

War and famine. Peace and milk. —Somali proverb

The Costs of Climate Change Far Outweigh the Costs of Actions to Slow it

Rachel Cleetus

The impacts of climate change are being felt now worldwide, including here in the US, in the form of droughts, heat waves, increased coastal flooding, water stress, and extreme precipitation. We urgently need actions to cut significantly our heat-trapping emissions and slow the pace of climate change, or these impacts and their costs will grow exponentially. Furthermore, we have already locked in a significant amount of warming due to our past emissions; so it is crucial that we also invest in measures to build resilience to worsening impacts over the next few decades. Study after study shows that the benefits of actions we take to limit the impacts of climate change will far outweigh the costs of unchecked warming (The Global Commission on the Economy and Climate 2014; Stern 2007).

What the Science Tells Us

Recent scientific reports such as the *National Climate Assessment* and the most recent Intergovernmental Panel on Climate Change (IPCC) reports clearly highlight the ways in which our carbon emissions from driving cars, generating electricity, agricultural practices, dietary choices, and cutting down tropical forests are contributing to worsening climate risks. Since the industrial revolution, we have seen a 1.5°F (0.8°C) increase in the global average temperature (IPCC 2013). We've also experienced an 8-inch rise in global average sea level, with much higher and faster rates of sea level rise along the East and Gulf coasts of the US. Heat waves like the 2013 European, Asian, and Australian heat waves have become more likely (Herring et al. 2014). Hotter, drier conditions are contributing

to droughts, such as the 2013 Australian drought and the 2011 Texas drought (Herring et al. 2014; Peterson, Stott, and Herring 2012). They are also worsening the risks of wildfires, especially in the Rocky Mountains West (Dennison et al. 2014; Westerling et al. 2006). Climate change is increasing the risks of heavy precipitation and flooding events in the UK and in parts of Asia (Pall et al. 2011; Herring et al. 2014). Tidal flooding riding on elevated sea levels has become routine in many communities along the Eastern seaboard and is projected to worsen significantly (Spanger-Siegrfried, Fitzpatrick, and Dahl 2014).

Climate Change Is Costly

The impacts of climate change are costly, and those costs currently and in the future fall disproportionately on those who can least afford them and often on those who are least responsible for the emissions that are fueling climate change. For example, the IPCC projects that, due to the effects of flooding, famine, and rising sea levels, people living in coastal parts of Asia will be among the worst affected by climate change (IPCC 2014). Most people in these communities are responsible for an insignificant amount of carbon emissions, especially relative to the large carbon footprint of US citizens of nearly 18 metric tons of carbon dioxide per capita.

In recent years here in the United States, we have experienced record numbers of billion-dollar extreme weather events (National Climatic Data Center n.d.). Climate change has worsened the consequences of many of them, including coastal flooding and drought.

(continued on page 3)

“People are saying they want to be perfectly convinced about climate science projections. But speaking as a soldier, if you wait until you have 100-percent certainty, something bad is going to happen on the battlefield.”

—page 5

TABLE OF CONTENTS

The Costs of Climate Change Far Outweigh the Benefits of Actions to Slow it <i>Rachel Cleetus</i>	1
Letter from a Former Director <i>Kate Cell</i>	2
Climate Security 101: Why the U.S. National Security Establishment Takes Climate Change Seriously <i>Caitlin Werrell & Francesco Femia</i>	3
What Carbon Costs Us <i>Elizabeth A. Stanton</i>	7
The Economic Impacts of Future Coal Production in West Virginia <i>Jeremy Richardson</i>	9
Upcoming Events	11
EPS at the AEA meetings 2015	12

EPS QUARTERLY
is published by
ECONOMISTS FOR
PEACE AND SECURITY

EPS promotes economic analysis and appropriate action on global issues relating to peace, security, and the world economy.

Newsletter articles are based on the views of the authors and do not necessarily represent the views of the Directors, Trustees, or members of EPS.

