (NIC) and the Office of the Director of National Intelligence, *Global Trends 2025: A Transformed World* (Washington, DC, Nov 2008): p. 53; <http://www.dni.gov>.

<sup>15</sup>International Alert, Dan Smith and Janani Vivekananda, *A Climate of Conflict: The Links Between Climate Change, Peace, and War* (International Alert, Nov 2007): p. 3; <http://www.international-alert.org>. See also CNA, National Security and Climate Change.

<sup>16</sup>See Mt 22:34–40; Mk 12:28–34; Lk 10:25–37. See also Rom 13:9–10; Gal 5:13–14; James 2:8; Dt 6:4–5; Lev 19:18.

<sup>17</sup>Here is a nice quotation from Augustine where he states that the Great Commandments are an interpretative key to understanding Scripture: “Whoever, then, thinks that he understands the Holy Scriptures, or any part of them, but puts such an interpretation upon them as does not tend to build up this twofold love of God and our neighbour, does not yet understand them as he ought.” See *On Christian Doctrine*, Book One, Chapter 36.40. You can find it online at: <http://personal2.stthomas.edu>.

gether by Jesus are what the Church has called The Great Commandments, and from a Christian perspective they are what our lives should be all about.

In the Gospel of Luke's version of Jesus' teaching of the Great Commandments, one of the experts in the law asks Jesus a follow up question: "And who is my neighbor?" This sets up one of the most memorable and loved of Jesus' stories, the parable of the Good Samaritan.

*A man was going down from Jerusalem to Jericho, when he fell into the hands of robbers. They stripped him of his clothes, beat him and went away, leaving him half dead. A priest happened to be going down the same road, and when he saw the man, he passed by on the other side. So too, a Levite, when he came to the place and saw him, passed by on the other side. But a Samaritan, as he traveled, came where the man was; and when he saw him, he took pity on him. He went to him and bandaged his wounds, pouring on oil and wine. Then he put the man on his own donkey, took him to an inn and took care of him. The next day he took out two silver coins and gave them to the innkeeper. "Look after him," he said, "and when I return, I will reimburse you for any extra expense you may have." (Lk 10:30–35).*

During Jesus' time Samaritans were considered by Jews to be heretical, traitorous, half-breeds and were regarded with utter contempt. By having the Samaritan be the one who demonstrated love by his actions, Jesus in effect says that everyone is our neighbor—even or especially others we hold in contempt. And furthermore, those of us who think of ourselves as religious, as doing the right things to appease God and look righteous to others better think again.

Here is where this parable intersects with climate change.

The priest and the Levite were not the ones who robbed the man, just like in our time we didn't create the poverty of the poor, a situation that makes them much more vulnerable to the impacts of climate change. But the priest and the Levite did pass by on the other side. Righteousness and love are the presence of good and loving acts, not simply the absence of bad ones. By not helping the man in the ditch, the priest and the Levite made his plight worse and failed to love God and be who God created them to be.

Today, collectively, we are in fact making the plight of the poor worse through our contribution to climate change. And knowing their plight and not doing what we can to help to overcome climate change is like passing by on the other side.

We may be highly observant of the outward signs of what it means to be religious or moral in our community. So, too, I'm sure, were the priest and the Levite. That's exactly why Jesus chose them to be characters in his parable. But if we don't help the poor who through no fault of their own find themselves victims in the ditch of climate change's impacts, then we have failed to completely fulfill the Great Commandments, to be morally mature persons, and our nation will not have lived up to its character as a compassionate country.

Matthew 25 lets us in on a little secret about the parable of the Good Samaritan. While the Good Samaritan is Christ-like in his behavior, it is Jesus Himself who is the man in the ditch. For Jesus says that whatever we do for "the least of these" we do for him (Mt 25:40).

In terms of the problem of climate change, right now it is as if you are approaching a victim of climate change in the ditch. You are just within sight of the person. You don't yet quite know what is going on. Is it risky to go over to this person? You can't quite yet tell anything about who it is—just that there is a lump in the ditch that looks human. Whoever it is could be drunk you think to yourself—maybe not a victim at all! But as you venture closer you come to find that it is a child, not a man. It is a young girl.

She is in distress. Is she sick? Weak from hunger? Both? Maybe she has an infectious disease. Where are her parents? Who is responsible for this young girl? How did she get in this situation? Suddenly you notice that someone else is in the ditch with her. It is Jesus, and he and the girl need our help.

When it comes to helping the poor adapt to climate impacts, what is true for Christians is also true for others. No morally mature individual or nation can pass by on the other side and leave the victims in the ditch of global warming's impacts. We must be Good Samaritans.

#### *Adaptation in poor countries*

Is it possible to overcome the consequences of climate change through adaptation? The short answer is YES. But it is only yes if we do two basic things: (1) sufficiently address the causes through mitigation, and; (2) making the necessary investments of time and treasure.

If we don't address the causes as we should, then at some point we will not be able to adapt to the consequences in a meaningful way. The impacts will overwhelm our capacity to adapt. This is especially true for the poor in poor countries, who would be the first to face such a situation.

Even if we mitigate or address the causes, could those of us in the rich countries invest enough in the adaptation efforts of the poor in poor countries so that they had the resources necessary to adapt?

Of course, the poor have been adapting to such things as floods and droughts for years with varying degrees of success. However, in many cases such coping strategies have been and will be completely overwhelmed by climate change.

A poor family in a slum in Ghana serves as an example. Their home and their furniture were made to withstand a certain amount of flooding. The mother explains that "When the rain starts falling abruptly, we turn off the electricity meter in the house. We climb on top of our wardrobes and stay awake till morning . . . our tables are very high and so also are our wardrobes, they are made in such a way that we can climb and sit on top of them." Unfortunately, these adaptive strategies have reached their limits due to more frequent and more intense flooding, leading to a partial break-up of the family. "I have two children, but because of the floods my first child has been taken to Kumasi to live with my sister-in-law."<sup>18</sup>

While what has helped in the past may simply need to be modified over time, relying just on past strategies could in fact prove dangerous, could become what experts call maladaptive, given that some of the impacts of climate change will fall outside of historical experience.

A similar situation occurs in the biblical story of Joseph found in the 41st chapter of Genesis, where an unusually severe and prolonged drought required a massive response outside of normal practice in order to avoid dire consequences. Like so much of what will be needed to successfully adapt to climate change, Joseph's story is an example of planning for hard times to come.

Because Joseph accurately predicted the dreams of others, the Pharaoh believed Joseph's interpretation of his dreams that there would be seven years of plenty followed by seven years of famine, a famine so severe that "the abundance in the land will not be remembered . . ." (v. 31). Then Joseph recommended a plan of action:

*(34) Let Pharaoh appoint commissioners over the land to take a fifth of the harvest of Egypt during the seven years of abundance. (35) They should collect all the food of these good years that are coming and store up the grain under the authority of Pharaoh, to be kept in the cities for food. (36) This food should be held in reserve for the country, to be used during the seven years of famine that will come upon Egypt, so that the country may not be ruined by the famine (vv. 34–36).*

Planning in the present to survive major problems in the future—this is a vital part of what climate change adaptation is all about.

Under Joseph's direction and authority the government took steps in the present to invest in the future, a time when "the abundance in the land will not be remembered." This required a great deal of organization, from the appointment of commissioners to the storage of grain to its proper distribution when conditions called for it. Additional storage facilities probably had to be built, distribution centers created, people trained, the populace educated.

I'm sure there were some doubters. I'm sure a good number didn't like a fifth of their grain being taken by the government for some future threat they didn't understand or believe in. But I bet they were glad when the famine came that they had food to eat because of Joseph's leadership.

Today, in light of climate change, we see Joseph in a new light. He is the Patriarch of adaptation; he is adaptation's "patron Saint," if you will.

Before going further, it will be helpful to have a working definition of adaptation. According to the Intergovernmental Panel on Climate Change or IPCC, adaptation actions are those that "enhance resilience or reduce vulnerability to observed or expected changes in climate."<sup>19</sup> This is exactly what Joseph did: he enhanced resilience in order to reduce vulnerability from expected changes in climate.

There are two complementary and sometimes overlapping ways to achieve adaptation, to enhance resilience and reduce vulnerability. One is broader, the other more targeted. The first is achieved by realizing the poverty-reducing and democracy-increasing dimensions of freedom, something as a country that our standard overseas

<sup>18</sup>International Institute for Environment and Development (IIED), Sheridan Bartlett, Climate Change and Urban Children: Impacts and Implications for Adaptation in Low- and Middle-income Countries (IIED, August 2008); <http://www.iied.org>.

<sup>19</sup>IPCC, AR4, WG2, Ch 17, p. 720.

development assistance (ODA) should be helping to foster. The second is achieved through projects, processes, and mechanisms designed in whole or in part to address climate impacts. Both are needed. Neither can be neglected. Federal funding for international adaptation in comprehensive climate change legislation, which needs to be new and additional in comparison to ODA, should go towards addressing the additional burdens created by climate impacts. In other words, such funding should go towards targeted adaptation based on what the likely major impacts of climate change will be in a particular area. Is there going to be more flooding? More drought? Higher temperatures? How do we prepare?

Targeted actions to enhance resilience or reduce vulnerability could take a variety of forms, including concrete projects like switching to more drought-resistant food crops. Just as in the Patriarch Joseph's case, this sounds rather straightforward. But when you go to apply it in a particular situation it can become quite complex. For example, sorghum is more drought-resistant than other crops. But it also brings in less revenue. If you switch, how, then, do you make up that revenue? Or, instead of simply switching to a crop already at hand you create one. The thing is, creating more drought-resistant crops can take decades. It has taken 30 years to achieve drought-tolerant beans for Latin America, for example. And that is the norm.<sup>20</sup> Furthermore, changing to such a drought resistant crop is not simply a matter of providing new seeds. Their acceptance by a family or community also depends upon such factors as their taste and how they can be prepared, storage requirements, and the availability and affordability of other inputs like fertilizers.<sup>21</sup>

As anyone who has managed a major project before knows, they are usually much more complicated than meets the eye and are just as much about process as they are about product. Furthermore, when the project means major changes in the way people do things, part of that process includes education and persuasion and buy-in of those who need to approve and participate in the changes. In many if not most cases, adaptation projects will need to involve both the private and the public sector. Governments, businesses, non-profits, community groups, churches, families, and individuals will have to participate and play their respective roles.

#### *Examples of Adaptation*

As briefly mentioned earlier, climate change will increase both the frequency and intensity of inland flooding. One consequence will be a diminishment of the ability of poor people living on increasingly flood-prone lands to grow crops. A simple, practical solution made from resources readily at hand is a floating garden. Water hyacinth (a free-floating perennial aquatic plant) is collected and formed into a raft, upon which soil and cow dung is placed. Seeds of suitable crops are then planted in the soil.

Such floating gardens have been successfully demonstrated in one of the poorest, most remote and flood-prone areas of Bangladesh, the Gaibandha district, located at the confluence of two major rivers, the Tista and the Brahmaputra. The local populations live below the subsistence level, and out of necessity many fathers leave the area in search of work, leaving behind their families.<sup>22</sup>

Now, however, some of the wives and mothers who have been trained on how to create and keep floating gardens are planting them to see them through the lean times. One such mother is Tara Begum, who was able to grow such crops as red onion, pumpkin, and okra. "This has made a great difference to my life. Now I have enough food in the floods and I can give some to help my relatives as well."<sup>23</sup>

Another consequence of flooding is the damage or destruction of housing. One successful formula being implemented in Bangladesh, utilizing locally available resources, involves creating a two-foot high foundation upon which to erect one's home. This simple foundation is made of earth with an outer protective layer of cement and stones. The walls of the home are constructed of easily replaceable panels made of jute (a readily available plant in the area). Water-thirsty plants, such as bamboo and banana, are planted around the structure to soak up water and retain

<sup>20</sup>International Livestock Research Institute, P. K. Thornton, et al., "The livestock-climate-poverty nexus: A discussion paper on ILRI research in relation to climate change," Discussion Paper No. 11. ILRI: Nairobi, Kenya, (May 2008), p.41; <http://www.ilri.org>.

<sup>21</sup>United Nations Framework Convention on Climate Change (UNFCCC), Technical Paper, Investment and financial flows to address climate change: an update (UNFCCC, Nov 2008): p. 30; <http://unfccc.int>.

<sup>22</sup>United Nations, International Strategy for Disaster Reduction, Linking Disaster Risk Reduction and Poverty Reduction: Good Practices and Lessons Learned (UNISDR, 2008): pp. 2-5; <http://www.unisdr.org>. See also the website of a non-profit relief and development organization in Great Britain called Practical Action, [http://practicalaction.org/?id=climate\\_change\\_floatinggardens](http://practicalaction.org/?id=climate_change_floatinggardens).

<sup>23</sup>Practical Action website, [http://practicalaction.org/?id=climatechange\\_floatinggardens](http://practicalaction.org/?id=climatechange_floatinggardens).

the soil. As one father said, “Before, when the rain came, we wouldn’t sleep. We were terrified. But now at last we can live our lives in peace.”<sup>24</sup>

*From flooding to drought*

As the old saying goes, necessity is the mother of invention. For thousands of years, when people have needed to they have found various ways to capture rainwater, called in the literature “rainwater harvesting.” Because of increased water scarcity brought on by climate change, many will need to discover anew how to do it in their local area.

One way to capture rainwater for crops in a time of drought is by constructing ridges of soil along the contours of fields so that the rainwater doesn’t simply run off the hard-baked soils. Before utilizing this technique, Tias Sibanda, a local farmer from the Humbane village of Gwanda, Zimbabwe, frequently harvested nothing during times of drought and would then have to sell some of his livestock to survive.

But utilizing this rain harvesting technique has made a tremendous difference for Tias Sibanda and his family. In the first year he had two crops, which he calculates saved him from having to sell 12 goats (worth about \$320). Tias states: “I am confident of further improvements in the future and, if the drought eases, would soon be able to sell some of my maize crop.”<sup>25</sup>

Another rainwater harvesting technique is to capture rainwater that flows off of rooftops by a system of gutters and pipes that channel the water into a storage tank. Efforts in Muthukandiya, a drought-stricken village in Sri Lanka, serve as an example, not only of effective use of this technology, but of how intentional efforts at community involvement increased the success rate.

Previous top-down efforts in Muthukandiya by the government proved ineffective. So a relief and development group working in the area, Practical Action, called a meeting of the village where they asked their views. As a result, this particular roof-top-to-tank storage system of rainwater harvesting was chosen and a plan was developed to make it a reality. A village committee was set up to run the project. Nearly forty families agreed to participate. Two local masons were trained in how to construct the 1,300 gallon storage tanks. Participating households were trained in how to maintain the system. The entire system cost \$195 (equal to a month’s income for a family), but over half of the cost was covered by the community in the form of materials and unskilled labor.

The results? During the driest times participating households have nearly twice as much water as non-participating ones—and such water is much cleaner, too.

A widow in the village, Nandawathie, has capitalized on the opportunities provided by increased water by growing and selling vegetables at her doorstep. With this additional revenue stream she applied for a loan to install solar power in her house, and she is thinking of building another storage tank to grow more produce. Nandawathie also feels safer not having to fetch water. Her children have less diarrhea, and her daughter Sandamalee has more time for school work.

The benefits from this project are clear and compelling. However, Practical Action reminds us that “a lot of effort and patience are needed to generate the interest, develop the skills, and organize the management structures needed to implement sustainable community-based projects” like this one.<sup>26</sup>

A final rainwater harvesting example involves a community-based project in a poor village in the drought-stricken Kitui district of eastern Kenya. Such rainwater harvesting projects are desperately needed in the country, given that only 4% of its rainwater collection potential is being tapped even though it is chronically water-scarce.<sup>27</sup> The particular technique utilized for this project was a “rock catchment,” which requires a rock outcrop of sufficient size and with impermeable rock. In the area where the rock slopes down a wall is built, essentially creating a dam. This particular project provided nearly a gallon of clean water within walking distance for each village resident during the dry season.<sup>28</sup>

Successive natural disasters can create a downward spiral that thwarts the efforts of the poor to try to create a better life for themselves, and climate-intensified disasters could make this dynamic even worse. I call this “the downward disaster spiral.” But recent efforts in Malawi, one of the world’s poorest, most densely populated countries, demonstrate that concerted efforts can thwart this downward disaster spiral. Because of successive floods and droughts, the 2005 harvest was one of the

<sup>24</sup> Practical Action website, [http://practicalaction.org/?id=flood-resistant\\_housing](http://practicalaction.org/?id=flood-resistant_housing).

<sup>25</sup> Practical Action website, [http://practicalaction.org/?id=climatechange\\_rainwater](http://practicalaction.org/?id=climatechange_rainwater).

<sup>26</sup> Practical Action website, [http://practicalaction.org/?id=rainwater\\_case\\_study](http://practicalaction.org/?id=rainwater_case_study)

<sup>27</sup> UN, ISDR, Linking Disaster Risk Reduction and Poverty Reduction: Good Practices and Lessons Learned, p. 36.

<sup>28</sup> UN, ISDR, Linking Disaster Risk Reduction and Poverty Reduction: Good Practices and Lessons Learned, pp. 33–36.

worst ever recorded, declining 29 percent.<sup>29</sup> Given that 85% of the country lives in rural areas and one third of GDP comes from agriculture,<sup>30</sup> such impacts are particularly devastating. Over 5 million people faced food shortages. But just as the biblical Patriarch Joseph planned for hard times to come, the government of Malawi worked with relief and development organizations and development financing institutions to help ensure that the population was better positioned to withstand the next round of natural disasters. Because the resources of many families had been depleted by successive calamities, leaving them unable to buy fertilizers and other inputs, these items were heavily subsidized and distributed by both government and non-government entities in order to raise production. The result was an additional 600,000 tons of maize worth at least \$100 million from an investment of \$70 million.<sup>31</sup> So not only did this effort thwart the downward disaster spiral, allowing millions to continue creating a better life, it made money for the entire economy in the process.

Another example involves the recent efforts in Mozambique, the sixth poorest country in the world and one that will be hit hard by climate change. Both coastal and inland flooding are constant threats with tropical cyclones (hurricanes) roaring in from the Indian Ocean and nine major rivers flowing through the country to the ocean. Heavy rains in 1999 had swollen the rivers and in February and March of 2000 Mozambique was hit with two major cyclones. Seven hundred people died and 650,000 were displaced. But when a similar situation occurred in 2007 only 80 died, an 89% reduction.

What made this dramatic difference? The government worked with relief and development organizations to conduct a detailed analysis identifying the 40 most vulnerable areas, home to nearly 6 million. At the community level disaster plans were developed and training exercises conducted. Early warning systems were created. In 2007 the activation of these plans and systems helped with the evacuation of those most at risk.<sup>32</sup> Even though they are poor, these concerted efforts by the government, relief and development organizations, and their local communities made them less vulnerable.

If success can be achieved in two of the poorest countries in the world, Malawi and Mozambique, then success can be achieved anywhere. And such successes not only save lives, they can be highly cost-effective economically, with benefits exceeding costs anywhere from 1 to 38 times, depending upon the project.<sup>33</sup>

#### *Enhancing Freedom by Helping with Adaptation*

For a freedom-loving people like ourselves, climate change represents a worldwide scourge. It is a freedom denier, a freedom destroyer, not only in terms of denying opportunities for individuals, but potentially for the cause of freedom in entire countries.

