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Witnesses:

Panel I

Christopher Field

Director, Department of Global Ecology, Carnegie Institution for Science, Professor, Stanford University

John Christy

Director and Distinguished Professor, Earth System Science Center, University of Alabama in Huntsville

James McCarthy

Alexander Agassiz Professor of Biological Oceanography, Museum of Comparative Zoology, Harvard University

Panel II

John Griffin

Secretary, Maryland Department of Natural Resources

Margo Thorning

Senior Vice President and Chief Economist, American Council for Capital Foundation

Jonathan Felding

Director, Los Angeles County Department of Health, National Association of County and City Health Officials

Committee Members Present:

Barbara Boxer (D-CA), Chair

James Inhofe (R-OK), Ranking Member

Bernard Sanders (I-VT)

Benjamin Cardin (D-MD)

Jeff Sessions (R-AL)

Frank Lautenberg (D-NJ)

Sheldon Whitehouse (D-RI)

John Boozman (R-AR)

On August 1, 2012 the Senate Committee on Environment and Public Works held a hearing to receive an update on the latest scientific studies on climate change and strategies to adapt local communities its impacts. According to a 2011 National Academies report, *America's Climate Choices*, climate change is occurring, poses a significant risk to humans and natural systems, and is primarily caused by the emission of greenhouse gases from human activities. Conclusions linking climate change to anthropogenic influence have been doubted by a select group of scientists and national leaders, including Senator James Inhofe (R-OK) who authored "The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future."

Chair Barbara Boxer (D-CA) opened the hearing with statements that the evidence for climate change is "overwhelming" and "human activities are the primary cause." She mentioned the New York Times article featuring Richard Muller, a former climate denier who now agrees the scientific evidence that climate change is occurring and humans are "almost entirely" the cause. Senator Boxer cited her efforts in 2007, after becoming Chairman of the Environment and Public Works Committee, to have senators express their views on climate change. More than one third of the Senate responded, including Senator John McCain (R-AZ) who called for action to mitigate and adapt communities for impacts of climate change such as drought, declining snow packs, forest fires, melting ice caps, species dislocation, habitat loss, and extreme weather events. Chairman Boxer discussed recent warming phenomenon, citing reports by the National Oceanic and Atmospheric Administration (NOAA) that the previous twelve months have been the warmest since record-keeping began in 1895 and during June 2012 over 170 all-time warm temperature records were broken or tied in cities throughout the U.S. She commended the Obama Administration for establishing new automobile efficiency standards that will reduce carbon by over 6 billion tons and save \$1.7 trillion in fuel costs, and the efforts of the General Services Administration (GSA) in reducing energy consumption by 20 percent since 2003. Chairman Boxer emphasized the economic advantage of preparing the nation for climate change. According to a Brookings Institute report, 2.7 million people were employed at 40,000 clean energy companies throughout the nation, surpassing the number employed by the fossil fuel industry. She concluded

that taking action to combat climate change now “will benefit us and future generations.”

In his opening statement, Ranking Member James Inhofe (R-OK) claimed that the global warming movement has collapsed since the last climate change hearing in 2009 and efforts to institute a cap-and-trade system are “dead and gone.” He said the global warming movement failed because the “poor science” conducted by the United Nations Intergovernmental Panel on Climate Change (IPCC) was exposed by the science community and notable media outlets including the New York Times, the Washington Post, Newsweek, and UK Daily Telegraph. Ranking Member Inhofe emphasized that global warming is no longer addressed by the current administration, evident by the lack of federal representation at this hearing and the failure of President Obama to attend the Rio+20 sustainability conference. He said President Obama is now attempting to appear as a “friend” to the fossil fuel industry by proposing the construction of oil and gas pipelines through Oklahoma, but continues to spend \$68 billion on a “global warming agenda” that “has been a disaster.” Senator Inhofe concluded that the nation should embrace the U.S. fossil fuel “energy boom” in order to improve the economy, ensure energy security, and become energy independent of the Middle East.

In response to Senator Inhofe’s claims, Chairman Boxer said the committee purposefully did not ask for federal witnesses in order to avoid having the hearing turn into an attack on the Obama administration.