Contact us:

EPS at the Levy Institute
Box 5000
Annandale-on-Hudson, NY
12504
USA

Tel: +1 845.758.0917
Fax: +1 845.758.1149
Email: info@epsusa.org

Thea Harvey
Executive Director

Ellie Warren
Communications Director

Lucy Law Webster
UN Representative

Contact the editor:
info@epsusa.org

© Economists for Peace
and Security 2014

Letter from a Former Director

Kate Cell

I am very pleased to welcome Kate Cell as the guest editor of this issue. Kate was my immediate predecessor as the Director of ECAAR/EPS, but we have known each other since junior high school. I have always valued her wisdom and leadership. I hope you find this issue as informative as I have. ~Thea Harvey-Barratt

Nearly 10 years ago I left EPS to start a family. For most of the time since, I've worked for the Union of Concerned Scientists in their climate and energy program. UCS originally recruited me to build UCS's network of economists, for which I relied heavily on EPS mentors, especially Jamie Galbraith and Michael Intriligator. We are all mourning Mike, and I cherish the fact that anytime I had a question on economic angles, or needed help making contact with someone, or just wanted to kick ideas around, Mike was there.

I've expanded my portfolio considerably in recent years. Increasingly I am working on an issue close to the hearts of many EPS members: inequality and its intersection with various aspects of climate change. I was recently honored to participate in a briefing for the new NAACP president on this issue. Poorer or browner people, worldwide as well as here in the US, are already facing the impacts of climate change, especially heat waves, flooding, and drought. And they are being hit first and worst. We need only think of the images from Typhoon Haiyan in the Philippines last year or from Hurricane Katrina some nine years ago.

In the US, these impacts are exacerbated by years of racially biased policies. For one example, take the long-term practice of the US Army Corps of Engineers of building protections such as levees based on the value of property rather than the needs of people. Without great care, policies to reduce our global warming emissions can also have unequal outcomes. We at UCS are in favor of the newly proposed EPA standards to reduce power plant emissions. But many climate justice activists point out that if these standards are implemented through

expanded cap-and-trade markets, auctions and offsets may continue to allow the dirtiest coal plants to operate in communities of color.

Furthermore, unless we take justice and equity into account, policies to help communities adapt to climate change will suffer from the same long-term biases. Helping homeowners to purchase subsidized insurance doesn't extend to those in affordable housing. When Hurricane Sandy hit New York, Wall Street got its lights turned on weeks and even months before low-income communities. In Sewell's Point, FL, where the median home price is over \$1 million, FEMA has spent \$3.2 million to flood-proof only 11 homes, while spending nothing in, for example, Sistrunk, the historically black section of Fort Lauderdale.

Issues of equity are increasingly important internationally, as, for example, at the UN Framework on Climate Change negotiations. Last year, during the Warsaw round, developing countries demanded that questions of "loss and damage" be addressed, such as, "Should developed countries 'compensate' poorer countries for the damages they suffer as a result of decades of carbon emissions they didn't emit?"

The economic, political, and security implications of climate change are complex, interrelated, and expanding as climate impacts accelerate. In this issue, UCS's climate economist, Rachel Cleetus, explores the costs of inaction and the benefits of action. Francesco Femia and Caitlin Werrell from the Center for Climate and Security examine climate change as a threat multiplier, a subject on which the Pentagon recently released an updated report. Elizabeth Stanton of Synapse Energy reports on years of work she's done to estimate more accurately the social cost of carbon emissions. Finally, my UCS colleague Jeremy Richardson, a physicist from a third-generation coalmining family in West Virginia, reports on the main findings of his recent paper in *Environmental Research Letters* on the economic impacts of future coal production in his home state.

(continued on page 3)

The Costs of Climate Change Far Outweigh the Costs of Actions to Slow it

(continued from page 1)

One way in which US policy is attempting to take into account the costs of climate change is by incorporating the “social cost of carbon” (SCC) into cost-benefit analyses of federal regulations that affect carbon emissions. According to the interagency working group that developed the most recent SCC estimate, a metric ton of carbon dioxide emitted in 2015 will cause future damages worth \$39 in 2011 dollars, assuming a 3 percent discount rate (EPA n.d.; Interagency Working Group on Social Cost of Carbon 2013). However, while the use of the SCC is an important step forward in improving policymaking, the current estimate is too low. This is for a variety of reasons, including the difficulties in estimating non-market impacts, the long-time scales and uncertainties involved, and ethical considerations about the appropriate discount rate to use for harms that accrue to future generations (Howard 2014). Better models and frequent revisions to reflect the latest scientific understanding of climate change and its impacts are needed (Revesz et al. 2014). Raising the SCC to reflect more accurately climate damages would, of course, increase the value of mitigation measures.