A recent study has demonstrated that it is poor countries that lack a literate population that are more vulnerable to climate impacts. Why? "A literate population will be better able to lobby for political and civil rights, which in turn will allow it to demand accountable and effective government. Where such rights exist, governments are more likely to become accountable for reducing the impact of successive high mortality disasters, and are thus more likely to address vulnerability."<sup>34</sup> The history of our own freedom proves the point. If our Founding Fathers had not been literate there would have been no American Revolution, no Declaration of Independence, no Constitution, no Bill of Rights.

As climate change helps to keep the poor, poor, it could also help rob them of their chance to become free in this democratic sense of being able to petition and influence one's government. More malnutrition, more stunted children, more maternal mortality, more loss of educational opportunities, and increasing conflicts over

<sup>29</sup> UNDP, Watkins, *Fighting Climate Change*, Box 4.4, p. 182.

<sup>30</sup> Central Intelligence Agency, *The World Fact Book*, <https://www.cia.gov>.

<sup>31</sup> UNDP, Watkins, *Fighting Climate Change*, Box 4.4, p. 182.

<sup>32</sup> UNDP, Watkins, *Fighting Climate Change*, p. Box 4.6, p. 184.

<sup>33</sup> United Nations, *International Strategy for Disaster Reduction (ISDR), Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate* (United Nations: Geneva, 2009): p. 134; <http://www.preventionweb.net>. The IPCC also states that "there is high confidence that there are viable adaptation options that can be implemented in some of these sectors at low cost and/or with high benefit-cost ratios. Empirical research also suggests that higher benefit-cost ratios can be achieved by implementing some adaptation measures at an early stage compared to retrofitting long-lived infrastructure at a later date." See IPCC, AR4, Synthesis, p. 56.

<sup>34</sup> Brooks, N., W.N. Adger and P.M. Kelly, "The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation," *Global Environmental Change*, vol 15 (2005): p. 161.

scarce resources—these consequences of climate change and others could either erode the democratic dimension of freedom or strangle it in its cradle.

The point is this: climate change will help to keep them poor and will strengthen the possible stifling of the democratic dimension of freedom—one of the very things that are needed to make them less vulnerable.

Given all of this, to be on the right side of history, to be on the right side of the cause of freedom today means overcoming the tyranny of climate change. This is one of the great causes of freedom in the 21st Century.

Christians believe that we don't simply have freedom for freedom's sake. We have it for God's sake. We have it for the sake of doing God's will. We have the gift of freedom so we can freely become the ever increasingly glorious images of Christ as we love God and love our neighbors as ourselves and care for the least of these we find in the ditch as if they were the LORD Himself.

As the Apostle Paul said to the Galatians: "It is for freedom that Christ has set us free. You, my brothers and sisters, were called to be free. But do not use your freedom to indulge the sinful nature; rather, serve one another in love. The entire law is summed up in a single command: 'Love your neighbor as yourself'" (5:1, 13–14).

In America's best moments we have been the harbingers of freedom around the world. So too can we be in helping the poor adapt to climate change. We can and we must rise to this occasion. We must not pass by on the other side and ignore those with Christ in the ditch of global warming's impacts. As a compassionate country, we must fulfill the content of our character to maintain our moral strength, which is the backbone of our nation.

#### *Funding*

Like we have done with AIDS and malaria and in times of major natural disasters, the U.S. should lead the world with our generosity in helping poor people adapt to consequences they did not cause. And while we may not have understood that our actions in burning fossil fuels would contribute to harmful impacts being visited upon them, that is in fact the case. Our country has a strong value of fairness, and it is only fair that we help those we have unintentionally harmed.

Recent contributions from the rich countries, unfortunately, have been woefully inadequate. One estimate for targeted adaptation puts it at less than 0.2% of what is required.<sup>35</sup>

This of course begs the question: what amount of financial resources will be required?<sup>36</sup>

An estimate from the United Nations Development Program concludes that it will cost approximately \$86 billion per year, which would represent a mere 0.2% of developed country GDP, or roughly one tenth what developed countries spend on their militaries.<sup>37</sup>

A study just released by the World Bank estimated targeted adaptation to cost between \$75–100 billion a year between 2010–2050.<sup>38</sup>

Another estimate by the UN Framework Convention on Climate Change (UNFCCC) of some of the major areas that will require targeted adaptation provides a range of \$28–67 billion, with the upper and lower ranges based upon how severe one assumes the impacts will be.<sup>39</sup> Other respected experts have collectively criticized the UNFCCC funding levels as underestimating the costs "by a factor of between 2 and 3" for the areas estimated. A key sector not included by the UNFCCC,

<sup>35</sup> UN, ISDR, Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate, p. 143.

<sup>36</sup> For a very helpful Table summarizing the major reports estimating the investments needed for both mitigation and adaptation in developing countries, see the World Bank's World Development Report 2010: Development and Climate Change (World Bank, 2009), Table 6.2 [p. 270 of the embargoed draft pdf]: <http://siteresources.worldbank.org>.

<sup>37</sup> UNDP, Watkins, Fighting Climate Change, p. 194.

<sup>38</sup> World Bank, The Costs to Developing Countries of Adapting to Climate Change: New Methods and Estimates: The Global Report of the Economics of Adaptation to Climate Change Study, Consultation Draft, (World Bank 2009) pp. 4–6; <http://siteresources.worldbank.org>.

<sup>39</sup> UNFCCC, Investment and Financial Flows to Address Climate Change, (October 2007): p. 8; <http://www.preventionweb.net>. When determining its estimate of how much adaptation funding will be required, the UNFCCC adheres to the concept of "additionality." As they explain in their Nov 2008 update, "the financing of adaptation needs to reflect the fact that adaptation is responding to the additional burden posed by climate change; quite distinct from the aggregate flow of resources towards overall socio-economic development goals." See UNFCCC, Investment and Financial Flows to Address Climate Change: An Update, p. 26.

the protection of ecosystems, “could add a further \$65–300 billion per year in costs.”<sup>40</sup>

What should be the contribution from the U.S. Government for targeted adaptation? Given that historically our generous spirit as a country has led the U.S. to contribute 20–30% of the funds for major natural disasters and for such health problems like AIDS, let’s assume 25 percent.<sup>41</sup> If we make a further assumption that the needs will be on the low end—\$28 billion per year—then the minimum contribution from the U.S. Government would be \$7 billion annually.

This is the level of federal funding within comprehensive climate change legislation that the partner organizations of the National Religious Partnership for the Environment (NRPE) have called for. The NRPE includes the Evangelical Environmental Network (the organization I work for), the U.S. Catholic Conference of Bishops, the National Council of Churches of Christ, and the Coalition on the Environment and Jewish Life. Together, in a joint letter to Senators (see attached example addressed to Sen. Kerry), we have called for there to be in comprehensive cap-and-trade climate change legislation “an allocation equivalent to \$3.5 billion annually, starting in 2012, which moves rapidly toward \$7 billion annually by 2020.”

Unfortunately, the Waxman-Markey American Clean Energy and Security bill passed by the House of Representatives only provided a 1% allocation for international adaptation, which would be the equivalent of approximately \$700 million—an amount that is woefully inadequate. Such funding levels must be increased significantly to capture the full support of the religious community.

While such funding can be justified in a variety of ways, one important way for our country to understand financing for targeted adaptation is as a strategic investment.

First, investments in targeted adaptation will in most cases generate a healthy rate of return (assuming the money is spent as intended). As mentioned previously, studies have shown that in the area of disaster risk reduction benefits can exceed costs anywhere from 1 to 38 times depending upon the project. As a recent major report on adaptation puts it: “well-targeted, early investment to improve climate resilience—whether in infrastructure development, technology advances, capacity improvement, shifts in systems and behaviors, or risk transfer measures—is likely to be cheaper and more effective for the world community than complex disaster relief efforts after the event.”<sup>42</sup> In other words, much better to avoid a big mess than have to clean one up. Much better to do things right the first time.

Second, a stable world is in our national interest (as Gen. Wald will testify to much more authoritatively than I). Diminishing the ways climate change functions as a “threat multiplier” helps to keep our military personnel out of harm’s way and forestalls situations that can become breeding grounds for terrorists. A stable world also enhances our economic security by facilitating the free flow of commerce.

Former Senator John Warner has reminded us all—most recently at the July 30 hearing by the Environment and Public Works Committee on Climate Change and National Security—that America’s military policy, energy policy and climate policies are interrelated and that, as he quotes Senator Kerry: “Climate change injects a major new source of chaos, tension and human insecurity into an already volatile world.”<sup>43</sup> Helping the vulnerable adapt will dampen the prospects for such outcomes.

Third, the U.S. cannot overcome climate change on our own. It is an international problem requiring an international solution. Our investments in both climate mitigation and adaptation will be ultimately futile without an international treaty or agreement, especially since a recent McKinsey & Co analysis concluded that 67% of the greenhouse gas mitigation opportunities required to keep the world below 2 °C above preindustrial levels (or about 1 °F above 2009 levels) are found in devel-

<sup>40</sup> Martin Parry et al., *Assessing the Costs of Adaptation to Climate Change: A Review of the UNFCCC and Other Recent Estimates* (International Institute for Environment and Development and the Grantham Institute on Climate Change: London, Aug 2009): p.14; <http://www.iied.org>.

<sup>41</sup> The U.S. has contributed nearly 30% to the Global Fund for AIDS. See U.S. President’s Emergency Plan for AIDS Relief (PEPFAR), 2009 Annual Report to Congress, p. 31; <http://www.pepfar.gov>.

<sup>42</sup> Economics of Climate Adaptation Working Group, *Shaping Climate Resilient Development: A Framework for Decision-making*, p. 12; <http://www.mckinsey.com>. This Working Group is a partnership of McKinsey and Co., the Global Environmental Facility, Climate Works Foundation, Rockefeller Foundation, Standard Charter Bank, Swiss Re, and the European Commission.

<sup>43</sup> See The Honorable John Warner (retired), Testimony before the Senate Environment and Public Works Committee, July 30, 2009; <http://epw.senate.gov>.

oping countries.<sup>44</sup> Such countries have made it clear that without sufficient funds for adaptation there will be no deal, and having sufficient dedicated funding for international adaptation in a climate bill is the best way for the United States to meet this need.

Fourth and finally, remaining true to our character and our values of fairness, compassion, generosity, and freedom keeps us strong as a country.

We have the means. Let us now summon the will. Thank you for your attention and for your leadership.

Senator MENENDEZ. Thank you, Reverend.

Mr. Waskow?

**STATEMENT OF DAVID WASKOW, CLIMATE CHANGE PROGRAM  
DIRECTOR, OXFAM AMERICA, WASHINGTON, D.C.**

Mr. WASKOW. Good morning. Thank you, Chairman Menendez, Ranking Member Corker, and Senator Shaheen. I am David Waskow, the Climate Change Program Director at Oxfam America.

Tomorrow, October 16th, is noteworthy for two reasons. It is World Food Day and it also marks the point 50 days before the international climate negotiations in Copenhagen in December. This date should serve as a reminder to us of two things. First, the struggle of vulnerable developing countries to maintain food security is becoming even more acute as climate change increases water scarcity and severe weather events. And second, we are nearing a critical moment in the international climate negotiations. In many ways, it is a moment of truth for the United States. Copenhagen is a tremendous opportunity for our country to inspire global change and demonstrate leadership on this unprecedented global challenge of climate change.

So I would like to ask the members of the subcommittee to take a moment and imagine how the world might respond if the United States came to the global negotiations in December with a dramatic commitment to assist the most vulnerable, at-risk developing countries to adapt to the climate change they are least responsible for causing. How would this reposition our country not only on climate change but also on a host of other international issues related to our national priorities and economic security? And moreover, this is essential for the negotiations.

Supporting countries hard hit by climate change is fundamentally important if the United States hopes to conclude a global climate deal. For many countries, from small island states to least-developed countries such as Bangladesh and many in Africa, to countries in the Andes suffering from glacial melt, adaptation to climate impacts is critically important. Indeed, for well over 100 nations, a vast majority of those in the negotiations, adaptation is a central element, not a peripheral issue in the talks for a post-2012 agreement.

Also, for major developing countries such as South Africa and India, who have substantial populations living on less than \$2 a day and have severe water scarcity challenges, adaptation is a core issue.

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<sup>44</sup>McKinsey & Co., Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve (January 2009): p. 35 <http://www.mckinsey.com>. According to the IPCC, keeping temperature rise to 2–2.4 °C above pre-industrial levels would require a stabilization of GHG concentrations at between 445–490 ppm (parts per million). See IPCC, AR4, WG3, SPM, Table SPM.5, p. 15. See also, World Bank, World Development Report 2010, pp. 66–69 [embargoed pdf].

And China has shown strong support for the efforts of other developing countries to address adaptation in the negotiations.

As you know well, climate change requires global solutions, and in sum, without substantial resources for adaptation, we will not achieve an international agreement.

As President Obama recently said, any effort that fails to help the poorest nations both adapt to the problems that climate change has already wrought and help them travel a path of clean development simply will not work.

We also have other U.S. interests at stake. Let me briefly mention three in particular.

First, passing climate legislation and leading in Copenhagen will build the global leadership role of the United States. Climate change is one of the greatest obstacles in the 21st century to development and efforts to reduce global poverty. It even threatens to roll back many development gains the United States has spent precious time and resources to achieve. Even if greenhouse gas emissions were completely eliminated today, we would face a couple of decades of growing impacts that must be addressed.

Some numbers. The International Food Policy Research Institute recently estimated that it will take \$7 billion a year in climate adaptation efforts in agriculture alone from research on crop varieties to improved irrigation in order to avoid a large jump in child malnutrition. According to the World Bank, total adaptation needs in developing countries will average \$75 billion to \$100 billion a year over the next 40 years. So we need to foster the ability of developing countries to cope or our best efforts to promote global development will be severely undermined.

Second, as I am sure General Wald will testify, climate change already poses serious security consequences in fragile and impoverished countries. I have a map. As this map shows in very brief form—and I will not go into the details—stressed regions are also the ones that will be deeply affected by climate impacts. Simply put, our national security depends on human security abroad.

Third, building resilience to climate impacts makes good economic sense. As a just-released report by McKinsey & Co. shows, many adaptation strategies from drip irrigation to buttressing infrastructure will provide greater economic benefits in the long run than they cost initially. Other studies have shown that disaster prevention efforts save \$7 for every dollar spent.

Building climate resilience is also an economic opportunity. Already we are seeing new markets for adaptation technologies and services such as water pumps and irrigation devices and early warning systems. U.S. businesses and workers can partner with communities internationally in this new adaptation marketplace. And I have another slide here. This slide shows a sampling of U.S. companies that stand to benefit from a robust adaptation market, and this is from a recent report we released, which I would be happy to share with the committee.

Let me conclude by saying that Congress can and should lead the way by investing in adaptation solutions today that will pay off immediately and in the future. We urge you to ensure that a significant portion of the resources, again, the money, in a comprehensive climate and energy legislation are devoted to adaptation efforts in

vulnerable developing countries. Providing this support is a critical step that will send a clear message to other nations and demonstrate our leadership globally.

Thank you very much.

[The prepared statement of Mr. Waskow follows:]

PREPARED STATEMENT OF DAVID WASKOW, CLIMATE CHANGE  
PROGRAM DIRECTOR, OXFAM AMERICA

Good morning Mr. Chairman, Senator Corker and Members of Subcommittee. I am David Waskow, the Climate Change Program Director at Oxfam America.

Oxfam America is an international development and humanitarian organization that works with communities and partner organizations in more than 120 countries to create lasting solutions to poverty, hunger, and injustice.

We have come to see climate change as one of the greatest challenges to our efforts in the 21st century to promote development and reduce global poverty. In our operations spanning Africa, Latin America, and East Asia, our staff and partners are already responding to the serious impacts of climate change, from increasingly severe weather events to water scarcity. Moreover, as the science indicates, poor and vulnerable communities around the world will increasingly bear the brunt of the consequences of global warming, threatening the lives of millions of people and undermining global stability and security.

As you know, climate change is a global problem that requires global solutions and cooperation. This is true not only to reduce greenhouse gas emissions, but also to combat climate change impacts already underway. In order for the United States to lead in addressing the devastating effects of climate change on the world's poor, as well as successfully negotiate a comprehensive global climate agreement, we must provide meaningful resources to support the efforts of vulnerable developing countries to adapt and build resilience to climate impacts.

Millions of lives and, in some cases, the literal survival of vulnerable nations depends on a significant and sustained financial commitment from the United States and other developed countries. Moreover, we cannot afford to put our security at risk as a result of inattention to the destabilizing impacts of climate change in impoverished countries around the world. The necessity of such action is complemented by the economic benefits it can provide, both for developing countries themselves and for businesses and workers in the United States who can partner with communities internationally to deliver adaptation products and services.

Congress has a unique opportunity to invest in adaptation solutions today that will pay off both immediately and in the future, and we urge you to help ensure that at least 3% of the resources in comprehensive climate and energy legislation are devoted to adaptation efforts in vulnerable developing countries. While these resources alone would not meet the substantial need for adaptation funding according to recent estimates, and must be augmented through other sources, providing this support in a U.S. climate bill is an important step to addressing critical needs in developing countries.

As President Obama recently stated before the United Nations: "For these are the nations that are already living with the unfolding effects of a warming planet—famine and drought; disappearing coastal villages and the conflict that arises from scarce resources. Their future is no longer a choice between a growing economy and a cleaner planet, because their survival depends on both. It will do little good to alleviate poverty if you can no longer harvest your crops or find drinkable water. That is why we have a responsibility to provide the financial and technical assistance needed to help these nations adapt to the impacts of climate change and pursue low-carbon development."<sup>1</sup>

The reality is dire for the world's poor who stand on the front lines of the global climate crisis that they are least responsible for causing. People living in developing countries are 20 times more likely to be affected by climate-related disasters—such as floods, droughts, and hurricanes—compared to those living in the industrialized

<sup>1</sup> Speech to United Nations General Assembly by President Barak Obama, as released by the White House, September 22, 2009.

world. In the 1990s alone, nearly two billion people in developing countries were affected by climate-related disasters.<sup>2</sup>

The estimates of climate change's contribution to worsening conditions are disturbing. Weather extremes, food and water scarcity, and climate-related public health threats are projected to displace between 150 million and one billion people as climate change unfolds.<sup>3</sup> Our already strained capacity to respond to natural disasters and health crises around the world is being stretched even further by the increasing harm caused by climate change impacts. Developing countries' struggle to maintain food security is made even more acute in the face of declining agricultural productivity and the loss of crops to weather-related disasters. The very lifeline of the world's poorest countries, where communities depend on agriculture for their very existence, is being frayed.

Moreover, the consequences of climate change reach significantly beyond these direct impacts. Global stability and security will be undermined by increasing migration and refugee crises, by conflicts over ever-scarcer natural resources, and by economic and political destabilization as poverty and food insecurity grow.

Reducing these threats will require action today so that vulnerable countries are able to adapt to and build resilience to climate impacts. For the long-term, the most important preventive action we can take is a dramatic, immediate reduction in the greenhouse gas emissions that cause climate change. Indeed, adaptation needs will be far greater in the future if we do not take concerted action now to limit those emissions. Yet it is also increasingly clear that the consequences of climate change are already being felt, and that those consequences are often experienced first and worst by vulnerable communities in poor countries. As the Stern Review has noted, even if emissions were to be eliminated today, we would still face at least two decades of increasing global temperatures.<sup>4</sup>

Taking international action on adaptation is made all the more urgent because of the increasingly serious impacts from climate change we are already seeing today. Earlier this year, the International Scientific Congress on Climate Change warned that global warming is outpacing even recent scientific projections. "Recent observations confirm that, given high rates of observed emissions, the worst-case IPCC [Intergovernmental Panel on Climate Change] scenario trajectories (or even worse) are being realized.<sup>5</sup> For many key parameters, the climate system is already moving beyond the patterns of natural variability within which our society and economy have developed and thrived."