Senator Bernard Sanders (I-VT) labeled Senator Inhofe’s views as “extreme and dead wrong.” Although the U.S. cannot prepare to address climate change alone, Sanders said Americans have “a moral and economic responsibility to lead the world” by cutting greenhouse gas emissions and incorporating more efficient and sustainable energies such as solar, wind, biofuels, and natural gas into the energy system. He cited a 2009 report by the McKinsey & Co. consulting firm and a 2010 study by the American Council for an Energy Efficient Economy, which confirm that we can reduce 2005 emissions levels by 17 percent by 2020. Through cost effective energy efficiency strategies such as retrofitting homes, households could save about 20 to 40 percent in energy costs and cut emissions by 20 to 40 percent. Addressing local adaptation strategies, Senator Sanders described the weatherization projects done on 55,000 homes in Vermont, which have saved households over \$900 per year on fuel bills. He criticized the government system for providing the fossil fuel industry with over \$113 billion in subsidies, while the wind and solar energy sector face extreme opposition to modest incentives. Sanders concluded that the “whole world is debating global warming...we can’t run away from this issue.”

Senator Jeff Sessions (R-AL) agreed with Senator Inhofe’s climate change skepticism and said that empirical data has demonstrated the “incorrectness” of computer modeling climate projections. Senator Sessions presented several graphs and said the data does not prove that global warming causes extreme storms and record high temperatures. The first graph constructed by scientists at NOAA shows that there have been more record low temperatures than record high temperatures on average since the 1930s. The second graph produced by scientists at the Massachusetts Institute of Technology, compared computer model temperature projections to temperature projections based on satellite data. Senator Sessions explained that the line graph constructed from the observational data shows a temperature increase from 1975 to 2010 of only two-tenths of one degree and that temperatures have stabilized over the last ten years. He emphasized that the observed temperature increase is much lower than what was projected by computer models. He concluded that the government should not ask the American people to “bear an immense economic burden” to meet the “visions of people who are not being proven correct by reality.”

In his opening statement, Senator Benjamin Cardin (D-MD) said that climate change is “real and upon us.” He commented that average temperature values can be misleading and the nation needs to recognize the significant costs extreme weather events can have on society. He mentioned the financial and health burdens associated with the current drought, affecting 60 percent of the country, and the recent heat wave and subsequent power outage caused by the 2012 derecho storm in the D.C. area. “Extreme weather events are not theoretical... they are the new normal,” Cardin said. He said the nation should improve water, public health, and transportation infrastructure, strengthen the electric grid, and prepare coastal zones and low-lying areas for sea level rise. Senator Cardin mentioned his Water Infrastructure Resiliency and Sustainability Act (S.1669) that would help adapt water systems to changing climate conditions. “We need to act now to protect our communities,” he concluded.

Senator Frank Lautenberg (D-NJ) said the nation should not adopt a “laissez-faire” climate policy. He said the nation cannot deny the rise in temperature levels, which have led to the worst national drought in more than half a century, killing crops and forcing taxpayers to dole out \$30 to \$40 million for federal crop insurance payments, and have led to second most extreme wildfire on record, burning 1.3 million acres of land in Colorado in June. Senator Lautenberg said these events are “simply a sign of things to come” and Congress needs to “move on to solving problems rather than dismissing them.”

Senator Sheldon Whitehouse’s (D-RI) opening statement focused on scientific facts supporting anthropogenic climate change and the adaptation strategies being implemented in Rhode Island. Land surface temperature has increased by 2.5 degrees over the last 250 years, primarily due to increases in greenhouse gas emissions. In winter 2011-2012, carbon dioxide was measured at 400 parts per million (ppm), which is 50ppm over the maximum level scientists say the Earth needs to maintain a stable climate. He said that climate change is increasing the risk of extreme weather. According to the Environment America Research and Policy Center report, *When It Rains It Pours*, rainfall events are happening more often and producing about 10 percent more precipitation on

average across the nation. In regards to climate change challenges, Senator Whitehouse claimed that coastal states are facing “a triple whammy” because they must not only adapt to extreme temperatures and extreme weather events, but also to sea level rise. He said that Rhode Island has begun to adapt through the adoption of a climate change policy by the Coastal Resource Management Council to protect private property and coastal ecosystems, evaluate adaptation strategies, and partner with the Federal Emergency Management Agency (FEMA) to evaluate hurricane evacuation scenarios.

Christopher Field, Director of the Department of Global Ecology at the Carnegie Institution for Science, testified that a changing climate involves changes in the frequency, intensity, duration, spatial extent, and timing of extreme weather events. He summarized three conclusions about climate change: it is real, it has already caused increases in extreme weather events, and it amplifies the risk of extreme weather events that can lead to disasters. He said scientists can now better quantify the way climate change alters weather patterns and have concluded that extreme weather events are 20 times more likely to occur during La Nina periods. Field mentioned the severity of the 2011 Texas drought and said it is the nation's responsibility to support agricultural producers and ensure that farmers and ranchers have access to appropriate and reliable climate information. Field concluded that “protecting and enhancing our natural legacy, our economy, and our people” from the challenges of climate change requires an objective understanding of the associated risks.