Ackerman and Stanton have argued that, under a reasonable set of assumptions, the social cost of carbon is so high as to greatly exceed the costs of decarbonizing

the economy²; thus trying to get to a precise estimate for the SCC is unnecessary. For policy purposes, cutting carbon emissions as quickly and cost-effectively as possible is all that matters (Ackerman and Stanton 2012).

Cutting Carbon Emissions

The recently released IPCC Fifth Assessment Synthesis report states that efforts to cut carbon emissions sufficiently to limit warming to below 2°C would lead to a 2 to 6 percent loss in global consumption in 2050 and a 3 to 11 percent loss in 2100, at the same time as baseline global consumption would grow 300 to 900 percent over the century (IPCC 2014b).

Investing in upgrading and modernizing our aging energy infrastructure comes with large economic benefits.

Cost-effective opportunities to cut our carbon emissions abound. These include cutting energy sector emissions by increasing renewable energy and energy efficiency; moving to a lower emission transportation system; and making changes to our consumption, development, and dietary patterns that drive emissions from land use and agriculture. Numerous recent studies point out that deep reductions in carbon emissions are possible and affordable using technology solutions that are largely available today (SDSN and IDDRI 2014; IPCC 2014; USGCRP 2014; IEA 2012). Most recently, the United Nations-sponsored Deep Decarbonization Pathways Project is analyzing emissions reduction options for 15 leading emitter nations (SDSN and IDDRI 2014).¹

In some cases market trends, such as the dramatically falling costs of wind and solar power, are already spurring a clean energy revolution (BNEF 2014; IRENA 2014). Wind capacity in the US increased by 75 percent, and solar capacity by 473 percent from 2009 to 2013 (AWEA 2014; SEIA 2014). The national average cost of wind power has dropped more than 60 percent since 2009, making it competitive with new fossil fuel plants in many regions (Wiser and Bolinger 2014). Solar photovoltaic system costs fell by about 40 percent from 2008 to 2012, and by another 15 percent in 2013 (Kann et al. 2014; Barbose et al. 2013). But what’s missing, and urgently required, is the political will to enact policies to scale up rapidly these types of solutions.

Preparing and Protecting Communities

Meanwhile, we have to invest simultaneously in resilience measures to help communities protect themselves and prepare for climate change. The Pentagon has coined the phrase “threat multiplier” to describe the effects of climate change. A recent report from the Department of Defense points out that “rising global temperatures, changing precipitation patterns, climbing sea levels, and more extreme weather events will intensify the challenges of global instability, hunger, poverty, and conflict. They will likely lead to food and water shortages, pandemic disease, disputes over refugees and resources, and destruction by natural disasters in regions across the globe” (Department of Defense 2014). Here in the United States, adaptation planning is proceeding fitfully, with comprehensive, forward-looking, science-based planning already happening in some places like New York City, Boston, and Norfolk, and other places lagging behind. In all cases, access to localized scientific projections, information about adaptation options, and, most importantly, adequate resources, is critical.

(continued on page 4)

Letter from a Former Director

(continued from page 2)

In the 12 pages of *EPS Quarterly*, one can focus either on the problem, or the solutions. In this issue I chose to focus on the problem; but let me assure you that solutions do exist and choices can still be made to avoid the worst impacts of climate change. If you would like to know more, including more about how you can serve as an effective expert advocate, I hope you’ll let me know at kcell@ucsusa.org.

In solidarity,
Kate

The Costs of Climate Change Far Outweigh the Costs of Actions to Slow it

(continued from page 3)

The Economics of Climate Change, Risk, and Uncertainty

Transitioning to a low-carbon economy can go hand in hand with economic prosperity. Investing in upgrading and modernizing our aging energy infrastructure comes with large economic benefits. Furthermore, the public health benefits from moving away from a fossil-dependent energy system are tremendous (Epstein et al. 2011; Muller, Mendelsohn, and Nordhaus 2011). However, we do have to ensure that the transition is handled fairly, with special attention to communities that currently may depend on fossil fuels for their livelihoods and those that may be affected disproportionately by higher energy costs.