To cope with these consequences, the World Bank estimated in September 2009 that developing countries would require \$75–100 billion annually during the period 2010–2050.<sup>6</sup>

In response to this reality, adaptation has come to the fore in international climate change negotiations. Making investments in international adaptation action in developing countries will be essential to achieving a global agreement that puts the world on the path to a future that is resilient to climate change.

For many countries—from small island states to least developed countries such as Bangladesh and many African countries to countries like Peru suffering the consequences of glacial melt—adaptation is not a peripheral issue in the negotiations for a post-2012 climate agreement. Indeed, for well over 100 countries—a vast majority of the countries that participate in the negotiations—adaptation to climate consequences is a central element that must be addressed in a serious way and with substantial resources in any global deal. Major developing countries such as South Africa and India, who have substantial populations living on less than \$2 a day and who face growing water scarcity challenges, also see adaptation become a fundamental concern in the international process.

Developing country leaders have been outspoken about the importance of adaptation. In a letter to this Committee dated July 30, 2009, the Bangladesh Ambassador to the United States stated, "such an agreement will be difficult to achieve without adequate resources for the least developed countries and other developing countries

<sup>2</sup>Jonathan Pershing (World Resources Institute): testimony to the House of Representatives Subcommittee on Energy and Air Quality, Committee on Energy and Commerce; Hearing on Climate Change, International Issues, and Engaging Developing Countries; March 27, 2007.

<sup>3</sup>Sir Nicholas Stern, "Stern Review on the Economics of Climate Change," (Cambridge, UK: Cambridge University Press, 2007) [www.hm-treasury.gov.uk](http://www.hm-treasury.gov.uk); and Christian Aid, "Human Tide: The Real Migration Crisis," May 2007, [www.christianaid.org.uk](http://www.christianaid.org.uk).

<sup>4</sup>Nicholas Stern, "The economics of climate change: The Stern review" (Cambridge, UK: Cambridge University Press, 2007).

<sup>5</sup>The International Scientific Congress on Climate Change, "Key Messages from the Congress," March 12, 2009, Copenhagen. <http://climatecongress.ku.dk>.

<sup>6</sup>World Bank, "Economics of Adaptation to Climate Change Study," September 2009.

to adapt to climate change impacts. The efforts to address these impacts and to build resilience to climate change are vastly under-resourced.”

At the recent UN Summit on Climate Change, Mohamed Nasheed, President of the Republic of Maldives, a small island state, appealed to world leaders on September 22, 2009: “We stand here to tell you just how bad things are. We warn you that unless you act quickly and decisively, our homeland and others like it will disappear beneath the rising sea before the end of this century. We ask you what will become of us.”

The Bali Action Plan, which set out the parameters for the international negotiations leading to Copenhagen in December, established adaptation as one of the four pillars of any global deal. Adaptation is also a substantial area of negotiation in two of the other pillars, finance and technology. For many developing countries, the current attention to adaptation is a welcome recognition of its importance after years of neglect following commitments made in the UN Framework Convention on Climate Change, which was agreed in 1992 and to which the United States is party.

In the current negotiations, developing countries are seeking support for efforts already underway to adapt to and build resilience to the climate impacts they face. For example, more than 40 least developed countries have developed National Adaptation Programs of Actions (NAPAs) that identify urgent and immediate adaptation needs and actions. Many of these countries and others have now embarked on broader and longer-term adaptation planning processes. Developing countries often have the strategies in place to combat climate impacts; what is missing are the vitally needed resources to carry out their plans.

Climate adaptation is an urgent necessity for developing countries. Supporting vulnerable countries with the resources to undertake their adaptation efforts would be a wise investment by the United States. Taking action now will pay for itself many times over. Reducing risks from climate-related disasters, ensuring that water resources are available, and increasing food security will help reduce the costs faced in disaster response, food assistance, and security engagements. A recent report conducted by McKinsey & Co. on the economics of adaptation showed that a wide range of adaptation strategies—from infrastructure improvements to technological measures and disaster relief programs—will provide much greater economic benefits than their initial costs.<sup>7</sup>

Building resilience in the face of climate change is also an economic opportunity that should be seized. Innovative adaptation solutions can be an integral part of a global transition toward a clean and climate-resilient economy. From improving water systems to developing more resilient agricultural practices, adaptation can provide substantial economic benefits. Already we are seeing a need for and development of new markets for technologies and services to help communities build resilience to climate change impacts, such as water pumps and filtration devices, irrigation equipment, early warning systems to forecast storms, flood, and drought, weather-indexed micro-insurance programs, and renewable energy systems to support adaptive strategies.

#### IMPACTS ON VULNERABLE COMMUNITIES IN DEVELOPING COUNTRIES

While the United States is facing a significant challenge in addressing the consequences of climate change, the capacity of vulnerable communities in developing countries to cope with climate-related impacts is even more limited and is being stretched beyond capacity. Already, the number of people affected by climate-related disasters in developing countries has increased exponentially during the past four decades, as demonstrated in the graph below.

This trend is expected to continue. By 2015, on average more than 375 million people per year are likely to be affected by climate-related disasters. This is over 50 percent more than have been affected in an average year over the last decade.<sup>8</sup> Weather-related disasters around the world have more than doubled since the 1980s.<sup>9</sup> The estimates of climate change’s contribution to worsening conditions are alarming. By 2020, up to 250 million people across Africa could face increasingly severe water shortages, according to the IPCC. By mid-century, more than a billion people will face water shortages and hunger, including 600 million in Africa alone.

More than 75 percent of people in developing countries depend on agriculture as the main component of their livelihoods. According to IPCC estimates, some countries’ yields from rain-fed crops could be halved by 2020 due to climate impacts. Ac-

<sup>7</sup> Economics of Climate Change Working Group, “Shaping Climate-Resilient Development: A Framework for Decision-making,” 2009.

<sup>8</sup> Oxfam International, “The Right to Survive,” April 2009. <http://www.oxfam.org>.

<sup>9</sup> Low, Petra, “Weather-related Disasters Dominate,” Worldwatch Institute, October 2, 2008.

ording to a recent study by the International Food Policy Research Institute (IFPRI), climate change will lead to a 20% increase in child malnutrition by 2050, and more than \$7 billion is needed annually in adaptation funding to prevent this growth in child hunger.<sup>10</sup>

If the moral and ethical arguments for dealing with the climate crisis are not yet evident, the economic imperative to reduce emissions is extremely clear. The Stern Review concluded that global warming may cost the world close to \$10 trillion by next century due to rising sea levels, famine, storms and other environmental harm. An Oxfam analysis of the costs of adapting to climate impacts in developing countries has found that the needs are at least \$50 billion annually, and potentially higher, when existing investments are protected and community-level adaptation needs are addressed.

As noted above, the World Bank released a study in September 2009 that estimates the cost of adaptation in developing countries to be \$75–100 million annually in the period 2010–2050. Similarly, the United Nations Development Program (UNDP) 2008 Human Development Report estimates that the adaptation needs of developing countries will total up to \$86 billion per year from 2015 onward. This estimate is based on the costs of integrating climate-resiliency into development activities (such as with irrigation systems and preventive health programs), strengthening infrastructure such as schools and roads, and adding to disaster preparedness and response capacity.

#### NATIONAL SECURITY, GLOBAL STABILITY AND BUILDING CLIMATE-RESILIENCE

Our national interest will not be well-served by a failure to tackle the powerful ripple effects that climate change will cause in some of the most politically sensitive parts of the world. In a report from CNA, a number of retired U.S. admirals and generals refer to climate change as a “threat multiplier,” presenting significant national security challenges for the United States.<sup>11</sup>

#### ADAPTATION AS CATALYST FOR NEW GROWTH AND RESILIENCY

Acting today to reduce disaster risks and improve livelihoods in agriculture and other sectors is essential in avoiding even greater costs later. For instance, providing improved irrigation and water retention systems will help reduce future food aid costs in times of scarcity or famine. Similarly, protecting infrastructure or putting in place natural sea buffers such as mangrove or cypress forests will help reduce future disaster assistance costs.

The financial benefits from taking preventive action have been demonstrated widely. According to an analysis by the U.S. Geological Survey and the World Bank, an investment of \$40 billion to reduce disaster risk is capable of preventing disaster losses of \$280 billion. A study conducted by the British international development agency finds that every U.S.\$1 invested in pre-disaster risk management activities in developing countries can prevent U.S.\$7 in losses.

In China, U.S.\$3 billion spent on flood defenses in the four decades up to 2000 is estimated to have averted losses of U.S.\$12 billion. Evidence from a mangrove-planting project designed to protect coastal populations from storm surges in Viet Nam estimated economic benefits that were 52 times higher than costs. In Brazil, a flood reconstruction and prevention project designed to break the cycle of periodic flooding in 2005 has resulted in a return on investment of greater than 50 percent by reducing residential property damages.

Bangladesh provides a particularly compelling example of the benefits of prudent planning and risk reduction. In 1970, up to 500,000 people perished in the Bhola cyclone in Bangladesh, and in 1991 another 138,000 people were killed in the Chittagong cyclone. Bangladesh has since instituted a national cyclone preparedness program that includes shelters, early warning systems and community-based preparedness measures.

<sup>10</sup> International Food Policy Research Institute, “Climate Change: Impact on Agriculture and Costs of Adaptation,” September 2009.

<sup>11</sup> The CNA Corporation, “National Security and the Threat of Climate Change,” 2007. For instance, the increased scarcity of natural resources has contributed to conflicts in areas such as Darfur. The recent conflict there coincides with a 40 percent decline in precipitation in Sudan, which has been linked by scientists to global temperature change and changes in rainfall patterns tied to warming in the Indian Ocean. Such examples provide us with a glimpse at what is to come in the developing world if we do not build resilience to the consequences of climate change. One of the recommendations of the CNA report is for the U.S. “to assist nations at risk to build the capacity and resiliency to better cope with the effects of climate change. Doing so now can help avert humanitarian disasters later.”

When Cyclone Sidr struck Bangladesh in 2007, a network of some 34,000 volunteers were mobilized to effectively communicate risks to millions of people—even where many had limited or no access to TV and radio—to encourage evacuation to a network of cyclone shelters. As a result, while 3,300 people perished, far more lives were saved compared to the earlier cyclones. By contrast, when Cyclone Nargis hit the Burma (Myanmar) delta region in May 2008, there was a broad failure by the government to alert residents and to provide protection. As a result, UN agencies report that more than 100,000 perished in the cyclone.

Working with vulnerable communities in building their resilience to the consequences of climate change can also provide a means to enable these same communities to become more economically, socially and politically resilient in the broadest sense. For instance, reliable access to essential services such as sanitation and clean water can help build the capacity of communities to respond to unpredictable climate events such as floods and drought but also can serve as a foundation for economic growth and development.

Often, building resilience means enhancing existing development approaches, such as improving agricultural techniques or water supply systems. At other times, however, the challenges will be new and different. For instance, some communities will have to adapt to rapidly melting mountain glaciers—creating excessive runoff and the potential for unprecedented floods now while leading to scarcer water supplies in future years once the glaciers are gone. These communities could benefit from the creation of reservoirs and water impoundments to capture and store water resources that will become increasingly scarce in the future. Alternatively, these communities may have to create flood warning systems to deal with higher water flows and may have to change agricultural practices and the crops they grow to deal with water abundance in the short term and scarcity sometime in the future.

In some cases, adaptation strategies can also provide important benefits in reducing or sequestering greenhouse gas emissions. For example, agricultural practices involving agroforestry; increasing soil carbon from reduced tillage, mulching, or other practices; and efficient water usage can provide both adaptation and emissions reduction benefits.

Vulnerable communities are engaging in a variety of resilience-building approaches that promote economic development and poverty and improve climate-change resilience. Some examples include:

- In the Arequipa region of Peru, small farmers are installing a new system of gravity-fed irrigation to ensure that pastures are properly watered, an increasingly difficult task as water supplies decrease due to the overly rapid melting of glacial water sources. Other initiatives in the region include installing radio networks to ensure that remote communities are informed of any severe weather patterns.
- In Karnataka, India, the local government has initiated an innovative watershed development project. Small dams now catch the water from monsoon rains before the water disappears from the watershed, and the water is slowly absorbed into the ground to replenish the local aquifer and refill dry wells.
- In Ethiopia, farmers are being trained in practices such as appropriate crop spacing and crop rotation, techniques which also increase farm productivity. Farmers have also learned skills and strategies such as water harvesting and carefully selecting seeds based on their capacity to cope with climate variability. In addition, distribution of energy-saving stoves has decreased unsustainable use of firewood and the workload of the women and children who gather it.
- In Cambodia, small-scale farmers are implementing an agricultural technique called System of Rice Intensification (SRI). SRI has been developed to revive traditional agricultural techniques for rice farming that may prove less water intensive and more productive than other agricultural approaches.

A recent cost-benefit analysis conducted by McKinsey & Co. for the Economics of Climate Adaptation Working Group of the World Bank found that the development of new areas of cash crop production in countries like Mali could avert the country's expected economic loss from climate change and even generate additional revenue. The analysis also found that climate resilience measures can have a positive impact on health. In Guyana, putting in place basic flood-proofing measures and emergency response capabilities would also significantly reduce mortality.<sup>12</sup>

Meanwhile, for many companies, there are critical overlaps between climate impacts that will affect their supply chains and impacts on local communities. For ex-

<sup>12</sup>Economics of Climate Change Working Group. "Shaping Climate-Resilient Development: A Framework for Decision-making," 2009.

ample, water scarcity can affect the production of cotton for the apparel industry so that finding ways to protect shared water resources can be enormously beneficial both to those companies and to communities.

Responding to climate change impacts affecting poor communities may also present new business opportunities and spur economic development in some of the poorest regions of the world. Recent interest in “climate-risk” insurance products by the insurance industry offers one indication that global financial institutions understand the costs and benefits of both emissions reduction and building climate resilience aimed at hedging future climate risks.

In Ethiopia, where 85 percent of the population is dependent on rain-fed agriculture, Oxfam is working with the insurance company Swiss Re and small-scale farmers to pilot a weather-indexed micro-insurance project.

Meanwhile, cutting-edge companies with major U.S. operations are already developing and deploying innovative technologies and services that help communities adapt to droughts, floods, storms, and other climate-change impacts. Climate resilience solutions take many forms. For example, Pentair, a Minnesota-based company with nearly \$3.5 billion in annual revenue, manufactures technologies for the entire water cycle—from pumps to filters. The company has installed and maintained filtration systems that provide clean drinking water to rural communities in India and Honduras. General Electric is supplying solar energy modules and water filtration technology to a new initiative to increase the availability of drinking water in rural areas of India and other developing countries in the East Asia region and Africa.

The development of new, clean energy technologies to support climate adaptation and resilience in developing countries is another arena for business opportunities. Energy poverty, or the absence of access to reliable energy services, affects approximately one-third of the world’s population, with 80 percent of those in South Asia and Sub-Saharan Africa. Building a renewable energy future in vulnerable countries can provide the developing world with the infrastructure needed for some critical adaptation strategies such as water pumps, while also helping developing nations grow along a low-carbon pathway. For example, General Electric’s Homespring system harnesses solar energy to power water apparatuses in off-the-grid communities in Africa and Asia.

The map in the appendix represents a sampling of companies operating in the U.S. that develop products and provide services that build climate preparedness. These and other firms stand to benefit from an increase in adaptation market opportunities that spur innovation and create jobs. Public financing for climate change adaptation will increase demand opportunities for well-positioned companies.

#### ACHIEVING A SUCCESSFUL OUTCOME IN INTERNATIONAL NEGOTIATIONS AND U.S. SUPPORT FOR INTERNATIONAL ADAPTATION

Climate change requires a global solution, including investments in international adaptation efforts around the world. Achieving a successful outcome in the international negotiations will depend on the readiness of the United States and other developed countries to support the efforts of developing countries to adapt and build resilience in the face of the climate change challenge.

The most important element for success is substantial resources for adaptation in vulnerable developing countries. These resources must be new and additional to existing official development assistance (ODA) commitments. Climate change is a new burden on developing countries; the resources to address this additional obstacle to development should not come from aid commitments intended to address underlying, already existing development challenges. Health and education development programs, for example, should not be diminished in order to pay for addressing climate challenges such as water scarcity or increasingly severe storms and floods.

The amount of funding currently being generated and distributed to support adaptation in vulnerable countries is woefully inadequate when compared to the current estimates of need. According to the World Bank, resources for multilateral adaptation finance initiatives included \$172 million total for the Least Developed Countries Fund (as of October 2008); \$600 million total in pledges for the World Bank’s Climate Investment Fund/Pilot Program on Climate Resilience (due to sunset when a post-2012 climate agreement is in place); an estimated \$300–600 million/year for the Kyoto Protocol Adaptation Fund, to which the United States is not a party; and \$50 million total for a special Global Environment Facility adaptation fund.<sup>13</sup>

While adaptation funding should be new and additional to existing ODA commitments, adaptation strategies and programs should be aligned with national development strategies in developing countries and a U.S. development strategy. If adapta-

<sup>13</sup> World Bank, “Economics of Adaptation to Climate Change Study,” September 2009.

tion is not carried out in alignment with broader development approaches, it will not provide the greatest possible benefit for development. Indeed, in many cases, adaptation practices must expand upon existing development approaches.

In addition to providing adequate resources, an international climate agreement, as well as Congressional legislation, should result in an appropriate structure and appropriate delivery mechanisms for international adaptation assistance. The following are key elements to address:

- Adaptation efforts in developing countries should be community-based and ensure the full engagement of local communities in the development and implementation of adaptation strategies and activities. Such approaches have the greatest likelihood of success on the ground.
- Adaptation resources should be focused on the most vulnerable communities and populations in developing countries. Gender should be a key consideration in deciding where to focus resources; women are often the most vulnerable to climate impacts because of their role in providing food and water for their households.
- Bilateral adaptation assistance should include multi-year funding for developing countries, based on agreements regarding national objectives for enhancing climate resilience.
- Multilateral adaptation funding should be overseen and governed in a way that ensures fair representation for vulnerable developing countries. To best achieve this, funding should be governed through a funding body under the oversight of the parties to the UN Framework Convention on Climate Change (UNFCCC), the principal international venue for addressing climate adaptation.

#### CONCLUSION

We appreciate this subcommittee's leadership on climate change and the ways in which we can deal with its consequences. It is not too late to demonstrate our resolve and to lead the world in addressing one of the greatest challenges of this century. Thank you for the opportunity to appear before you today.

Senator MENENDEZ. Thank you.  
Dr. Green?

#### **STATEMENT OF DR. KENNETH P. GREEN, RESIDENT SCHOLAR, AMERICAN ENTERPRISE INSTITUTE, WASHINGTON, D.C.**

Dr. GREEN. Thank you, Mr. Chairman, Chairman Menendez, Senator Corker, members of the subcommittee. I am Kenneth Green, a Resident Scholar at the American Enterprise Institute where I study energy and environmental policy.

Thank you for inviting me to testify today on a topic that I believe has received insufficient attention since the threat of climate change came to the attention of policymakers worldwide. That topic is the need to focus on adaptive responses to climate variability whether caused by human action or by the influence of bio-geo-chemical cycles, ocean currents, or changes in solar activity.

These views are also my own. They do not represent anyone other than myself. AEI does not have official positions. My words are my own.

Before I begin the body of my remarks, I would like to start where I state my beliefs and biases so people can understand what I am saying in context. By training I am an environmental scientist. I received my doctorate in environmental science and engineering at UCLA. By vocation, I am a public policy analyst that worked for 15 years analyzing environmental policy in California, as you mentioned, in Canada at the Fraser Institute, and here in Washington nationally.