In his testimony, Director and Distinguished Professor of Earth System Science at the University of Alabama-Huntsville John Christy said scientists do not understand the climate system well enough to accurately predict risks and recent anomalous weather cannot be blamed on increases in carbon dioxide emissions. Christy cited a study that shows human disturbance to Earth's surface disrupts the normal formation of the cooler, surface air layer during the night, when nighttime low temperatures are measured. He asserted that this study proves there is a discrepancy in temperature measurements that biases toward warming trends. He concluded that there is no legislative or fiscal action that could hinder the impacts of climate on society and that climate change alone is a weak platform to base a centrally planned change in energy production, infrastructure, and cost.

Professor of Biological Oceanography at Harvard University James McCarthy testified on the ocean's response to changes in increased atmospheric concentrations of greenhouse gases. He said new evidence and improved measurement techniques show most of the heat added to the atmosphere is stored in the ocean. Data collected by an international collaboration of universities and agencies, from a vast array of instrumented ocean buoys known as Argo floats, have shown that the usually constant temperature of the deep ocean is steadily increasing over time. Warming in the Arctic can slow the propagation of weather patterns across central North America because of alteration to the upper atmospheric jet stream, which McCarthy said explains the phenomenon of extreme cold temperatures in addition to extreme warm temperatures. He explained that the warming of the deep ocean is causing sea level to rise at a rate three times faster than it was over a century ago. McCarthy asserted that there is no scientific debate over whether or not the Earth's temperature is increasing, and it can only be explained by the increase in greenhouse gas emissions.

During the first question and answer session, Chairman Boxer asked John Christy to discuss the reliability of the study that discredits regional thermometer station measurements. Christy said the study has not yet been peer reviewed, but the thermometers are sensitive to “clutter” and long wave radiative forcing nearby some stations. Christopher Field disagreed and said NOAA has released peer-reviewed studies that have found no problems with any of the temperature measurements. Boxer then asked if state and local governments should ignore reports of climate change that could potentially harm the agricultural and tourism economies. Christy responded that there is no doubt climate change is occurring; it is merely a question of what steps should be taken to address climate change.

Ranking Member Inhofe asked if the credibility of the IPCC had been “cleaned up.” Christy responded that he does not expect much to change because the panel excludes scientists with different views on climate change. Inhofe then commented that one extreme weather event is not indicative of anthropogenic global warming. Christy agreed and said there are not a record number of high temperatures because the bases of these claims are taken from 30 year record stations rather than 100 year record stations. Christy added that scientists do not clearly understand the climate system.

Senator Sanders asked the panel if the majority of the scientific community was correct in believing that global warming is real. Field said scientific conclusions are nearly unified and McCarthy replied that evidence that humans are contributing is unequivocal. Christy said he is unsure the extent to which humans contribute.

Senator Sessions asked Christy to explain why there are both record high temperatures and record low temperatures. Christy replied that current thermometer stations are a poor metric to use for climate change and that temperature has leveled off over the past few years.

Senator Lautenberg commented that there is a difference between “a projection and a hoax.” He claimed that there has been a movement to discredit science and convince Americans to disbelieve the facts. Lautenberg asked the panel to explain the recent circulation of scientists' emails that express uncertainty of climate change science. McCarthy said none of the investigations into this issue have found any reason to question the possibility of climate change and the “science stands unaffected.” Lautenberg then

questioned the biological implications of climate change. McCarthy informed him that there is evidence on every continent of changes in the distribution of organisms, which reflect changes in the climate consistent with warmer, wetter, or drier conditions.

Senator John Boozman (R-AR) expressed his annoyance when the scientific community makes a conclusion one way or the other because it is not helpful for decision-making and they often turn out to be wrong. He discussed the rise in electricity prices that would occur if cap and trade were implemented and asked how the nation could respond to "man-made" climate change and not hurt the economy. Field responded that there are studies being conducted to develop smart adaptation strategies. He added that there would be consequences if the nation continues to increase greenhouse gas emissions in the same way there would be consequences to the economy if nothing is done to prepare.