Putting a price on carbon emissions is critical to ensuring that economies have the right incentives to limit emissions and spur low-carbon innovations. Ideally, this price should reflect the externality costs of climate change; in practice, that can be difficult to estimate given the uncertainties, long time periods, and wide-ranging market and non-market impacts involved. However, even a modest carbon price that ramps up over time can send a significant market signal. It can also create a revenue stream that can be used to offset other taxes and help with transition assistance.

It's no surprise, then, that various forms of pricing carbon are already used in many places around the world, including several US states, Europe, and China. In 2014, about 40 national and over 20 sub-national jurisdictions, accounting for more than 22 percent of global emissions, have already implemented or scheduled emissions trading schemes or carbon taxes (World Bank 2014).

Uncertainty is not an excuse for inaction. If anything, mainstream economic thinking would lead one to the conclusion that a risk-averse society would do *more* to inhibit climate change given some of the more extreme risks that climate tipping points pose.

Finally, it's critical that we get out of the cost-benefit trap in weighing whether or not to act on climate change. As others have argued more eloquently, these economic tools are woefully inadequate and completely unsuited to confronting risks that are so fundamental to the future of our planet (Ackerman and Stanton 2012; Rosen and Guenther 2014). Those risks are clear from a growing body of scientific evidence. The economic challenge is to find cost-effective ways to limit those risks as much as possible, given our limited resources.

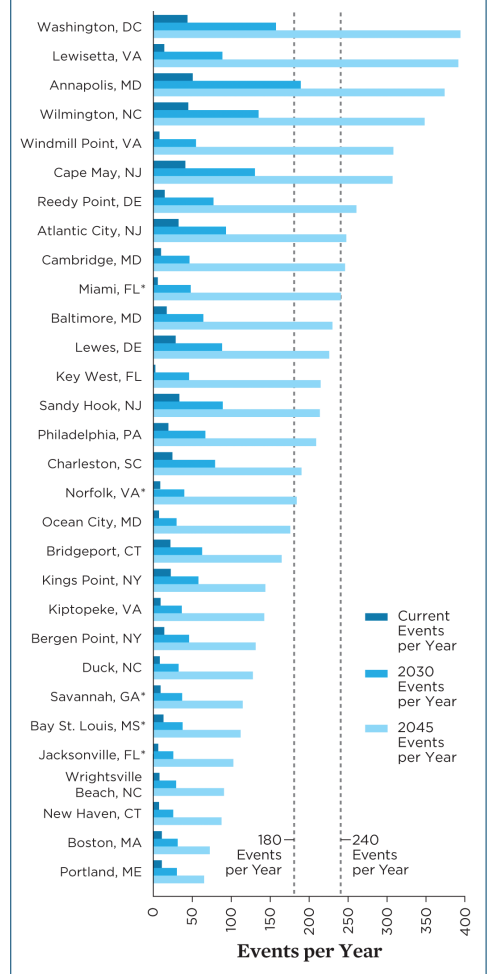
We Can and Must Do More

The window for keeping global temperature increase below 2°C is fast closing. But, as a recent journal article coauthored by my colleagues at the Union of Concerned Scientists points out, using 2°C as the sole metric of success or failure for climate policies is itself dangerous (Sanford et al. 2014). Whether or not we cross that particular threshold, we must reduce emissions as much and as quickly as possible to limit the risks of climate change. Every fraction of a degree we can avoid matters.

There are glimmers of hope in recent policy developments. The United States is on the verge of adopting the first ever limits on carbon emissions from power plants, its single largest source of those emissions. China has made public statements that indicate it will try to peak its emissions as early as possible, and its expanding carbon market is a sign of real commitment to that goal. The world will be watching to see if all this momentum translates into a fair and ambitious global climate agreement in Paris in 2015. A lack of political will is a sorry excuse for failing in our responsibility to future generations and leaving our children and grandchildren a dangerously altered world.