I do my best to just read the science. I actually subject myself to a masochistic ritual of reading the IPCC reports every 5 years

when they come out. And hence, I accept that greenhouse gases can cause heat retention in the atmosphere, though I believe it will be on the modest side based on what we have seen in 20th century, and having looked at my 401(k) recently, I place virtually no faith in predictive models.

My policy analysis—actually I am going to move ahead here to the issue at hand. What is the best response to climate variability domestically and internationally?

We have heard about the question of throwing money at it, and I am going to actually look at this a different way. You can sort of sum up what I am going to say by saying if you give a man a fish, you feed him for a day. If you teach how to fish, you feed him for a lifetime. And that is what we need to be doing.

Since the earliest days of climate policy development, the world has been focused on mitigating greenhouse gas emissions rather than on adaptation. In fact, the UNIPCC and environmental groups have tended to scoff at adaptation because they believe it implies accepting that the climate will change rather than—

[Interruption from the audience.]

Dr. GREEN. Thank you very much.

Senator MENENDEZ. We appreciate the civil expression but I think you got your message across, and we want to let Dr. Green continue. Doctor, go ahead.

Dr. GREEN. Thank you very much.

Where was I? Oh, anyway, the environmental groups and the IPCC have generally tended to favor mitigating greenhouse gas emissions rather than funding resilience. But as we know, some risks are not exactly predictable. We do not know exactly where the risks of climate change will manifest or how they will manifest, and as Aaron Wildavsky, a great policy analyst, pointed out, in many cases building resilience is better than attempting to head risks off at the pass.

What does it mean to build resilience? I think we can build resilience both nationally and internationally by achieving several aims.

The first is right now we subsidize risk-taking. We subsidize people living in coastal areas. We subsidize people living in drought-prone areas and flood-prone areas because governments intercede when floods, droughts, and storm damages happen and we often allow people to rebuild right in the same place. The subsidization of risk leads people to these fragile areas that we are afraid they will face damage in, and we should be finding ways to de-subsidize risk-taking, not only here but also building institutions abroad so that people pay the full cost of their choices of where they choose to live.

Second, the way we manage our infrastructure and the way that developing countries are going to manage their infrastructure as they build it is very important. If we do not price our infrastructure and build it according to market signals that can maintain it, what happens is we build the infrastructure and then it is not updated. It is not maintained. It is not made resilient in the face of change. And so establishing full pricing of infrastructure is a vitally important action as well. Roadways, highways as an example, water infrastructure, waste water infrastructure, all of these things can be

expected to be impacted by climate change. All of them will react better if they are priced to systems where people are paying—getting a price signal for how variable their climate is and how dangerous it is to be in a certain place climatically.

Finally, some people say, well, what about the people who cannot do this? What about countries that are simply too poor? They cannot get away. Should we not have a climate adaptation fund?

I am a little dubious about this because if you look at what happens with trust funds, they often wind up being used today and replaced with IOUs tomorrow. And handing our great grandchildren an obligation without resources strikes me as being a poor choice in effectiveness and also poor ethically.

I am concerned that in fact this would make the problem worse. Establishing a fund would lead people to take greater risks knowing that there is a fund waiting there to bail them out. It would tend to lead them not to take adaptive measures ahead of time. And so, in fact, it might make the problem worse by building complacency that others will come in and fix what needs to be fixed.

My full comments will be submitted to the record, and I will be glad to take your questions. Thank you for the couple of extra seconds, and thank you for the civil and quiet protest.

[The prepared statement of Dr. Green follows:]

PREPARED STATEMENT OF DR. KENNETH P. GREEN

Mr. Chairman, Senator Menendez, members of the committee:

Thank you for inviting me to testify today on a topic that, I believe, has received insufficient attention since the threat of climate change came to the attention of policymakers world-wide. That topic is the need to focus on adaptive responses to climate variability, whether caused by human action or by the influence of biogeochemical cycles, ocean currents, and changes in solar activity.

Before I begin my remarks, I always like to state my beliefs and biases, so my comments can be understood in proper context. By training, I'm a biologist and environmental scientist. By vocation, I am a public policy analyst, having worked for 15 years in think tanks in the U.S. and Canada.

I do my best to keep my science free of biases—I just try to figure out what the science really says, and look past the hype. Hence, I accept that greenhouse gases can retain additional heat in the atmosphere, though I believe that heat the heat retention capability of the greenhouse gases is quite modest, based on what we've observed in the 20th Century. I do not believe in predictive climate models, or most other forms of forecasting other than extrapolation for very modest periods of time. Nonetheless, what we have learned about the variability of the Earth's climate holds an important lesson for us about the need to build climate resilience into our private and public institutions.

My policy-analysis, on the other hand, is not value-neutral: I hold environmental protection in very high regard (I wouldn't have spent 16 years in college studying biology and the environment if I didn't), but I believe that environmental protection must complement, rather than displace, other values such as fiscally responsible governance; personal freedom; economic opportunity and prosperity; free enterprise; limited government; and so on. I also believe that our best actions abroad are to help people develop the institutions of liberal democracy that allow them to rise out of poverty.

Now, to the issue at hand: what is the best response to climate variability, both domestically, and internationally?

Since the earliest days of climate policy development, the world's focus has been on the mitigation of greenhouse gas emissions rather than adaptation. In fact, the United Nations Intergovernmental Panel on Climate Change (IPCC) has always discussed the idea of adaptation to climate change as a second- or third-best policy response—something to be done only after every possible effort has been made to reduce GHG emissions.

Both governmental and environmental groups have generally been hostile to adaptation-based responses to climate change, as they view such approaches as sur-

render, an acceptance of the idea that GHG emissions will continue, that the climate will change, and that people will come to believe they can adapt. They fear that a focus on adapting to climate change would detract from a focus on mitigating emissions.

But as Aaron Wildavsky, one of the great policy analysts of the 20th Century documented, some risks are unsuited to pre-emptive mitigation. Attempting to head risks off ahead of time generally fails unless the nature of the risk is extremely well known, and the efficacy of the proposed intervention is equally well known. Consider this: say that you're a batter, and you're 70% sure that you know the pitcher is going to throw you a fast ball. Your success hitting that particular pitcher's fast ball is also 70%. What's the probability you'll actually hit the ball? Only 49%. The other 51% of the time, either he throws a different pitch and you miss, or he throws the fastball and you miss.

In the context of climate change, our level of information about where specific harms will manifest is far, far lower than 70%, and our understanding of whether our mitigation efforts will negate any particular harm is virtually nil. Clearly, the focus on greenhouse gas mitigation, both domestically and internationally, has been misplaced, and the money and attention of world leaders toward greenhouse gas mitigation efforts would be best directed elsewhere.

Instead of seeking greenhouse gas reductions, what we need to foster, as Wildavsky called it, is resilience: the ability to withstand changes, and bounce back from them. We need to encourage others to build their own climate resilience as well. What makes for climate resilience? I would argue that we can establish climate resilience with three efforts.

The first effort is to remove the incentives that lead people to live in climatically fragile areas, that is to say, at the water's edge, in drought-prone locations, in flood-prone locations, and so on. At present, our government, and other governments, serve as the insurer of last resort. When people who live at water's edge or in a flood plain are hit by storms or floods, governments intervene not only to rescue them and their property if possible, but then provide rebuilding funds to let the people build right back where they are at risk. The United States is currently doing this in New Orleans, where people are re-building in an area that is still at risk from storm surges and levee failure.

Both domestic programs that subsidize risk-taking and international aid programs that subsidize risk taking should be phased out as quickly as possible, replaced with fully-priced insurance regimes. Eliminating risk subsidies would show people some of the true cost of living in climatically risky areas, and would, over time, lead them to move to climatically safer places where they can afford to insure their property and safety.

A second effort pertains to infrastructure. Again, these are efforts that should be taken both domestically and, as infrastructure is built in developing countries, internationally as well. Another government action that leads people to live in harm's way is the failure to build and price infrastructure so that it is both sustainable, and resilient to change. Governments build highways, but without a pricing mechanism, no revenue stream is created to allow, for example, for the highway to be elevated if local flooding becomes a problem. There is also no price signal relayed to the users of the highway that reflects the climatic risk that their transportation system faces. The same is true of fresh-water, wastewater, electricity, and other infrastructure.

Establishing market pricing of all infrastructures would quickly steer people away from climatically fragile areas, dramatically reducing the costs of dealing with climate variability.

Now, as I'm sure people will argue, not everyone can do this. If predictions of strong sea-level rise come to pass, low-lying areas, many of them in poor countries, will be inundated, potentially leading to mass exodus. The same is true if desert areas become sharply dryer.

Though as I mentioned, I don't believe in predictive modeling, that doesn't mean we can't tie up our camel. For that reason, as a third effort, I support re-directing government research and development spending away from greenhouse gas mitigation technologies and into geo-engineering, and carbon air-stripping technologies.

Now, when I've talked about this before, I always get the same question, so I'll answer it pre-emptively. What about people who can't get away? This is a tough problem. Some have proposed the establishment of a climate-change damages trust fund, which would grow over time, and be there to pay for relocation of people, the construction of sea-walls, the building of pipelines for bulk-water transport in the event climate calamities come to pass.

Ideally, such a fund should be paid into by all developed and semi-developed countries on a fair basis, such as an equal fraction of GDP. If climate change is shown

to be a non-threat, or a modest one, or some cheap ways of removing carbon from the air turn up, those moneys could be returned to the tax-payers of the donating countries.

I have to say, however, that I am not sanguine about such a fund for several reasons. First, I doubt that it would be paid into fairly: based on their unwillingness to adopt binding emission reduction targets, and their demands for wealth transfer from the developed countries to the developing, I very much doubt that the semi-developed countries will agree to contribute, any more than they are likely to agree to binding emission reductions. Second, I am also dubious about government's ability (any government) to keep its hands out of the funds, rather than spending them today, and replacing them with IOUs, as is a common practice in such "trust funds." And third, I am concerned that it would simply make the problem worse: the establishment of such a trust fund would lead to greater risk-taking around the world, with less self-insurance by individuals or governments, under the assumption that if anything goes wrong, the world will step in to make things all better.

I'll be glad to take your questions.

Senator MENENDEZ. Thank you.

Mr. O'Driscoll?

**STATEMENT OF PETER O'DRISCOLL, EXECUTIVE DIRECTOR,  
ACTIONAID USA, WASHINGTON, D.C.**

Mr. O'DRISCOLL. Thank you, Chairman Menendez, Ranking Member, Senator Corker, Senator Shaheen. I would like to thank you for the opportunity to comment on how climate change is already affecting people in developing countries and on measures the United States Senate can take to help address their urgent needs.

ActionAid field work confirms the urgent need for adaptation strategies and for significant financial commitments to avert catastrophic famine and loss of life from increased vulnerability to extreme weather events in the poorest countries.

The good news on climate is that the Government of the United States is now fully engaged on the issue. The bad news is that the impacts of climate change are already wreaking havoc on food production, on poverty eradication programs, and on emergency response systems in developing countries.

And with due respect to my colleague's views on the value of predictive studies, there does seem to be a broad consensus that the problem is only going to get worse, no matter how much progress the Congress or the Copenhagen negotiations make on emissions reductions. Temperatures will likely continue to rise throughout the century, making the climate consequences worse.

Therefore, from ActionAid's perspective, there is no viable alternative to investing in climate adaptation. Helping people, communities, and entire countries face these consequences must be a central pillar of U.S. foreign policy.

Perhaps the cruelest irony of the unfolding climate emergency is that those most intensely and immediately affected are least responsible for the greenhouse gas emissions that are driving global warming.

The Intergovernmental Panel on Climate Change identifies agriculture as a sector particularly vulnerable to climate change. 70 percent of the world's extreme poverty is found in agricultural areas where subsistence farmers depend on rain for their harvests. In some countries in Africa, yields from rain-fed agriculture could be reduced by up to 50 percent by 2020, and in parts of Asia, crop yields could fall by up to 30 percent by 2050 because of climate change.

ActionAid's field work shows that decreases in crop production are happening already. And since women in the developing world are largely responsible for food production and provision, the impact of climate change on agriculture also means that women, who already constitute the majority of poor people, are most adversely affected.

The voices and experiences of those most affected should be considered in the deliberations of policymakers whose decisions will have life-or-death implications for them. Therefore, at the invitation of the chair, I would like to focus on two women farmers with whom ActionAid has worked closely so that we can offer some insight into the impacts of climate change in the developing world and the kinds of solutions in which we might invest on a larger scale to help them adapt.

I would like to introduce you to Joyce Tembenu from Malawi. She is a 38-year-old mother of three and a widow. She works as food security officer for the Salima Women's Network on Gender and also with the Yamikani Women Farmers Group in Salima, Malawi.

In Malawi, she depends on agriculture for her livelihood. She is facing challenges from climate change. Her mother remembers a rain cycle much longer than the rain cycle she currently experiences. As a result of that shortened rain cycle, the local seed varieties do not have time to mature and grow. Therefore, during food shortages, farmers are forced to turn to hybrid seeds which are more expensive and require more expensive inputs, which local farmers simply cannot afford. As she puts it, "We are poor, so we are starving in Malawi."

As a woman farmer in Malawi, Joyce's challenges are familiar to a huge segment of the population there. Agriculture is the main driver of Malawi's economy, contributing up to 39 percent of GDP and employing 80 percent of the country's labor force and more than 90 percent of them rely on rain-fed subsistence agriculture.

Funding agencies must work with farmers to implement adaptation programs and governments must play a key role in providing a policy framework to guide and support effective adaptation strategies.

I would also like to introduce you to Asiya Begum who lives with her mother and two sons in the village of Charipara on the river delta in the south of Bangladesh.

Over the past decade, her river has eroded land and forced 100 families to find another place to live. As she says, "Our poverty is caused by river erosion; people of two villages are now living in one."

In 2007, Asiya's family lost all their crops when Cyclone Sidr hit Bangladesh. The storm also increased the salinity on their land, making it more difficult to grow food. To supplement their family's income, Asiya's sons have quit school so they can work.

Asiya volunteered to participate in an ActionAid project which involved testing improved rice varieties which have succeeded, along with a better irrigation system, fertilizers, and insect traps, in nearly doubling crop yields in Charipara. So today, Asiya is urging her government and ours to further support adaptation to cli-

mate change through projects that build the resilience of poor communities and improve food production.

Within the concept of the common but differentiated responsibility, the United Nations Framework Convention on Climate Change, to which the United States is a party, states that it is the responsibility of developed nations to “assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.”

The Senate’s deliberations on a climate bill and on the UNFCCC process through Copenhagen and beyond are crucial opportunities to establish both financial commitments and financing mechanisms that are effective and accountable to people like Joyce Tembenu and Asiya Begum. The Senate can make great strides in this direction by focusing on financial commitments to the cost of adaptation funding and on enhanced financing mechanisms to make sure such funds reach those who need them most.

You have heard a number of estimates already of the annual cost of adaptation, but it is fair to say that they range from \$25 billion to \$100 billion per year at least.

ActionAid encourages the Senate to significantly expand on the American Clean Energy and Security Act’s commitment to funding climate adaptation which starts at only \$750 million per year. We would like to see that number rise, as Rev. Ball suggested, to \$7 billion and beyond through 2020.

Such funds should prioritize agricultural adaptation projects that use environmentally and economically sustainable techniques. They should also emphasize investment in women farmers as well as community participation in project design.

But a vast increase in funding is only part of the solution. Essentially adaptation funding will only be as effective as the institutions through which it is channeled. Because of our concerns about the World Bank and the Global Environmental Facility’s governance, their fossil fuel lending, and their openness to stakeholder engagement, ActionAid endorses the need for an enhanced financial mechanism under the authority of the UNFCCC’s Conference of Parties with an adaptation funding window.

Thank you very much, Senators, for this opportunity to express our views. We are ready to work with you at ActionAid as you set about the complex but necessary work of developing international climate adaptation policy to help achieve a more sustainable and equitable future for people around the world like Joyce Tembenu and Asiya Begum. Thank you.

[The prepared statement of Mr. O’Driscoll follows:]

PREPARED STATEMENT OF PETER O’DRISCOLL,  
EXECUTIVE DIRECTOR, ACTIONAID USA

I would like to thank the Chair, Senator Menendez, the Ranking Member Senator Corker, and all the Senators on this Subcommittee, for the opportunity to comment on how climate change is already affecting people in developing countries, and on measures the United States Senate can take to help address their urgent needs.

ActionAid is an international anti-poverty agency working in 50 countries, taking sides with poor people to end poverty and injustice together. Our approach to climate change is informed by over 35 years of experience working alongside poor and excluded people in Africa, Asia and Latin America. Climate change has become an

institutional priority in recent years because of ActionAid's focus on agriculture and disaster risk reduction. Our field work has confirmed the urgent need for adaptation strategies and for significant financial commitments to avert catastrophic famine and loss of life from increased vulnerability to extreme weather events in the poorest countries.

The good news on climate is that the government of the United States is now focused on the problem. The Obama Administration has recognized the need for real negotiations on emissions reductions and the transition to a clean energy economy. And after passage of the American Clean Energy and Security Act in the House in June, the Senate now takes up legislation that could improve the House bill and strengthen U.S. contributions to resolving this global challenge.

But the bad news is that the impacts of climate change are already wreaking havoc on food production, poverty eradication programs and emergency response systems in developing countries. And no matter how much progress the Congress, the President and the international negotiators at December's United Nations Framework Convention on Climate Change achieve on emissions reductions and clean technologies, global temperatures will continue to rise throughout this century, making the climate consequences worse.<sup>1</sup> There is therefore no viable alternative to investing in climate adaptation: helping people, communities and entire countries face these consequences must be a central pillar of U.S. foreign policy.

#### 1. THE POOREST PEOPLE ARE THE MOST VULNERABLE TO CLIMATE IMPACTS

Perhaps the cruelest irony of the unfolding climate emergency is that those most intensely and immediately affected are least responsible for the greenhouse gas emissions that are driving global warming. The response to climate change can thus be framed as one of the gravest equity challenges of the twenty-first century. The eight richest countries in the world, which represent just 13 percent of the world's population, are responsible for generating over 40 percent of the greenhouse gas emissions that cause global warming.

Although projections suggest that climate impacts will vary geographically, analyses by the Food and Agriculture Organization of the United Nations (FAO) and the International Institute of Applied Systems Analysis (IIASA) have attempted to pinpoint likely regional impacts of climate change on agricultural productivity and on food security. Their work suggests that, on balance, developing countries will lose out due to an increase in arid areas in coming decades:

The FAO/IIASA study indicates that the developing world would experience an 11% decrease in cultivable rain-fed land, with consequent decline in cereal production. Sixty-five developing countries, representing more than half the developing world's total population in 1995, will lose about 280 million tons of potential cereal production as a result of climate change. This loss, valued at an average of U.S. \$200 per ton, totals U.S. \$56 billion, equivalent to some 16% of the agricultural gross domestic product of these countries in 1995. Some 29 African countries face an aggregate loss of around 35 million tons in potential cereal production.