Secretary John Griffin of the Maryland Department of Natural Resources opened the second witness panel of by discussing Maryland's response to the impacts of climate change. Due to regional land subsidence and global sea level rise, the coast of Maryland has experienced sea level rise of about one foot over the last century and could see an additional rise of three to four feet over the next 100 years. Griffin said climate change is increasing the coastal community's vulnerability to more frequent and severe floods, which submerge tidal marshes and lead to shoreline erosion, salt water intrusion, and higher water tables. He discussed a United States Geological Survey (USGS) report, which concludes sea level rise has risen three to four times faster than the global average since 1990 along an east coast "hotspot" stretching from Cape Hatteras to Boston, Massachusetts. Highlighting Maryland's vulnerability, Griffin said the state is currently losing 580 acres of shore every year due to erosion, thirteen Chesapeake Bay islands have disappeared underwater, and the 2.8 degree Fahrenheit increase in Chesapeake Bay water temperatures threatens critical eelgrass habitats. Griffin emphasized the efforts of Maryland Governor Martin O'Malley to mitigate the impacts of regional climate changes by creating the Maryland Commission on Climate Change. In addition, Governor O'Malley supported the Maryland Greenhouse Gas Reduction Act of 2009, which commits the state to reduce greenhouse emissions 25 percent by 2020, and instituted a Climate Action Plan to guide state-level climate adaptation efforts.

As Director of the Los Angeles County Department of Health, Jonathan Felding testified on the impacts of climate change on public health. Felding emphasized that extreme weather events cause more physical and mental health cases, increase the prevalence of vector-borne diseases, and disproportionately affect elderly, poor, and young populations. He said there is a significant cost associated with changes in the frequency, intensity, and distribution of extreme weather events as well. Estimates show that six climate change-related events from 2002 to 2009 were responsible for more than \$14 billion in health costs. Felding provided several examples of health sector adaptation strategies, including the enhancement of emergency preparedness plans and performance of climate-health vulnerability assessments in Los Angeles County, and the development of a heat vulnerability index in Portland, Oregon. He informed the committee that health departments across the nation have taken action to adapt because climate change threatens health and basic survival. He suggested that the nation expand upon investments made by the Center for Disease Control (CDC) and create a clear action plan throughout all levels of government.

In her testimony, Senior Vice President Margo Thorning of the American Council for Capital Foundation described three primary challenges faced by the private sector in adapting to near and long term variations in climate. Firstly, climate models vary greatly in estimates of when and where temperature changes will occur. The second challenge is that the business community rarely plans more than 3 to 15 years in advance. The last challenge is that it is difficult for the private sector to adapt when subjected to stringent regulatory policies. Thorning emphasized that regulation, such as those under the Clean Air Act (P.L. 95-95), reduce investments, hinder job growth, and reduce the amount of that could be used to adjust to climate change. She said many businesses have already begun to adapt. In the agriculture sector strategies are being used that are implemented under the normal course of business to address more direct impacts, termed "no regret" strategies. Utility industries are using more "hard adaptation" strategies by preparing energy distribution and transmission lines for extreme weather events. Thorning suggested that the federal government can assist companies to cope with the impacts of climate change by ensuring national economic growth, retain capital cost recovery rules, and consider a consumed income tax under which all saving is deducted and all investment is expensed. In addition, she recommended the federal government reform regulatory processes.

Chairman Boxer began the second question and answer period by asking if companies are already preparing for the impacts of climate change. Thorning responded that companies are shifting to "no regret" policies that will help sustain their business and prepare for potential climate impacts. Boxer commended Thorning for introducing the "no regret" terminology and said Congress should implement a similar policy strategy. She said the leadership in the private sector could be used to move Congress forward on climate change.

Ranking Member Inhofe asked how the creation of a carbon tax would affect the economy. Thorning said a carbon tax could weaken the nation's global economic competitiveness and that the best approach would be to switch to a broad-based consumption tax. Senator Inhofe stated that China has surpassed the U.S. as the largest emitter of carbon dioxide. Provided this trend, he questioned how enactment of legislation that would cap U.S. emissions could affect the economy and manufacturing base of the U.S. Thorning replied that capping U.S. emissions would have no impact on the global concentration of greenhouse gas emissions because of the economic growth of China and India. She added that scaling back on EPA regulations would reduce investment

uncertainty within the business community.

Senator Cardin asked what the state and local government of Maryland is doing to respond to the unique sea level rise challenges on the coast. Griffin informed the Senator that Governor O'Malley is taking steps to build a more reliable electric grid and working with the Regional Greenhouse Gas Initiative (RGGI) to create an ocean policy, improve building codes, and provide local officials with tools needed to reduce the vulnerability of coastal populations.

Senator Sessions said he doubted that flooding and extreme weather events were caused by greenhouse gases. He asserted that it would burden the economy to ask the American people to do something "not in their economic interest." Thorning agreed and said that states with a renewable industry sector spend 30 percent more on energy than people living in states without renewable energies. Sessions concluded that the low cost of natural gas is "exciting" and the federal government should not diminish the economy with high, artificial energy costs.

An archived webcast of the hearing, majority and minority statements, and witness testimonies can be accessed on the [Environment and Public Works committee web site](#).