Rachel Cleetus is Senior Climate economist with the Climate and Energy Program at the Union of Concerned Scientists (UCS). The focus of her work is designing and advocating for effective global warming policies at the federal, regional, state and international levels and analysis of the economic costs of inaction on climate change. The full references for this article can be seen at <http://epsusa.org/publications/newsletter/newsletter.htm> Intergovernmental Panel on Climate Change (IPCC). 2014b. Fifth Assessment Synthesis Report. Online at http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_LONGERREPORT.pdf

Projected Increases in Tidal Flooding on the East and Gulf Coasts in 2030 and 2045
<http://www.ucsusa.org/encroachingtides>



Climate Security 101: Why the US National Security Establishment Takes Climate Change Seriously

Caitlin Werrell & Francesco Femia

In a 2007 report by the CNA Military Advisory Board, General Gordon R. Sullivan stated:

“People are saying they want to be perfectly convinced about climate science projections ... But speaking as a soldier, we never have 100-percent certainty. If you wait until you have 100-percent certainty, something bad is going to happen on the battlefield.”

The national security establishment in the United States, including the US military and the US intelligence community, understand that climate change is a national security threat and that we cannot wait for 100-percent certainty before acting to mitigate and adapt to its effects. Not only do they understand it; they plan for it, considering its implications in strategic documents like the *Quadrennial Defense Review*, the *Arctic Strategy*, and the commissioning of the US National Intelligence Council’s *Global Trends 2030: Alternative Worlds*. But why? Why do those organs of government that the public normally associates with fighting the nation’s wars devote time and effort to a problem that

is popularly perceived as primarily an “environmental” issue? The simple answer: Climate change is, actually, a national security threat. It’s not just about polar bears, rainforests, or “bugs and bunnies.” It’s actually a problem worthy of attention by those whose primary job it is to protect the United States and its allies from physical harm. The following is a brief outline of how and why the US national security community treats climate change the way it does.

The definition of a national security threat, and how climate change fits into that definition

Unfortunately there is no single, accepted definition of a national security threat. However, the national security community generally categorizes threats as, simply put, either *direct*, physical threats to the US homeland or vital US assets and personnel abroad; or *indirect* threats in regions of the

world that are either of strategic interest to the United States or whose instability could lead ultimately to direct threats to the United States. In this context, the national security community considers climate change a “threat multiplier” (a term first coined by CNA’s Military Advisory Board), or an “accelerant of instability” as it’s characterized in the FY2010 Quadrennial Defense Review report conducted by the US Department of Defense (DoD). This means that climate change exacerbates, or heightens, other threats to the United States.

The actual national security implications of climate change

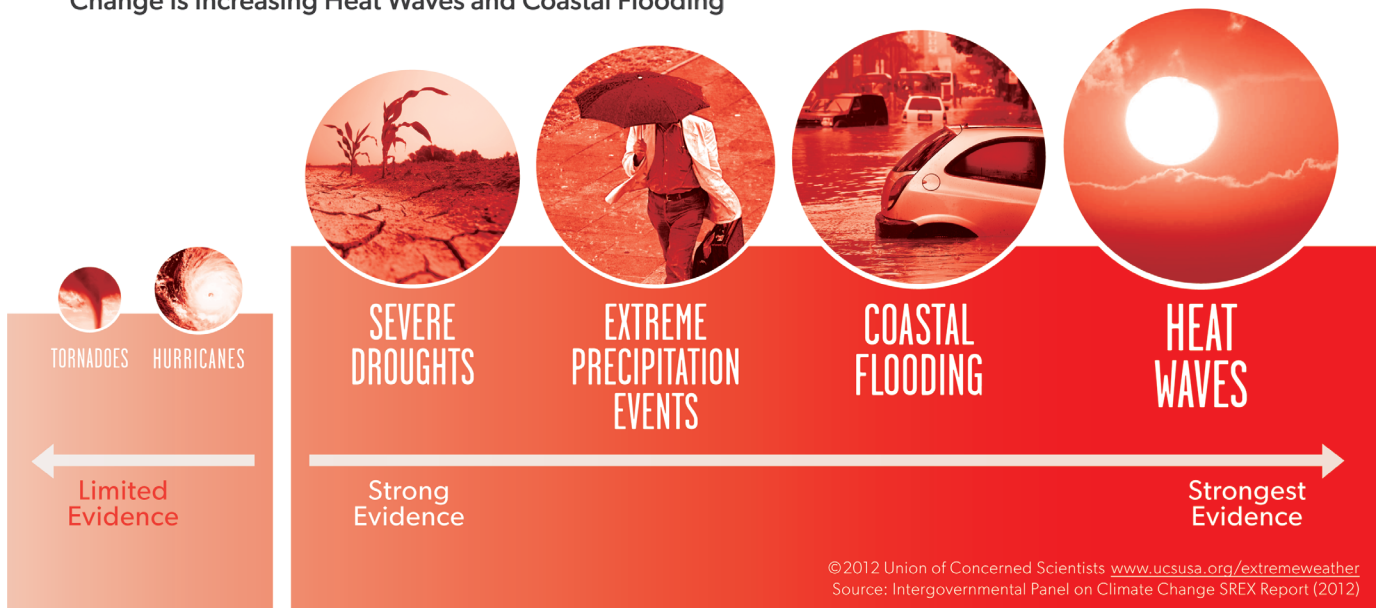
Climate change as a “threat multiplier” manifests in both direct and indirect threats to the United States.