In the case of Asia, the impact of climate change is mixed: India loses 125 million tons, equivalent to 18% of its rain-fed cereal production; China's rain-fed cereal production potential of 360 million tons, on the other hand, increases by 15%. Among the cereals, wheat production potential in the sub-tropics is expected to be the worst affected, with significant declines anticipated in Africa, South Asia, and Latin America.<sup>2</sup>

The Intergovernmental Panel on Climate Change (IPCC) also identifies agriculture as a sector particularly vulnerable to climate change. Seventy per cent of the world's extreme poverty is found in agricultural areas<sup>3</sup> where subsistence farmers depend on rain for their harvests. In some countries in Africa, yields from rain-fed agriculture could be reduced by up to 50 percent by 2020,<sup>4</sup> and in Central and

<sup>1</sup>A new UNEP report, the "Climate Change Science Compendium 2009," offers an overview of recent global warming research and concludes with increased projections of temperature rises expected by 2100. Scientific assessments now outstrip worst case scenarios foreseen by the Intergovernmental Panel on Climate Change in 2007. See <http://www.unep.org>.

<sup>2</sup>FAO and IIASA. *Impact of Climate Change, Pests and Diseases on Food Security and Poverty Reduction*, 31st Session of the Committee on World Food Security 23-26 May 2005, FAO, page 2.

<sup>3</sup><http://www.fao.org>.

<sup>4</sup>IPCC (2007): Summary for Policymakers. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Inter-

South Asia, crop yields could fall by up to 30 percent by 2050<sup>5</sup> because of climate change.

Further to these official statistics, participatory vulnerability analyses (PVA) conducted by ActionAid have revealed that poor and excluded people themselves identify loss of crops due to climate change as a key factor increasing their vulnerability.<sup>6</sup> ActionAid's field work shows that decreases in crop production are happening already. And to add to the stress of decreasing yields, poor people in developing countries (who typically spend 50–80 per cent of their income on food)<sup>7</sup> have been doubly hit by recent volatility in food prices. While commodity prices began to decline in late 2008, many of the factors that led to high prices are still in place. This volatility, compounded by increasing climate variability, will therefore likely continue to be a serious problem for the foreseeable future.

Since women in the developing world are largely responsible for food production and provision, the impact of climate change on agriculture also means that women—who already constitute the majority of poor people—are most adversely affected. Women depend more than men on the fragile ecosystems that are threatened by climate change, yet lack adequate access to and control over the natural resources, technologies, and credit they need to produce food. As a result, they are more vulnerable to seasonal and episodic weather variations, and to natural disasters resulting from climate change.

The voices and experiences of those most affected must be considered in the deliberations of policy makers whose decisions will have life-or-death implications for them. In this testimony I would like to focus on two women farmers with whom ActionAid has worked closely in recent years. I hope that through their reflections on climate change in Malawi and Bangladesh, the Subcommittee might gain new insight into impacts of climate change in the developing world, and into the kinds of solutions in which we might invest on a larger scale to help them adapt.

## 2. MALAWI: JOYCE TEMBENU

My name is Joyce Tembenu. I am 38 years old, the mother of three children, and a widow. I am the food security Officer of Salima Women's Network on Gender (SAWEG) and a member of Yamikani Women Farmers Group in the SALIMA district of Malawi in Southern Africa. With SAWEG, I work on issues of climate change adaptation, women's rights, and HIV and AIDS.

As you may know, Malawi is an agriculturalist society. We depend on agriculture for our livelihood. But we are being challenged by climate change. I am a farmer. My mother was a farmer. For my mother, the rains used to come from October until April. This would give our local indigenous varieties of seeds time to mature and grow. And we would have food on the table and for the market. Today, because of climate change, the rains come in December and end in March. Our local varieties do not have time to mature. We are forced to buy hybrid crops, which are much more input-intensive, and we cannot afford these inputs. We are poor. So we are starving in Malawi.

Because of Climate Change we see:

- An increased frequency and intensity of floods and droughts which causes death of people, food crops, and animals.
- Houses, toilets, crops and household items collapse and are carried away by running water.
- Increased cases of water borne diseases, such as malaria, cholera, dysentery.
- Women engaged in unsafe sex just to buy food for their families. And girls as young as 13 years old are forced to get married, exposing them to greater risks of HIV and AIDS.
- Migration of men to urban areas in search of work, leaving women with extended families and the burden of feeding children whose parents have died of HIV and AIDS.

governmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7–22.

<sup>5</sup> Prioritizing Climate Change Adaptation Needs for Food Security in 2030. David B. Lobell, Marshall B. Burke, Claudia Tebaldi, Michael D. Mastrandrea, Walter P. Falcon, Rosamond L. Naylor, *Science*, 1 February 2008: Vol. 319. no. 5863, pp. 607–610. DOI: 10.1126/science.1152339.

<sup>6</sup> International Institute for Applied Systems Analysis. Fischer, Gunther; Shah, Mahendra; Van Velthuizen, Harrij; and Nachtergaele, Freddy O. Global Agro-ecological Assessment for Agriculture in the 21st Century

<sup>7</sup> International Food Policy Research Institute. High Food Prices: the What, Who, and How of Proposed Policy Actions. Policy brief: May 2008.

As a woman farmer in Malawi, Joyce's challenges are familiar to a huge segment of the population there. Agriculture is the main driver of Malawi's economy, contributing up to 39 per cent of GDP and employing 80 per cent of the country's labor force. About 6.3 million Malawians live below the poverty line, the majority in rural areas. More than 90 per cent of them rely on rain-fed subsistence farming to survive. Climate change and weather extremes are having a huge impact on the country's agriculture sector, affecting productivity and therefore resulting in food shortages and chronic hunger. Crop losses related to natural disasters, such as drought and flash floods, as well as crop failure due to erratic and unpredictable rainfall, pose a great danger to food security, especially for poor and marginalized communities.

Vulnerability and adaptation studies undertaken in Malawi predict that temperatures are likely to increase by 1 °C, 2 °C and 4 °C for the years 2020, 2075 and 2100 respectively, and that rainfall will increase by up to 8 per cent by the year 2100.<sup>8</sup> In these circumstances, the number and intensity of drought and floods will increase, with a negative impact on food production. If nothing is done to support poor and marginalized communities, their right to food will be severely undermined. Women, who represent the majority of full-time farmers, will be particularly adversely affected.

Rainfall data from 1990 to date shows that the Districts like Salima, where Joyce is from, have been subjected to climate change and weather extremes in most years. There were recorded droughts in Salima during the 1994–95, 1999–2000, 2001–02 and 2004–05 seasons, which resulted in total annual rainfall of less than 800mm, hardly enough to sustain crop production. Salima was also subjected to floods during the 1997–98, 2002–03 and 2005–06 seasons, causing losses of property; destruction of infrastructure; siltation of rivers; destruction of crops such as maize, sorghum, millet and rice; diseases like malaria and cholera; and malnutrition and hunger.

Climate-related hazards have a significant impact on human health. During years of drought, malnutrition becomes a major issue, especially amongst children and the elderly. Any fluctuation in climate leading to adverse weather conditions is likely to lead to significant malnutrition problems among the population as less food is consumed. Children, breastfeeding mothers, pregnant women, female-headed households and orphans are among the most vulnerable.

The dependence of Malawi's agricultural sector on the climate cannot be over-emphasized. Most of the crops and livestock are grown under rain-fed conditions; therefore any drought or flood has a direct impact on productivity and may result in country-wide food deficits and hunger, especially among small-holders, the most vulnerable groups. The increased severity of floods means increased risks of ruined crops, killed or injured livestock as well as submerged and destroyed infrastructure (roads, footpaths and buildings). People from Mbangu Village, for example, have suffered from floods that have caused extensive and severe damage to their assets and livelihood. They have also observed that the frequency and severity of the floods have increased over the last decade.

The drought experienced in the 2001–02 season resulted in low crop yields and a food deficit of 570,000 tons. More than 3.2 million people were affected and the World Food Program (WFP) spent \$87.5 million on emergency food aid, while the Malawian Government spent an additional \$67.4 million. Some elementary schools had to close down due to the hunger crisis, and a large number of children suffered from kwashiorkor (a dietary deficiency disease). Most people started eating wild fruits, roots and tubers and indigenous vegetables, while at the same time eating and harvesting premature maize to avert hunger.

In order to become more resilient to climate change, communities and households attempt to diversify their agricultural production and to intensify activities they can carry out when the weather is favorable. Communities have also begun to embrace methods to improve soil fertility, using organic manure instead of chemical fertilizers. In Salima, for example, farmers use the "chimato" system where vegetative material is composted in special mud structures. The cultivation of winter crops using the residual soil moisture from river banks or flooded areas is also a way to cope. Farming communities living along rivers, the lakeshore and the Shire valley are successfully adapting to changing climatic conditions by growing a second crop of maize that is planted at the end of the rains in March and is harvested in winter.

As part of the adaptation programs, many clubs and communities from Malawi are engaging in activities to diversify their livelihood. In many cases, women are leading in this effort. For example, the Salima Women's Network on Gender

<sup>8</sup> Environmental Affairs Dept. (2005). National Adaptation Programmes of Action (NAPA). Government Press, Zomba. Environmental Affairs Dept. (2008). Malawi's Second National Communication to the UNFCCC. Government Press, Zomba.

(SAWEG), of which Joyce Tembenu is food security officer, has started various income-generating activities in order to empower themselves economically. Women and girls in Salima realized that in times of hunger they were vulnerable because their husbands often controlled the money they would need to buy more food. Now women are involved in various activities such as selling cakes and scones (“zitumbuwa”), brewing beer, making traditional pots or weaving baskets.

Small-holder farmers produce about 80 per cent of Malawi’s food. Most of them are poor and depend on rain-fed agriculture, so they lack resources to adapt to climate change sufficiently. There is a need for concerted efforts from funding agencies to assist the farmers to implement adaptation programs. Governments must play a key role in providing a policy framework to guide and support effective adaptation strategies for individuals and communities. Some key recommendations from ActionAid partners include the need for:

- High-quality climate information and tools for risk management that help to improve climate predictions. These will be critical, particularly for rainfall and storm patterns.
- Land-use planning and performance standards that encourage both private and public investment in buildings and other long-term infrastructure to take into account the vulnerability of different elements in the community systems.
- Governments that can contribute through long-term policies for natural resources protection and emergency preparedness.
- A financial safety net. This may be required for the poorest people who are often most vulnerable to the impacts of climate change and least able to afford protection.

The case of Malawi illustrates how women are leading adaptation efforts in their communities. For adaptation to be effective, funding must therefore support women’s efforts to reduce their vulnerability to the impacts of climate change, and build their capacity to become leaders in their communities.

### 3. BANGLADESH: ASIYA BEGUM

Asiya Begum, a widow, lives with her elderly mother and two sons in the village of Charipara located on the river delta on Bangladesh’s southern tip. Over the past decade, the river has eroded land and forced one hundred families to find another place to live. “Our poverty is caused by river erosion; people of two villages are now living in one,” says Asiya. In 2007, Asiya’s family lost all their crops when Cyclone Sidr hit Bangladesh. The storm also increased the salinity of their land, making it more difficult to grow food. To supplement their family’s income, Asiya’s sons Mohibur (14) and Habibur (12) have quit school so that they can work.

Because of the impacts climate change is having on communities like Charipara, ActionAid is working in Bangladesh to help poor people adapt to changing weather patterns. In Asiya’s village, the community identified declining food production as one of their greatest struggles, and decided to try new seed varieties and farming methods to produce better yields.

Asiya volunteered to participate in an ActionAid project in which the Bangladesh Rice Research Institute in Dhaka provided farmers with three seed varieties to test, and taught them how to use the seeds to produce better yields. “Now we are doing Boro (a variety of rice) cultivation, which was not practiced in this village,” says Asiya. “We are going to harvest the rice in a few days, and we never had rice during this time of year. With the help of the project our poverty is getting reduced.” The new seeds, a better irrigation system, fertilizers and insect traps have nearly doubled crop yields in Charipara. “We couldn’t have vegetables before,” Asiya adds. “Now with ActionAid’s support, we can even sell them. From every aspect, things are now getting better.”

Today, Asiya is urging her government and other agencies to further support adaptation to climate change through projects that build the resilience of poor communities and improve food production. The challenges she faces are typical for many in her country. With a population of about 140 million living in an area covering 144,000 km<sup>2</sup>, Bangladesh is one of the most densely populated countries in the world.<sup>9</sup> More than 75 per cent of its people live in rural areas and agriculture represented nearly 20 per cent of the country’s GDP in 2006.<sup>10</sup>

People living near the rivers of Bangladesh and the Bay of Bengal are used to floods. In the past, yearly floods even contributed to agriculture by bringing mois-

<sup>9</sup> Bangladesh Bureau of Statistics (2006).

<sup>10</sup> *Ibid.*

ture and nutrients to the soil. Nowadays, however, the intensity and severity of floods has sharply increased. Most climate models predict that 17 per cent of the total area of Bangladesh along the coastal belt may be under water by the end of the twenty-first century due to rising sea levels. This will increase salinity intrusion, which is already having a negative effect on soil fertility. Seasonal droughts in the northwestern region of Bangladesh are also causing serious damage to crops and food shortages. Extreme weather events put a huge strain on the country's economy, infrastructure and social systems. They bring with them loss of lives, destruction of houses and public buildings, disruption of education and loss of assets and livelihoods. Their intensification will have a disastrous effect on poor people.

While disasters and food insecurity induced by climate change affect both women and men in Bangladesh, the burden of coping with disasters falls heavily on women's shoulders. The division of labor between men and women becomes critical, as disasters bring additional work and changes in environment that often reinforce and even intensify gender inequity. Because women are culturally perceived as having a lower social status, they suffer more than men from poverty, hunger, malnutrition, economic crises, environmental degradation, health-related problems and insecurity. ActionAid's field work shows that women are often forced to sell their assets, such as hens, chickens or goats, in order to feed their families, and when food support is insufficient to feed all family members, women are generally the ones who do not eat.

Climatic events such as changes in rainfall patterns, floods, storms, river bank erosion, salinity intrusion and drought have exacerbated the problems faced by Bangladesh's agricultural sector and increased the risks of food shortages. Cyclones also prevent fishermen from going to the coast or the rivers to bring back fish or crabs. Researchers from the Asian Disaster Preparedness Centre (ADPC) and the FAO have pointed out that agriculture in Bangladesh "is already under pressure from increasing demands for food and the parallel problems of depletion of agricultural land and water resources from overuse and contamination. Climate variability and projected global climate change makes the issue particularly urgent."<sup>11</sup>

The associated decline in crop production, loss of assets and reduced employment opportunities contribute to household food insecurity. Food consumption falls, along with the ability of households to meet their nutritional needs on a sustainable basis. Vegetables and roots are in short supply during natural hazards. Acute shortage of pure drinking water makes the situation even more critical, as most women from rural areas have to carry water over long distances.

In Bangladesh, many communities are doing what they can merely to cope with the impacts of climate change. For example, farmers have started to change the way they cultivate their land; some of them raise the bed of their vegetable fields, while others are modifying their cropping patterns, harvesting water from canals and ponds, improving soil moisture retention through mulching, and increasing the amount of organic matter in their soil. In rural areas of Sirajganj district (where feeding animals can be highly problematic in times of hardship) farmers are now preserving fodder for their cattle. And in areas where water logging is a common problem, farmers are practicing hydroponic agriculture for vegetable production. In south-west Bangladesh it is becoming a popular adaptation strategy that increases households' food security.

In some rural areas, women also dry food in order to preserve it for the lean season. This practice is gaining increasing attention and has started to spread among poor households. Kitchen gardening by women also makes a contribution to household nutrition. It increases their resilience as well, since vegetable surpluses can be sold to provide extra income to the family and seeds can be dried.

The needs of Bangladesh's people are clearly overwhelming their ability to cope, much less to truly adapt to the mounting impacts of climate change. The damage from Cyclone Sidr (which lasted only one night) is estimated at up to \$4 billion. Given the increasing intensity and frequency of floods, cyclones and other extreme weather events, the amount of money that the country will need to adapt to these changing conditions is immense. However, money alone is not sufficient to respond to the needs. Knowledge and skills are also crucial to ensure that money is used effectively and in a manner that really addresses the needs of the most vulnerable groups.

While spontaneous and ingenious efforts to cope with the adverse impacts of climate change are noticeable at community and household levels, limited resources and capacities often hinder these initiatives. Changing planting dates and seed varieties, for example, could help to offset losses and increase yields—if people had ac-

<sup>11</sup>R. Selvaraju et al. *Livelihood Adaptation to Climate Variability and Change in Drought Prone Areas of Bangladesh*, ADPC, FAO, 2006.

cess to the information, credit and seeds they would need to implement those changes. Climate change also has implications for justice and equity: poor households and small-holder farmers are more affected, yet support does not necessarily reach them. More attention to these questions is therefore needed.

#### 4. RECOMMENDATIONS FOR UNITED STATES CLIMATE ADAPTATION POLICY

Within the concept of “common but differentiated responsibility,” the United Nations Framework Convention on Climate Change (UNFCCC), to which the United States is a Party, states that it is the responsibility of developed nations to “assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.”<sup>12</sup> Although communities are already taking steps to adapt to climate change, their efforts will require a significant infusion of new resources to avoid the most disastrous consequences forecast by the IPCC. Rich countries, which are historically responsible for generating the lion’s share of the greenhouse gases that cause climate change, should now provide the necessary funds to enable poor countries to adapt.

Developing nations highly dependent on agriculture are especially vulnerable to the impacts of climate change on food production. It is therefore critical that U.S. legislation and the post-2012 international climate negotiations in Copenhagen protect the right to food by promoting measures to support small-holder farmers and the sustainable agriculture approaches they are embracing to combat the impacts of climate change. This support must include concrete financial contributions and the establishment of governance mechanisms for adaptation funds that are effective and accountable to people like Joyce Tembenu and Asiya Begum.

On the basis of consultations with community partners around the world, ActionAid sees the Senate’s deliberations on a climate bill and the UNFCCC process through Copenhagen and beyond as crucial opportunities to link the global response to the climate emergency to the concrete needs of those most affected by and least responsible for the crisis. The Senate should therefore assure that:

*a) There are substantial additional financial resources to fund climate change adaptation.*

The absolute level of resources needed to adapt to the impacts of climate change remains a matter for debate, in part because too few formal adaptation projects and programs have been completed to provide an accurate assessment. The UNFCCC estimates that between \$28–67 billion will be needed annually by 2030 to help developing countries adapt. The 2007–08 UN Human Development Report estimates that \$86 billion will be needed annually by 2015. And the World Bank now estimates that \$75–100 billion will be needed annually between 2010 and 2050.<sup>13</sup> If significant emissions reductions are not achieved in the short term, these figures will only increase as rising global temperatures generate worsening impacts.

Though these estimates may vary, it remains clear that the cost of adapting to climate change will be enormous. Developed countries may dismiss the need to generate \$86 billion per year as unrealistic, or point to fiscal deficits and the impact of the 2008 global financial crisis on their capacity to respond. But the fact remains that they are bound by the framework convention to respond to the adaptation needs described in this testimony, and that they can use a variety of innovative mechanisms to generate new and additional adaptation funding. ActionAid calls on the Senate to take on this challenge with the degree of political commitment it will require. In that vein, ActionAid encourages the Senate to significantly expand on the American Clean Energy and Security Act’s commitment to funding climate adaptation, which starts at approximately \$750 million per year in 2012. The goal for the U.S. ought eventually to reach \$30 billion per year for climate adaptation, to be generated through a variety of mechanisms.

*b) Adaptation funds must be governed in a transparent and accountable manner.*

A vast increase in funding is only part of the solution to the developing world’s adaptation needs. Even if developed countries were to announce massive new financial pledges tomorrow, how that funding is disbursed, managed and governed would determine whether it would truly meet the needs of poor and excluded communities. Essentially, adaptation funding will only be as effective as the institutions through

<sup>12</sup> UNFCCC at <http://unfccc.int/resource/docs/convkp/conveng.pdf>

<sup>13</sup> <http://siteresources.worldbank.org/INTCC/Resources/EACCFinalRelease.pdf>

which it is channeled. ActionAid has identified a core set of principles by which any adaptation funding mechanism should be assessed.<sup>14</sup> Such mechanisms should:

1. Demonstrate a broadly representative governance structure;
2. Ensure the participation of affected communities;
3. Provide sustainable and compensatory funding streams;
4. Avoid the imposition of economic policy conditionality; and
5. Create streamlined access for countries seeking funds.

There are currently two multilateral institutions primarily involved in adaptation finance: the World Bank, which manages the Pilot Program on Climate Resilience; and the Global Environment Facility (GEF), which manages the Least Developed Countries Fund. ActionAid's analysis of these funds and, in particular, their managing institutions, demonstrates the need for new approaches to the governance of climate adaptation funds.

The World Bank's role in climate finance must be challenged for a number of reasons. Its governance structure does not allow developing countries sufficient voice in how the institution is managed or how funds are disbursed. The World Bank has a poor track record in engaging affected communities and civil society in its work. The Independent Evaluation Group of the World Bank estimates that in 2003, 75% of World Bank projects did not involve community participation.<sup>15</sup> Moreover, even as the World Bank is positioning itself as a major player in the response to climate change, it is worsening the problem through its fossil fuel lending. From 2006–08, coal lending at the World Bank Group increased by 648%, and in 2008 fossil fuel funding more than doubled.<sup>16</sup>

There are also significant concerns about the GEF's role as an operating entity for the UNFCCC's financial mechanism. These relate to its governance structure (which weights votes according to financial contribution) and the lack of access to funding for the most vulnerable countries and communities. Because of these and other concerns, ActionAid endorses the need for an enhanced financial mechanism under the authority of and accountable to the UNFCCC's Conference of Parties (COP), with an adaptation funding window.

The basic structure of this enhanced mechanism would include a board, appointed by and accountable to the COP, called the Executive Body (EB). It would establish and coordinate funding windows for areas such as climate adaptation, mitigation, reducing emissions from deforestation and degradation (REDD), and technology development, disbursement, and diffusion. The EB would be serviced by a secretariat and a trustee. Each funding window would be advised by a technical assessment panel. Other key structures could include National Multi-stakeholder Committees, a Women's Rights Desk, and a Monitoring and Evaluation Panel.<sup>17</sup>

*c) Agriculture must be recognized as a sector that is particularly vulnerable to climate change.*

The United States should ensure adequate funding for adaptation strategies based on sustainable agricultural techniques that allow communities to combat hunger and realize their right to food. Given the particular impact that climate change has on agriculture, the Copenhagen outcome should recognize the responsibility of the international community and national governments to enhance the food security of vulnerable people. Furthermore, a significant portion of adaptation funding should be specifically dedicated to promote sustainable agriculture practices in the developing world. Such programs should build on the examples of adaptation strategies that have already increased food security. And in the face of such significant outstanding need, substantial adaptation funding should:

- Enhance farmers' ability to respond quickly and effectively to shocks in order to maintain food production, even under rapidly changing climatic conditions;
- Advance farmers' capacity to use organic matter and to employ multiple cropping strategies and livestock production systems that will enhance soil quality, increase food security and reduce exposure to climate shocks;

<sup>14</sup>These principles were established in ActionAid's 2007 report, *Compensating for Climate Change: Principles and Lessons for Equitable Adaptation Finance*. See <http://actionaidusa.org>

<sup>15</sup>Independent Evaluation Group. World Bank Support for Community-Based-and-Driven Development. Overview. <http://web.worldbank.org>.

<sup>16</sup>Bank Information Center. World Bank Energy Sector Lending: Encouraging the World's Addiction to Fossil Fuels. February 2009. <http://www.bicusa.org>.

<sup>17</sup>For a full description for ActionAid's proposed enhanced mechanism, see ActionAid, "Equitable Adaptation Finance: The Case for an Enhanced Funding Mechanism Under the UN Framework Convention on Climate Change" at <http://www.actionaidusa.org>

- Support innovative practices, especially farmer-controlled methods of agriculture based on local knowledge and traditional practices that reduce farmers' dependence on synthetic inputs and imports, in line with the recommendations of the 2008 International Agricultural Assessment of Science and Technology for Development;<sup>18</sup>
- Support community-level organization—especially of women—to implement creative solutions and hold duty-bearers accountable to implement policies that ensure their access to and control over natural and productive resources.

d) *Climate adaptation measures must ensure the effective participation of poor and excluded communities.*

Many poor communities have been adapting to climate change for some time now, and already have ideas for adaptation strategies appropriate to their specific context. U.S. adaptation programs and the adaptation financing mechanisms negotiated through the UNFCCC must increase the participation of the most vulnerable groups in decision-making around how adaptation funds are disbursed, managed, used, monitored and evaluated. Furthermore, representatives of affected communities must be meaningfully involved in the governance of multilateral adaptation funds to enhance their effectiveness through transparency, accountability and stakeholder participation.

e) *Climate adaptation measures must support women's efforts to claim their rights.*

Poor women are particularly vulnerable to the impacts of climate change, but are also potential leaders of change and innovation with respect to adaptation. Women must be acknowledged as a vulnerable social group in the Copenhagen outcome, and adaptation funding must be specifically directed towards addressing women's needs.

ActionAid thanks the Subcommittee on International Development and Foreign Assistance, Economic Affairs, and International Environmental Protection for the opportunity to express these views today. We stand ready to share the perspectives and experiences of our partners around the world as you set about the complex but necessary work of developing international climate adaptation policy to help achieve a more sustainable and equitable future for people around the world like Joyce Tembenu and Asiya Begum.

Senator MENENDEZ. Thank you.  
General Wald?

**STATEMENT OF GENERAL CHARLES F. WALD, (USAF, RET.), FORMER DEPUTY COMMANDER OF UNITED STATES EUROPEAN COMMAND; DIRECTOR AND SENIOR ADVISOR, AEROSPACE AND DEFENSE INDUSTRY, DELOITTE; WASHINGTON, D.C.**

General WALD. Thank you, Chairman, Senators. Appreciate the opportunity to testify today on behalf of the Center for Naval Analysis.

A question I think a lot of people would ask is why are a group of 11 military retired general officers and admirals focusing on climate change. We asked ourselves that 2 years ago when we started the project as well. And I think we came into the project from different angles and different probably backgrounds and probably different levels of belief of this being a problem. But by the end of the year, there was consensus among the 11 of us. All have been in command at various places in the world, to include Africa, Central Command, which is basically where most of our activity today in the world is militarily, as well as the Pacific, and chiefs of staff of the military.

At the end of the project, we all agreed that climate change, as was depicted to us and as we studied, is now and will be more in-

<sup>18</sup> see <http://www.agassessment.org>.

creasingly a national security threat to the United States and our allies.

The study, *National Security and the Threat of Climate Change*, came out in 2007. I would commend reading it. It is interesting, I think, not because we wrote it, but it is kind of a different approach.

We found four findings and five recommendations from the project.

The first finding was that we projected that climate change does pose a serious threat to the American national security. In my last job as European Command Deputy, we also had Africa in our region at that time. It has subsequently become a separate command. I spent a lot of time in Africa. I looked at the chart that was shown by David. It was pretty telling I think. As a matter of fact, all those circled areas I spent time in. Unless you go there and see it, it is hard to imagine just what it is really like. And I know you have traveled a lot and have seen it.

But places like Lagos, Nigeria, for example, which the first time I arrived there, to me it looked like a Mad Max movie, literally. There were 17 million people there in abject poverty. The United States Marine Corps this year did a study on what they think the world will look like in 2025 so they can start projecting their acquisition costs for what the environment will be. They think Lagos in 2025 will be 40 million people, mostly living in slum areas, which is basically a recipe for extremism. It is a good place for terrorism to actually breed. It is a good breeding ground for recruitment. And we have seen that around the world in places that are basically unstable or fragile.

The second finding was that climate change is actually a threat multiplier, which is interesting. I mean, historically, as was mentioned earlier, the United States is going to respond particularly with military to natural disasters or manmade disasters, either one. You see during the tsunamis or during earthquakes, the U.S. military is usually the first one on the scene. In 1996, there were two consecutive typhoons on the eastern coast of Africa that caused Mozambique to totally flood as a nation. That is a huge nation. The only people that were able to respond because of our equipment was the United States military. And there are figures that say we probably saved 250,000 people by evacuating them from flooded areas. That will become more common.

Last week I was in Germany—or I should say Brussels, and there has been an international military advisory board started to look at this from an international standpoint. And the representative from Bangladesh tells me that if they have a 3-foot ocean rise, which is predicted, that 30 million Bangladeshis will be displaced, mostly into India. India today is starting to build a fence along the Bangladeshi/Indian border. You can just imagine the conflict.

Third, climate change will add to the tensions even in stable regions of the world. And a lot of people like to say that climate change is kind of a zero sum game where there will be winners and losers. I think that is probably a bad statement. I think everybody is going to lose in this somewhat. There will be lesser losers, but we are going to lose somewhat. So we are going to have to start predicting what that will cost.

Now, yesterday I was told that if we send whatever the number is—but per thousand troops we are going to send to Afghanistan, which we probably will I think, additionally it is \$1 billion per thousand troops per year. Now, that counts for deployment anyplace of troops. So it is going to cost a lot of money.

And then lastly, climate change, energy security, and national security are basically a Venn diagram. They are all connected. And for those who do not believe in climate change or do not think it is a problem, they should believe that energy security is a problem for us. And if we address energy security in the proper way, we are probably going to address climate too. So it is a win-win, if you look at it that way.

What we recommended is that we, the United States military, start putting climate change in our national security planning; that we, the United States, demonstrate leadership in the world. In my travels around the world, it is very apparent that hardly anything major in the world is ever going to happen without U.S. leadership, and the world is begging for that. We need to develop global partnerships in this effort.

DOD, in this case, now should accelerate our planning in the acquisition area for addressing this and the United States Navy, this Chief of Naval Operations, Admiral Roughead, has sanctioned a group that I am a part of through the National Academy of Sciences to study what the Navy should do acquisition-wise to address the impending consequences of climate change. The reason that is important, I think, is because most of the systems we acquire today will be with us 30–40 years from now.

And then lastly, that the United States military should start looking at their installation efficiency and climate footprint and carbon footprint at their installations.

So I thank you for the time and look forward to the questions. Thank you.

[The prepared statement of General Wald follows:]

PREPARED STATEMENT OF GENERAL CHARLES F. WALD, USAF, RETIRED

Mr. Chairman, Members of the Committee, Ladies and Gentlemen, it is an honor to appear before you today to discuss the critically important matter of climate change and its implications for U.S. foreign policy. Thank you for the opportunity to share my views, which are based on 35 years of service in the United States Air Force.

In my final assignment, I served as the Deputy Commander of United States European Command. Over the past three years, 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. I would like to take this opportunity to summarize, briefly, the findings of the Board's work as they relate to the committee's deliberations.

CNA's Military Advisory Board has produced two reports: the first, released in April, 2007, examining the national security threats of climate change, and the second, released in May of this year, which analyzed the national security threats of America's current and future energy posture.

Our first report, National Security and the Threat of Climate Change, 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 potentially 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.

Other findings of our *National Security and the Threat of Climate Change* report include:

- *Reduced Access to Fresh Water.* Adequate supplies of fresh water for drinking, irrigation, and sanitation are the most basic prerequisite for human habitation. Changes in rainfall, snowfall, snowmelt, and glacial melt have significant effects on fresh water supplies, and climate change is likely to affect all of those things. In some areas of the Middle East, tensions over water already exist
- *Impaired Food Production.* Access to vital resources, primarily food and water, can be an additional causative factor of conflicts, a number of which are playing out today in Africa. Probably the best known is the conflict in Darfur between herders and farmers. Long periods of drought resulted in the loss of both farmland and grazing land to the desert. The failure of their grazing lands compelled the nomads to migrate southward in search of water and herding ground, and that in turn led to conflict with the farming tribes occupying those lands. Coupled with population growth, tribal, ethnic, and religious differences, the competition for land turned violent. I believe this shows how lack of essential resources threatens not only individuals and their communities, but also the region and the international community at large.
- *Land Loss and Flooding.* Displacement of Major Populations. About two-thirds of the world's population lives near coastlines, where critically important facilities and infrastructure, such as transportation routes, industrial facilities, port facilities, and energy production and distribution facilities are located. A rise in sea level means potential loss of land and displacement of large numbers of people. Rising sea levels will also make coastal areas more vulnerable to flooding and land loss through erosion. Furthermore, most of the economically important major rivers and river deltas in the world—the Niger, the Mekong, the Yangtze, the Ganges, the Nile, the Rhine, and the Mississippi—are densely populated along their banks. As sea levels rise and storm surges increase, saline water can contaminate groundwater, inundate river deltas and valleys, and destroy croplands.
- *Mass Migrations Add to Global Tensions.* Some migrations cross international borders. Environmental degradation can fuel migrations in less developed countries, and these migrations can lead to international political conflict. For example, the large migration from Bangladesh to India in the second half of the last century was due largely to loss of arable land, among other environmental factors.
- *Potential Escalation of Conflicts over Resources.* To live in stability, human societies need access to certain fundamental resources, the most important of which are water and food. The lack, or mismanagement, of these resources can undercut the stability of local populations; it can affect regions on a national or international scale.

Since the CNA Military Advisory Board's April 2007 report was published, a National Intelligence Assessment on global climate change confirmed our findings. And the most recent scientific evidence reveals that climate change is occurring at a much faster pace than originally believed. The Arctic is a case in point. New evidence and analysis suggests that the Arctic could be substantially ice-free in the summer within in as few as 30 years, not at the end of the century as previously expected.

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% certainty during a crisis can be disastrous, especially one with the huge national security consequences of climate change. And in the case of climate change, the trends are clear: 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 among the major challenges we're facing.

Energy, security, economics, and climate change - these are all connected. It is a system of systems that is very complex. And we need to think of it in that way and not simply address small, narrow issues, in the hope that they will create the kind of change needed to fundamentally improve our future national security. Inter-connected challenges require comprehensive solutions.

These are interconnected challenges that require comprehensive solutions, and 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, let me add my firm belief that it is the responsibility of the United States to be first among leaders. 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 - that there are steps that can help us economically, militarily, diplomatically. And those steps fit with the direction the world is heading in its pursuit of climate solutions.

As retired Marine Corps General Anthony Zinni, former commander of U.S. Central Command, and Military Advisory Board Member has said "We will pay now to reduce greenhouse gas emissions today, or we will pay the price later."

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 devoted over one year to examining our national energy posture, and, this past May, released its second report entitled: Powering America's Defense: Energy and the Risks to National Security.

While most of the findings of our second report are beyond the scope of this hearing, the Military Advisory Board's primary conclusion was that America's energy posture constitutes a serious and urgent threat to national security—militarily, diplomatically and economically.

Our second report also 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 increased use of fossil fuels. Our nation requires diversification of energy sources and a serious commitment to renewable energy. Not simply for environmental reasons—but for national security reasons.

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.

Unless we take dramatic steps to prevent, mitigate, and adapt, climate change will lead to an increase in conflicts, and 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.

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

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 a daunting challenge into an opportunity for a better quality of life and a more secure future for our world.

Thank you again for the opportunity to address the committee and contribute to this important national discussion.

Senator MENENDEZ. Thank you and thank you all very much.

We are going to start 8-minute rounds since there are three of us here. And if there is more time needed, we will be happy to go through a second round. The chair will start with himself.

Thank you all for your testimony.

Mr. O'Driscoll, I listened to your testimony and it sounds to me that some of what you suggest may very well meet Dr. Green's admonition that if we give someone a fish, they will eat for a day. If we teach them how to fish, they will be able to eat for a lifetime. It sounds like some of the adaptation projects that your organization is involved with and are suggesting goes to the very heart of

that. You are creating the opportunity for people to be self-sufficient in the long run. Would that be a fair statement?

Mr. O'DRISCOLL. I think that is exactly the right approach to take to this. There are certain dimensions of adaptation that involve creation of infrastructure to protect, you know, sea walls or elevating buildings and so forth, which are obviously one-time infrastructure investments. But most of the approach to adaptation I would say, particularly in the field of agriculture, which is where we are focusing, is absolutely on investing in sustainable futures and looking for technical training and investments, access to seeds and credits and so forth that will enable people to become self-sufficient as quickly as possible.

Senator MENENDEZ. You know, I want to get a better sense for the record of what the terms "adaptation" and "climate resiliency" mean, and we have just begun to broach this with some of the projects most likely to be funded by programs such as the ones outlined by the Kerry-Boxer bill. I understand the view that it needs to be more robust, but not the nature of what that would ultimately fund. Are we talking about sea walls or drought-resistant crops or irrigation systems or water treatment systems? What do you envision being the universe of the projects? And I will say that to you and anyone else who wants to engage.

Mr. O'DRISCOLL. Sure. I think you have covered a range of the options that are there. Certainly from my testimony, we would emphasize there are twofold dangers of climate change on the one hand, the risk to communities based on extreme weather events, which speaks to a number of adaptation projects that will protect them in various ways whether it is through the construction of this kind of infrastructure or whether it, in some cases, might involve relocation and compensation for that. So that is certainly one dimension.

That said, however, I think we are also at a critical moment, as David mentioned, looking at World Food Day and looking at the reality that a billion people are living in hunger, there is a huge convergence between the climate emergency on the one hand and the need to refocus on agricultural development on the other. So I think what we should be thinking about in terms of climate adaptation funding is how do we support the capacity of communities to meet their food needs in the face of these changing climate circumstances. And I think that goes beyond climate adaptation to look at the importance of reinvesting in agriculture more generally, making sure that farmers have the means, not only the seeds and the fertilizers and so forth, but also the access to credit, the access to markets, and so forth that will enable them to thrive.

I think we want to insist there that it is also important to focus on sustainable techniques. I think some of our concerns about some of the ideas on the table for agricultural adaptation and new seed varieties might be beyond the means of the 60 percent of the world's billion people who are small farmers. So I think it is really important that adaptation projects focus on making sure that technologies are affordable and accessible to the poorest people.

Senator MENENDEZ. Mr. Waskow?

Mr. WASKOW. Thank you. First, just as a general comment on the notion of adaptation, I think sometimes it is seen as sort of a

matter of running in between the raindrops, if you will, if you think of climate change as a gathering storm. And we prefer to think of it as really the importance of building a robust umbrella and being proactive so that we are not simply responding to climate impacts but, given an uncertain and unstable climate, really putting in place the kinds of tools and the kinds of preparedness that need to be there in a proactive way.

Secondly—and I think this echoes much of what Peter was saying—it is really critical that communities be deeply engaged in the process of developing and implementing climate adaptation strategies and activities. And that is so because we know from the history of development that when you do not have that community-level engagement, you do not have the kind of success on the ground that is necessary.

And so to take some concrete examples and drawing on some of what you were asking about, sea walls are often not the right approach in a context where sea level rise or storms are the issue. Instead, putting in place mangroves, for example, planting mangroves, which can act as a sea buffer, a natural sea buffer, in many cases is the approach that makes more sense, both from an environmental standpoint and also often from the point of local communities. And so we really need to ensure that we are undertaking those kinds of community-based adaptation strategies when we go about this.

Senator MENENDEZ. Dr. Green, I see you want to get in here.

Dr. GREEN. Yes. They were very interesting questions. What do we mean by adaptation? What do we mean by resilience?

To me those really are two separate activities. Adaptation are steps we can use to move away from the areas of risk, sort of almost a pre-migration strategy that happens very slowly, incrementally because you fix the institutions so that people understand the level of risk they face where you create those institutions where they do not exist.

Resilience being the ability to bounce back after damages, and that again consists of creating institutions that are insurance-based and market-based so that you have revenue streams and the ability to be resilient. If you have one-time infusions to build infrastructure and then you do not have any revenue stream for that infrastructure, it quickly becomes non-resilient to change. So those two things, I would say, lead to adaptation and resilience.

Mr. O'DRISCOLL. Mr. Chair, can I follow with one brief comment?

Senator MENENDEZ. Briefly. I want to get to one or two other questions.

Mr. O'DRISCOLL. Go ahead.

Senator MENENDEZ. No, go ahead.

Mr. O'DRISCOLL. Just to say that, as David said, community involvement is crucial. An ounce of prevention is worth a pound of cure. And we have found that investing in participatory vulnerability analyses in communities so that they are thinking in advance about what the threats are and what ways they can mitigate those threats is a very important investment in reducing costs down the line. Thank you.

Senator MENENDEZ. Thank you.

General Wald, you mentioned in your testimony that unchecked climate change can result in an increased number of U.S. military humanitarian missions. And you have been talking about certain different departments of our defense looking at what their procurement needs will be towards the future. Of course, procurement needs are normally about equipment. Equipment is also followed by personnel, and that drives the numbers as well, as well as our personal commitments, as well as our deployments and being spread thin in a world in which we provide global leadership, but there are real challenges to national security in a variety of ways.

So if we agree that the Defense Department is already looking at what it will take to meet some of these challenges in the future, which is going to drive money as well, to go to Senator Corker's concern, which is a very legitimate one, is it not possible to view that a robust climate adaptation could save us money in the long run if we are proactive in that respect?

General WALD. Yes, I think so. I mean, I think there needs to be a lot more study done, which is being done right now, to get to the real bottom of what the implications will be.

But a couple examples. One Peter just mentioned is when we were in European Command, much of our activity was in Africa. Africa is very volatile, unstable in many places and has a lot of problems, as you know. And we did a lot of preventative actions as well, training. Governance is a huge issue as well, obviously not a military mission, but it is part of something that would help us if we could get better governance in a lot of areas. But one of the things we found in a study with the General Accounting Office was that for every \$1 of prevention, we saved \$10 in response, which is kind of an interesting number.

I told that to some EU parliamentarians trying to get them to be more participatory, and one of them said to me, that is a great point except I cannot get any credit for doing anything, so we do not want to do that. And that is part of the problem because when you prevent something from happening, you cannot chalk it to a success a lot of times. So it is difficult to put money to something that you cannot get a tangible return on, but I think that is one thing.

I was, I guess, fortunate enough to run the Afghan air war for the first 4 months, and without Diego Garcia, which is an island in the Pacific, we never would have been able to do that the first few months of the attack on the Taliban. It is predicted a 3- to 5-foot rise in sea water. That island goes away, for example.

I was in Europe last week with the NATO Commander in an advisory group, and one of the things he is looking at today is what they call the high north, the North Sea. And the north passage is now going to be opened. It was predicted at 2040, and now they say it is going to be in the next 5 to 10 years. And that becomes a military issue because resources and et cetera. So the Navy is looking at—they only have two icebreakers, for example. They do not have the ships that even go up there. Those are very expensive, by the way.

And so the question is, well, how do you kind of start posturing yourself equipment-wise, as you point out, which is a long-term issue? And then number two is, how do you try to get ahead of it

a little bit? And then number three, the Navy obviously and the Marines—their big issue is littoral, and that is where most of the population is going to live, but also that is where their seaports and their bases are. Norfolk in Virginia, a large naval base there, would be affected significantly with a 3- to 5-foot rise in sea water. You just do not replace bases like that. You are talking about billions of dollars.

So I think your point is well taken. Number two is I think that is what we recommended here. The military needs to start looking seriously at what the impact here fiscally is going to be as well.

Senator MENENDEZ. Thank you.

Senator CORKER?

Senator CORKER. Thank you, Mr. Chairman, and I thank each of you for your testimony.

Rev. Ball, I certainly appreciate the scripture that you referred to on the front end. This is certainly a place where that can be utilized heavily.

I also was interested in your audacious comments speaking on behalf of the entire religious community, and upon hearing that, I have got three or four other issues I want to talk to you about after this.

And, General, I appreciate also your tremendous service to our country.

I am going to focus most of my questions to the three gentlemen in the middle. I thank all of you, though, for your testimony.

One of the things we have done since we have been here—first, we have observed that every time a Senator goes to a country, we come back and authorize a new development program. I mean, we see a need. We authorize it, and we end up having lots of aid programs that are not fully synchronized, by the way, all of which in most cases have merit. And so we have asked the administration to streamline those, to put those in priority. We are actually meeting with one of the administration officials this afternoon. They have been working with us to do that.

But as it relates to adaptation, are there some existing development programs, aid programs, that we now have that we could orient in a different way to be far more effective as it relates to adaptation itself?

Mr. WASKOW. I am happy to take that.

I think this is a multi-part puzzle. Climate change adaptation is something that is essentially a new and additional task that has to be undertaken in the context of a new situation. This is an additional obstacle and burden on developing countries. So because of that, our view is that additional resources beyond existing development assistance are going to be needed to tackle it.

At the same time, this is something that has to be done very much in alignment with ongoing development strategies. It cannot be simply off in its own climate adaptation bubble of some kind. So I think your suggestion, if I understood it right, that we need to integrate climate change understandings and adaptation approaches into our broader development work is absolutely correct. That is something that AID can and has begun to do and I think, if resourced properly, would be able to do much more of.

Let me say this does go to the resources again. Even when we are integrating adaptation into ongoing development approaches, that does take quite a bit of resources to be able to have the intellectual capacity within development agencies like AID and actually play it out in the field.

So I think you are absolutely right that we should be doing that integration. At the same time, we need to be ensuring that it is not just a matter of saying, oh, we can redirect current strategies, current resources, but in fact, augmenting the resources sufficiently that we can tackle this new challenge.

Dr. GREEN. Thank you, Senator Corker.

I think there are areas where we could redirect before we add additional funding. One of those areas is research and development on things like genetically engineered crops which can adapt to varying climatic conditions, saline conditions, and the like, drought conditions, and also promotion of policies that lead to those deployment of genetically modified crops in the field. Right now there are many international obstacles to the use of genetically modified organisms and crops that I think we could divert some more attention to repairing, to fixing.

Also, research and development on geo-engineering which may become necessary if there are high-end outcomes from climate change.

And also, I think we could do more to increase the access to energy that is going to be vital for developing countries to be able to respond to climate change, to adapt and be resilient. Having ample supplies of affordable energy is very important for reacting to change and an awful lot of the world has virtually no access to energy or what access they have is very harmful to their health because it is highly polluting forms of energy.

So in those areas where we have existing programs, we could augment them or redirect funds into those areas to help build the knowledge base and the infrastructure base the developing world will need in order to be resilient in the face of change.

Mr. O'DRISCOLL. Thank you, Senator Corker. You are certainly asking the right question.

I think we would agree with David. I think there are at least two sets of issues here.

First of all, the particular threats and challenges that are created by climate change are augmenting a series of international development challenges that were there on the table before. Again, these things have been brewing for a while. We are just becoming more familiar with them and more capable to identify them as climate change challenges. So we would also strongly support the notion that climate change and climate change adaptation needs to be understood as the particular frame of our international development policy.

That said, one of the strongest arguments for climate adaptation funding is the risk to existing development infrastructure and investment that has been made over the course of decades, gains that have been made that could be lost or wiped away by the threat of climate change. And so the notion of how you climate-proof existing international development programs on the one hand and how you anticipate the impact of climate on future programs is crucial.

We were meeting at the State Department yesterday with a number of staff about the President's food security initiative and made strongly the point that, as welcome as that emphasis is on food at a time that a billion people are hungry, we want to make sure that the strategies and the initiative are factoring in the climate impact on agriculture as well.

Senator CORKER. I know that sort of the topic du jour to focus on is climate change and understandably so. And yet, when I look at issues like we saw in Darfur in Sudan—and other places we have seen the same—there is a complicating issue and that is we have climate change that is occurring, but we also have huge masses of migration and it exacerbates. I mean, in many cases with the desertification that is taking place, you might say, well, really it is not a function of climate change. It is a function of a mass of people coming into an area and just absolutely exacerbating the water issues.

Should we also, as we look at this, be focusing more on the bureau of migration, I mean, looking at migration, looking at the bureau of population? Should those kinds of things not—let us face it. I mean, a big issue and maybe I am saying something that is not within the mainstream politically to say, if you will. But I mean, a big part of our issue is we have more people in the world today than natural resources can support in some cases. And are we focusing appropriately on those kinds of migration issues and population issues tied to this issue also?

Mr. WASKOW. Well, I think the answer is that it is not an either/or. If you take the case of Bangladesh and the Indian border, we need to be looking at what the implications are for migration and security in that context and very much having the institutions that address those issues really focusing on what is coming down the pike and what is already happening in instances like that.

And at the same time, we need to be thinking about, in Bangladesh, for example, how can we work with communities on the ground so that they are better prepared for the impacts that they facing. Floating gardens was an example that Jim raised of an approach that has been successfully used in Bangladesh. We have been working there for years on early warning systems for severe weather events, and I think with the most recent cyclone that we saw, that that has had some very positive effect. There are going to be a number of other interventions, if you will, that are going to have to be made, I think, in Bangladesh to try to alleviate some of this migration pressure.

So I think it is not an either/or. We both have to be looking at how to create that resilience to climate on the ground and also looking at some of these other issues that are intersecting with the climate impacts.

Dr. GREEN. I think migration is an interesting question and I think we could focus more on that issue. In some ways, migration can exacerbate problems, as you pointed out.

In other ways, migration is a desirable outcome. You want to get people out of climatically fragile areas. One of things climate science has taught us is that the climate is much more variable than people thought it was previously, not just from anthropogenic impacts, but simply because the climate is prone to sharp shifts in

short periods of time. And we should be adapting our living patterns to reflect that new knowledge. So areas that already drought-prone are probably good areas to leave. Areas that are already flood-prone are probably good areas to move back from.

So I think we need to look at migration not only as a negative or as a potential risk, but how can we actually promote good migration from dangerous areas as opposed to bad, sort of sudden responsive migration that is unplanned. And that I think is a key challenge, figuring out a way to establish a system that leads to that kind of migration you want and does not lead to the kind of migration you do not want because it takes too long.

Mr. O'DRISCOLL. Well, Senator, as you know, concerns about the impact of a growing population have been talked about since Thomas Malthus, and we have heard all sorts of dire predictions.

I think the way to distinguish the two issues that I do agree with you are related is to say that it is one thing to figure out what the impact of a growing population will be on a fixed resource base. It is another thing when you start looking at changes in that resource base that will complicate those calculations.

So I think we need to do both. We need to think about what a growing population strain will put on existing infrastructure, but as these predictive models suggest, if those resource bases are going to dwindle, then we are just going to complicate the implications for population growth and for migration.

Senator MENENDEZ. Thank you very much.

Senator Shaheen?

Senator SHAHEEN. Thank you, Mr. Chairman, and thank you all for your testimony.

There have been a variety of amounts thrown out that are going to be required for an adaptation fund. How do you arrive at that number, and how important is it that we agree on a number? Is that critical to accomplishing a global deal?

Dr. GREEN. I think that, if I may, Senator, gets to the question of predictive models. The way these numbers tend to be arrived at is someone does an economic study of predicted damages and they come up with a fund that they believe will avert those predicted damages. The problem is climate models, even if they can have some accuracy in the very big global picture, they have virtually no accuracy below the continental scale. And so the ability to actually predict—

Senator SHAHEEN. Wait, wait, wait, wait. What do you mean below the continental scale?

Dr. GREEN. When climate models make predictions, they can predict for the whole globe, and they have a certain amount of confidence in their outcomes. When you scale the modeling down, uncertainties go up. So when you get to the continental level, you can make some predictions. Subcontinental—even the IPCC admits there is virtually skill to the models in making predictions at the subcontinental level. That means you cannot actually predict what the changes are. You cannot put a monetary amount on it ahead of time.

And that is why I have focused on the question of how do you build resilient systems independent of creating a big fund or independent of picking a dollar amount because I do not believe you

fundamentally can know where these changes are going to occur or have any confidence that your number is a correct one or a meaningful one.

Senator SHAHEEN. Mr. Waskow?

Mr. WASKOW. Well, two things. One is there is uncertainty and instability in the system. That, in fact, is the problem with climate change. But I think what we are seeing with the estimates, that they have been growing in time in terms of what the adaptation needs are. Oxfam 2 years ago did an analysis saying that we thought that adaptation needs in developing countries in total would be about \$50 billion. Now the World Bank comes out just a couple weeks ago and says over the 2010 to 2050 period, that it is an average of \$75 billion to \$100 billion a year. The UN Development Program has said \$86 billion a year, and so forth. So I think that we see that not only are their numbers large, but in fact estimates have been growing.

The other thing I want say is that many of the adaptation strategies that we think should be undertaken are, in fact, win-win strategies in the sense that they both are important for climate adaptation purposes and also are economically sound and sensible and winners. So, for example, drip irrigation, according to the McKinsey study, is a strategy that not only provides adaptation benefits but also is a net economic gainer. You reduce water usage in important ways and you increase your crop yields. So I think that in many of these cases, the need to really put these resources forward is not only necessary but also optimal.

Mr. O'DRISCOLL. Thank you, Senator. As David has suggested, there is a broad range of estimates. The low end of the United Nations Framework Convention on Climate Change is \$25 billion a year, rising to \$67 billion; \$86 billion per year forecast by the United Nations Development Program, and so forth. The World Bank, now says \$75 billion to \$100 billion. So I agree with you that the range of those numbers is confusing and it makes it hard to focus on what the exact number should be.

However, I think what might be helpful is to even take the low end of that range, the \$25 billion estimate from the United Nations Framework Convention, and say what is the distance between that expense and, for example, the amount of money committed in the American Clean Energy and Security Act of \$750 million and how the United States and the global community can step up even to that low end of the adaptation bar. So we are very hopeful that the Senate's deliberations will look at that issue and see whether we can substantially increase the amount of funding.

Senator SHAHEEN. Again, to go to the second part of my question, how important do you think that figure is in arriving at a global deal?

Mr. WASKOW. You know, many developing countries have come to the negotiations pointing to numbers like the World Bank's numbers or the UN Development Program's numbers. The numbers are very large. One might say that the U.S. responsibility should be based on our historic emissions of greenhouse gases, 25 percent, or at the World Bank, we contributed close to 20 percent of the funds based on that institution's metrics. So what we ought to put into the pot is probably somewhere in that percentage ballpark.

What the total pot would be, of course, is a matter of negotiation. Countries have said this is what is needed based on these estimates. We think that that has to be generated through the negotiating process.

I think what is critical for the United States is to get over a certain hurdle, right, so that we can be taken seriously at the negotiating table. I personally, having watched the negotiations closely, having been at many of the negotiating sessions over the past almost 2 years, do not think we have crossed that hurdle yet. I do not think what is in the House-passed legislation gets us there yet. So we do think it is critical that the Senate expand on what was done in the House.

Senator SHAHEEN. Thank you.

As we look at an adaptation fund and how it gets used, how do we ensure that we are undertaking the most appropriate measures to address adaptation in various places? Several of you have suggested some measures are more optimal than others. Do you have thoughts about how we allocate those decision-making capacities and how that gets handled in an adaptation fund?

Mr. O'DRISCOLL. Yes, that is a great question. Thank you very much. And we have a recently published paper ["Equitable Adaptation Finance: The Case for an Enhanced Funding Mechanism under the UN Framework Convention on Climate Change," available at <http://www.actionaidusa.org>] on that very issue that I would love to put in your hands after the hearing.

Senator SHAHEEN. I thought you might.

Mr. O'DRISCOLL. Yes.

But I think one of the key principles—and this perhaps goes back to Senator Corker's earliest comments. How do we make sure that taxpayers' money really is being invested wisely and is accountable? And I think from our perspective one of the best ways to make sure that it is being spent efficiently and accurately is to ensure transparency and accountability in whatever those financing mechanisms would be. And moreover, I think we would say that those funds are much more likely to be invested wisely and efficiently if the communities are involved in the design, the implementation, the monitoring of the projects themselves.

So those are key principles for us, which then led ActionAid to ask the question, what institutions are most likely to be able to provide that level of participation on the one hand, accountability and transparency on the other hand? That is where we have raised some questions about the direction the conversations are currently leading. Both the World Bank and the Global Environmental Facility, which are put out there as likely recipients of this adaptation fund, have had some serious questions. For example, an internal World Bank report suggested that as of 2006, about 75 percent of the World Bank's projects had not involved significant community participation.

So one of the suggestions that we are making strongly in our paper is that the Senate and the administration look long and hard at the possibility of creating a new enhanced adaptation funding mechanism under the auspices of the United Nations Framework Convention on Climate Change, which is not only, we hope, an opportunity to expand the oversight, the transparency, the account-

ability of the process but also to this key question of how we get a global deal in December, a huge indicator of good will and of openness and leadership on the part of the United States around these issues.

Senator SHAHEEN. Thank you. I actually am out of time, but I wonder, Mr. Chairman, if I could ask one final question—

Senator MENENDEZ. Go ahead.

Senator SHAHEEN [continuing]. —to Rev. Ball. And I want to try and be diplomatic about how I put this. But I think there were a number of people who were, frankly, a little surprised but very much appreciated the support from evangelical Christians for addressing climate change. And as we look at the challenges of getting the votes in the Senate, many of the people who have expressed reservations about any legislation come from parts of the country that have very strong evangelical Christian populations.

So what do you think the prospects are for engaging the evangelical community on this issue to try and get legislation passed?

Rev. BALL. Well, as I said at the beginning, there is this group of senior evangelical leaders called The Evangelical Climate Initiative. In my community, you need senior leaders like that to bless the facts. Right? In other words, in terms of the science and to be messengers that are trusted. Unfortunately, for some in my community, scientists are not necessarily the most trusted of messengers, or honestly, neither are necessarily Democratic politicians. Apologies.

Senator SHAHEEN. I appreciate that. [Laughter.]

Rev. BALL. So we have gotten our leaders to step up and—

Senator MENENDEZ. Only Democratic politicians? [Laughter.]

Senator MENENDEZ. You do not have to answer that.

Rev. BALL. So we have gotten our leaders to step up and say this is a crucial issue. A key part of that is caring for the least of these, as we talk about it in our community.

We are not going to be able to say to our folks that this is something to support unless the funding levels are sufficient, and the funding levels in the House bill are not sufficient. We want to fight hard and we will if those funding levels are sufficient.

So we need to have a bill that our community can fight for. It is already a tough sled because some in our community are not with us, and so to engage those we know will be, we need to have something that we can fight for.

Senator SHAHEEN. Thank you. Senator Corker took notes on that.

Senator MENENDEZ. Senator Cardin?

Senator CARDIN. Well, Mr. Chairman, first of all, thank you for having this hearing. I think this is an extremely important part of the challenge that we have before us.

I participated this past weekend in a discussion with the OSCE in Greece on climate change. We had 56 states that were represented there, and we had a chance to debate how we can move forward in Copenhagen. Of course, the question that was asked the most from my participation is where is America. Where is the United States? Where is the leadership from this country?

I pointed out the fact that the House has already acted on legislation. The Senate legislation has been introduced. We are having

hearings at the end of this month, and I am optimistic that America is going to be a leader in Copenhagen.

But you know, we look at it from the developed nation's point of view, and that is we look inward to how we are going to get a bill done by dealing with expanding jobs in America and building the infrastructure in this Nation that is necessary in order to achieve our targets and dealing with consumers to make sure that they are protected through this and how we are going to deal with transition with industries to meet the new challenges of energy.

But in order to be successful, if we are going to have international targets that are going to bring down carbon emissions, then we have to deal with the issue that we are dealing with here, and that is financing. How are we going to deal with the developing world? They have already been confronted by the impact of global climate change. They already have seen what we call climate migrants who are fleeing their country and causing instability. And there are international responsibilities here that we need to deal with and how we finance it is critically important. So I think this hearing is critical if we are going to be successful in dealing with the climate change issues.

But I just want to emphasize one point and ask for whoever on the panel would like to respond—and that is, how do we have accountability on these funds? I look today at mineral wealth nations that are poor, that the mineral wealth has been a curse because it fuels corruption and it does not help the people of that nation. As I look at how we are trying to finance these international efforts on global climate change, it could very well be a revenue flow to nations that do not have the maturity to deal with it and could be a funding source for corruption, therefore, not only failing to accomplish the goals that we are setting out, but also fuel additional international problems of corruption.

So how do we avoid that? How do we put into this international effort to avoid those issues? Rev. Ball?

Rev. BALL. Earlier Senator Corker said I was saying the whole religious community. That was a bit of shorthand. I was more careful in my written testimony.

But my organization—I knew you were kidding—is the evangelical partner of the National Religious Partnership for the Environment. It includes the U.S. Catholic Conference, the National Council of Churches, and the Coalition on the Environment and Jewish Life. And together we have put out a statement talking about how we should do some of these things. One of the things that we have talked about is exactly these types of questions.

I already criticized Waxman-Markey a little bit, so let me praise Waxman-Markey here. We think they got it pretty good. One of the things that we want is to see about 40 to 60 percent of the funds staying with USAID, and USAID being the ones to be able to figure out who will get the grants. Hopefully, some of those go to evangelical relief and development organizations, but folks who are on the ground who USAID already has relationships with and there is transparency and monitoring all those kinds of things for some of the reasons that you have raised.

We think there needs to be balance of multilateral and bilateral funding. If we are able to have 40 to 60 percent, as it says in the

Waxman-Markey bill, kind of stay at USAID to then be given to PVOs, secular or religious, to do work, especially work within communities—that was another thing that Peter highlighted that is really important. These relief and development organizations are working at the community local level. So I think for that kind of transparency and balance of funding, I think if you have that kind of formula, that that would be very helpful.

Dr. GREEN. Thank you, Senator. You raise a very important question. I think it needs to be understood that many of the countries we are talking about that face the biggest climate risk also have the weakest institutions. They often lack property rights regimes. They often lack even the basic rule of law. And as you pointed out, we have seen in the past that U.S. aid programs can, indeed, find their way right into the hands of the very people that are victimizing others and causing more trouble.

So I would argue that we really need to keep not 60 percent of this under the control of U.S. agencies. We should keep virtually all of our aid under the control of U.S. agencies. And then we should institute the kind of transparency initiatives that the President has talked about with regard to science, transparency in science. There also should be transparency in the way these projects are funded and the way they are monitored and the way their performance metrics are established to make sure that we are getting some value for what we are spending.

And I just have one question. Senator Shaheen had asked a question I did not get the chance to point to. There has been discussion here about putting a number out before Copenhagen, and I guess maybe I would ask you a question. Why would you go into negotiations having already put out your number as to what you are willing to spend instead of actually negotiating it at the point where you are going to have the maximum leverage?

Senator CARDIN. Well, I think we have put out the number. The international community has put out the number. It is no greater climate change 2 degrees centigrade from pre-industrial levels. I think that is going to be, I hope, the standard that we set. Now, how it is divided among the nations is something that obviously can be negotiated.

I just want to challenge you, though, on the point. And Mr. Waskow, I will certainly give you a chance on this. Okay, maybe we can do a better job with U.S. contributions here. But we are talking about international in Copenhagen, and we want to make sure there is a fair sharing of the burdens of the developing world in dealing with these problems.

We have not been successful on mineral rights internationally. The EITI is a strong effort. Senator Lugar and I have introduced legislation to strengthen the U.S. involvement and to make it more multinational. But the track record has not been that good. So why do we expect that the international community will assist us in making sure the money actually is used in an open way?

Let me give Mr. Waskow a chance.

Mr. WASKOW. Thank you, Senator.

I think there are three things that need to be done for the purposes of accountability.

One has to do with community-level engagement, and this is something that several of us have stressed here. It is critically important that communities be involved in the development and implementation of adaptation strategies and programs. Without that, the success on the ground is likely to be severely diminished, and I think that the level of accountability will also be diminished if you do not ensure that communities, in fact, are engaged and making sure that the programs and the funding, in fact, is meeting the needs on the ground.

Secondly is monitoring and evaluation. I agree that we need to have clear metrics in place and we need to have an evaluation process that very clearly spells out how we are looking at what the success is of the funding.

On those first two elements, community engagement and monitoring and evaluation, I think the House-passed legislation, in fact, does a very good job.

There is a third element that I think we ought to seriously consider, and that is really building off the experience, the model of the Millennium Challenge Corporation. And that model, in essence, requires that the United States reach agreements with other countries' governments on the parameters and objectives for the ways in which development assistance will be spent and then has a very clear feedback system for monitoring and evaluation. We put in place multi-year grants with these governments and have these kind of very robust systems to look at both what needs to happen and whether it has happened. I think that incorporating that, not all of the funding that Congress would put forward, but I think incorporating that into the adaptation resources that Congress puts forward, in fact, would be an extremely important step for the Senate to take.

Dr. GREEN. Senator, I agree with you. This is a huge challenge. I am not saying that the European or the rest of the world, developing or developed, are going to put up the same kind of resources we are talking about and run their programs in a highly rigorous way that we would approve of. And I think that is something that should be understood going into negotiations. It should be required that even the developing countries, China and India, contribute to these processes because the Chinese are already the largest emitters of greenhouse gases and they are going to, by far, be the biggest contributor in the big picture of things in the long-term scheme. So I think it is very important that we require these. But they also must require the same kind of institutional settings we have, which is performance metrics, transparency, real delivery of funds, and so forth. And there have to be agreements in place that if they do not, we do not.

Mr. O'DRISCOLL. Senator, may I jump in on that?

Senator CARDIN. Surely. Go ahead. The chairman is being generous with my time.

Mr. O'DRISCOLL. Just to say community engagement is critically important, but also making sure that the conditions that are attached to international funding include communication of amounts and mechanisms to civil society because I can tell you about sitting down in Malawi with a group of parliamentarians who said, "the IMF has come to town. They have sat down with our finance min-

istry. They have negotiated a loan. The conditions on that loan are not apparent to us. We are being asked as a parliament to approve that loan without knowing the conditions.”

Senator CARDIN. Transparency is absolutely essential. I agree with you, and I think that is one area that we can insist upon not only with America’s participation, but the international.

Thank you, Mr. Chairman.

Senator MENENDEZ. Thank you.

I have one or two other quick questions, and then we will see if anyone else does.

Dr. Green, in your written testimony, you seem to be a lot more reticent than even in your oral testimony about any monies being spent in this regard, or at least you raise serious cautions about it. But I listened to your response to one of the questions where you said, “I think one of the key questions is how do we build a more resilient system.” I think you and I could both agree that in order to build a resilient system, there is going to be money necessary. So for those who might suggest that there should be no money as it relates to adaptation, that is a difficult proposition if we are going to try to build even resilient systems.

Dr. GREEN. Well, I agree to a certain extent.

I think there are two areas in which we can contribute. One is we could contribute money, or the other is we could contribute experience.

In the case of the developing countries such as China and India who have advanced technologies, we should be encouraging them or showing them how to build resilient systems and encouraging them to move away from, for instance, state-run infrastructure and things of that sort. So I think we have leadership that we can exert that is non-monetary to try to teach what resilience is to countries that do not actually have the institutions at hand to implement it.

If money is to be allocated, I think it should be reallocated from existing uses and also should be targeted with extreme care. As I said, I mean, I understand the need for some—there may be some need, but the establishment of how that is done is really a huge challenge—

Senator MENENDEZ. You mentioned China and India, and I probably would agree with you there. Those are countries that are resource-wealthy or well-off. But we could have the greatest experience to share on resilient systems with countries that have absolutely no wherewithal to implement such systems. So we are going to need some resources here. We might argue about what the level of that is, but we are going to need some resources. I think as a foundation question we should agree to that.

General Wald, I just want to ask this. Having listened to your testimony, there are some in the Senate who believe that the CIA is wasting money by opening its Center on Climate Change and National Security. I wondering if you are familiar with what work is and what your views are on that.

General WALD. I am. In our first report, we recommended a national intelligence estimate be done this issue, which was somewhat controversial I think. It got a lot of blow-back from some Senators and Congressmen.

I know the person that runs the center. As a matter of fact, he was my instructor pilot in 1971 when I learned how to fly. So it is kind of ironic. But he is one of the most responsible individuals I have ever met, one of the most intelligent. He believes this is an issue. And they are not going out and doing human intelligence per se. They are doing an estimate of what they see, literally and figuratively, the environment we are going to have to contend with in the future. That is part of their job is estimating threats and estimating situations.

So I think it is a good idea, and I think the criticism of it is misplaced.

Senator MENENDEZ. Let me ask Mr. Waskow. Because of glacier melt in the Himalayas leading to water scarcity and because sea level rise will lead to more coastal flooding, China and India are quite vulnerable to climate change. But the domestic bills here in Congress are quite clear that well-capitalized countries such as India and China are not targets of the adaptation fund. What about that view internationally?

Mr. WASKOW. There has been a focus internationally on what are often described as the most vulnerable developing countries. That is the language used in many of the UN documents, including the Bali Action Plan that underpins the current negotiations. Those are generally understood to include small island states, least developed countries, and also Africa, countries in Africa.

Now, I think that makes sense as a basic rubric, but at the same time, I think it does leave out some countries. And so we need to think about how to address that. For example, no countries in the western hemisphere other than Haiti are classified as least developed countries. So that leaves out a number of countries, all of Central America, countries in South America that are deeply affected. So I do think we need to think more about how to create rubrics and parameters that really make sense.

Senator MENENDEZ. No one is seriously arguing that India and China, for example, should have access to such funding.

Mr. WASKOW. I do not think China sees itself as a—China knows that it needs to do adaptation because, as you said, they have a very serious water issue.

Senator MENENDEZ. The question is, should they have access?

Mr. WASKOW. I do not think they see themselves as needing access.

I think India may be a slightly different case for a couple of reasons. One is their GDP per capita is less than half of China's. Their emissions are about a quarter of China's. So I think from their perspective, they clearly have serious issues that they are going to need to address and I think maybe see themselves as deserving of some of that assistance. I think we would tend to agree with that, but I think India is certainly a question mark that needs to be taken up.

Dr. GREEN. With all respect to Mr. Waskow, I think your question is how does the international community feel about our not allowing access to these funds to China and India. From what I have read, that is not an accepted position internationally, nor is it accepted by China, which has put forward actual demands for percentages of GDP wealth transfer from the United States or from

developed countries to developing countries including themselves. So I think while the position is pretty well understood in the United States that we do not think that China and India should be recipients of these funds, internationally I do not believe that is the case, and I think there would be an emphasis on moving some of those funds to China and India whether U.S. funds or international funds.

Senator MENENDEZ. That would be something for negotiation and clearly something that if we come in with a significant threshold, we will be in a better position to negotiate on.

Let me ask Rev. Ball. The role of government can sometimes be very divisive in the faith community, and I am just wondering, as I hear your testimony and some of your answers here, is climate change adaptation something for which there is deep disagreement or a broader agreement? I am not asking for universal agreement. That is almost impossible.

Rev. BALL. Yes. It is interesting. It is a very helpful question because you may recall during the campaign that Governor Palin was asked what was her position—what were her views on climate change, and she basically said while I think global warming is happening, I am not so sure how much humans are causing it. That is a view that is shared by some in our community.

But if you believe that global warming is happening, regardless of the cause, and you start to understand the seriousness of the impacts that are going to occur, then—when we would explain that to someone, even those who think it is baloney in our community that it is being caused by humans, but nevertheless see that it is happening, I think they would say, yes, we have got to help these folks.

Just like I contribute money to World Vision to help with other kinds of humanitarian issues, if global warming is going to make these things worse in terms of refugees and health issues and food security and water scarcity, the things that I give money to help people with, then yes, we should do that. So I actually think that adaptation is a place where there is going to be a lot of consensus within the religious community.

Senator MENENDEZ. Senator Corker?

Senator CORKER. Mr. Chairman, thank you. I think this has been a great hearing and I thank each of you for what you have had to say.

I think Senator Cardin's comments were very, very good, and I think that line of questioning—as, of course, our chairman and others. But to sort of figure out a way to link up the heart that I think Rev. Ball is trying to embody here with the practicality of monies being spent in a way that makes sense, something that many of the folks in his community at this time of the year are talking to their congregants about and certainly as legislation occurs, if it occurs, my guess is that this whole issue of how you actually expend money in a way that makes sense and there is a desired end I think is very, very important.

I would actually challenge the community that is the recipient of these monies to work more closely together to develop something that makes sense in that regard. Part of it being multilateral, as

you refer to, part of it bilateral is going to make that very, very complex.

Not to give a travelogue, but most recently I was in Afghanistan, and you talk to citizens there on the ground and they are getting like 20 cents on the dollar of our aid. I mean, it is criminal. Lots of people are benefitting all along the way.

So I do think that the question Senator Cardin asked—and I think certainly if you look at the government—in most cases we are talking about countries that are very, very poor. They do not have a system there of checking corruption. So I think that is a very, very important thing to focus on.

I want to ask a question, and this is obviously slightly loaded. But we are already involved in adaptation now. I mean, we do things. We deal with that. If legislation like this passes, there is no question in my mind we will be involved more. There may be various things that each of us feel in different ways are most important. Obviously, you all are here about adaptation.

I was in the Amazon region recently, and I cannot imagine how anybody in the world would not think that the burning of those forests is not—regardless of how you feel about climate change, it is not a good thing. Okay? It is affecting the world. And so some people might say that monies ought to be expended there to keep that kind of thing from happening. I know the international community has disagreed with that.

But let me ask you this question. And it is loaded. Energy security has been something that has been important to me. The general talks about our national security in some ways as it relates to climate change. My focus on this area has been to figure out a way that regardless of how you may feel about all these other things, how do we craft a policy that moves our country and the world ahead. How do you do that?

How do you feel about a bill? You talked about not having enough money coming into adaptation. I mean, that is why you are here today. But these bills that are being put forth seem to move away from climate change and they move towards lots of people making lots of money. I mean, if you look at the U.S. cap group and how they as a group benefit from this, you look at buying off the hook and bullet guys that exist all around our country, you look at buying off the agriculture community, you look at buying off every interest group in the world which basically is taking money out of our economy.

So here you are people of good will, I think. I think you, on a daily basis, try to do things that are good for other human beings. How do you feel about a piece of legislation that is the centerpiece that basically extracts money from the very people we represent, syphons it off to various groups around the world? I am not talking about adaptation and I am not talking about the Amazon. Okay? But all those other areas. Do you feel like the end justifies the means and if it takes us buying off every organization and every interest group in the country to get it passed, it makes sense? Or would you like to see this body act more responsibly?

Dr. GREEN. Well, Senator, if I may. I think that is a crucial question.

Senator MENENDEZ. Only slightly loaded. [Laughter.]

Dr. GREEN. Only slightly loaded. That is true. I did not detect any hint of loading in the question.

This is one of the areas where I think it is important to think about technology development because one of the things that we can do that cuts around this question of corruption is we can develop the technologies that can be deployed in these countries to help them adapt to climate change. So, again, genetically engineered crops is a large area we should be working on developing new technologies. New energy technologies that can be deployed in these areas, new sanitation technologies that can be cheaply and easily deployed in developing countries. I think we have much more in terms of building things and technology advantage than we do in trying to get around corrupt systems and make sure that if we send money, it goes to the right hands. If we create technologies that can be deployed, it is going to reach the lower levels and not profit as much the people we do not want to profit.

Mr. O'DRISCOLL. Senator, when you say that your question is loaded, I wonder if you are suggesting that you would like us to write the legislation for you so that we can make sure adaptation is—

Senator CORKER. My guess is adaptation would have a larger chunk. [Laughter.]

Mr. O'DRISCOLL. It would have a significantly larger chunk. So we will be working on that bill and we will get to you shortly.

You know better than we do the complications of getting legislation passed and the realities of politics in this country. So I think our position on any bill is that there is a certain amount of that that we certainly cannot avoid and that that is why we appreciate the efforts that you are making and the meetings that you are having with the different groups who have some interest in this issue.

That said, I think from where we sit, there is absolutely no alternative to moving forward with a bill that addresses this issue, and we will be thrilled to talk to you as you work out the various interests and how they come together. But I do not think from our perspective we could possibly say that the best solution is no bill and not addressing this issue.

Mr. WASKOW. If I could amplify that a little from our perspective. We have long had the position that 100 percent of the resources in a climate bill should go to public benefit. That will likely not happen. So I think we all have tough calls to make.

But let me say this. We focused at this hearing on adaptation and there is no question that is a critical task ahead. As I said, even if we eliminate emissions today, we will have climate change growing and increasing over the next few decades. So we have to take on this adaptation challenge. At the same time, if we do not tackle the emissions reduction challenge, the adaptation challenge 40, 50, 60 years from now will be so immense that it may not even be possible. We will not be able to have the tools to adapt out into that time frame. So action on climate change is urgent, and as I said, we have tough calls to make, but I do think that we need to do something now and not wait.

General WALD. Can I just make a comment?

First of all, I agree with everything that was said. But I would say that there needs to be—

Senator CORKER. Everything I said or he said?

General WALD. Everything you said, Senator.

Senator CORKER. Thank you. [Laughter.]

General WALD. But seriously, the big issue that needs to be addressed, I think, is—I mean, money is an issue. It always is. But is U.S. leadership. This is not going to be effective unless we really take a part in this. Our saying in European Command is we wanted to use OPM. That is “other people’s money.” We need to have them focus the money in areas that are beneficial to us, and we are not going to be able to do that without serious leadership. And so unless we do something as a Nation, none of this is going to be fixed. And by the way, it is going to be hugely inefficient unless we are leading.

Senator CORKER. Reverend, do you want to close us out with a benediction here?

Rev. BALL. Well, that would be interesting.

I just was recalling that a professor at Harvard—Professor Stavins I think it is—did an analysis on the Waxman-Markey bill, and he came to the conclusion that 80 percent was going towards public benefit and 20 percent towards private. So if you go by the adage of don’t let the perfect be the enemy of the good, then I think, well, we have got to make the sausage, and so let us at least have a good-tasting sausage.

Senator MENENDEZ. That is one great benediction. [Laughter.]

Senator CORKER. Thank you all very much.

Senator MENENDEZ. Thank you very much.

This will conclude this hearing on addressing the impacts of climate change in the world’s most vulnerable nations.

Let me thank all of the witnesses on behalf of Senator Corker and myself and our other colleagues for participating. I think we lay a lot of work here to help the committee prepare as it moves forward on a climate change bill.

The record is going to remain open for 1 week to allow Senators the chance to ask follow-up questions in writing. We ask, if you receive them, to please try respond as quickly as possible.

With that, the hearing comes to a close.

[Whereupon, at 11:50 a.m., the hearing was adjourned.]