As multiplier of direct threats to the US homeland: Numerous climate projections highlight a future of increased extreme

(continued on page 6)

SCIENCE CONNECTIONS → EXTREME WEATHER & CLIMATE CHANGE

→ Strongest Scientific Evidence Shows Human-Caused Climate Change Is Increasing Heat Waves and Coastal Flooding



©2012 Union of Concerned Scientists www.ucsusa.org/extremeweather
 Source: Intergovernmental Panel on Climate Change SREX Report (2012)

Climate Security 101: Why the US National Security Establishment Takes Climate Change Seriously

(continued from page 5)

weather events, such as droughts, floods, storms, and sea level rise in North America that could devastate coastal communities, energy facilities, and areas of the United States that rely on predictable patterns of rainfall. US domestic military installations are also at risk. For example, the DoD has assessed how drought, dust storms, forest fires, and rising temperatures due to climate change could physically affect military bases across the American Southwest. DoD is also examining the impact of sea level rise on its numerous coastal military installations.

As multiplier of direct threats to US soldiers and US military installations abroad: Heightened droughts or unpredictable rainfall patterns due primarily or in part to climate change in areas of the world where the US military operates can leave armed forces vulnerable to being disconnected from potable water supplies. Protecting convoys transporting available water is also one of the more dangerous and deadly missions soldiers engage in (along with protecting fuel convoys, which accounted for one-third of US Army casualties in Afghanistan in 2007). That's why the DoD works to equip its soldiers with portable water filtration and desalination devices, along with mobile hybrid and renewable energy systems (see, for example, the US Army's Energy to the Edge program).

US military installations abroad are also at serious risk. For example, the future impacts of sea level rise, according to the US Navy's Task Force Climate Change (TFCC) conducting assessments of them, could pose threats to numerous coastal naval installations across the globe.

As multiplier of indirect threats in regions of the world that are either of strategic interest to the United States or whose instability could lead ultimately to direct threats to the United States: Just as much of the national security community's concern about climate change revolves around its capacity to multiply indirect threats to the United States or its interests, particularly in regions of the world that the US either sees as key, strategic

environments or those whose instability could constitute a threat to the US.

For example, climate change indirectly threatens to upset the balance of competing interests in the South China Sea, an area of critical geostrategic importance to the United States, where, according to a report from the Center for a New American Security (CNAS), ships carry \$1.2 billion in US trade annually. On top of this, sovereignty over parts of the China Sea is bitterly contested by adjacent countries, and the US and China perennially have competed over its control, with the US viewing Chinese expansionism in the sea as a threat to national security and the security of key allies.

Four-star Navy Admiral Samuel J. Locklear III, head of US Pacific Command (PACOM), identified climate change as the biggest security threat facing the Asia-Pacific region. In the Asia-Pacific, US Pacific Command is working with China and India to align military capabilities for "when the effects of climate change start to impact these massive populations." As Admiral Locklear also stated in reference to the climate threat to these growing coastal populations, "If it goes bad, you could have hundreds of thousands or millions of people displaced, and then security will start to crumble pretty quickly." A security breakdown in such a strategically significant part of the world could have a significant impact on US national security interests.

In Egypt, a mercurial but longstanding ally of the United States, a combination of factors over time, including sea level rise, the over-extraction of water from coastal aquifers, and the sharing of Nile waters with neighboring states, is leaving the Nile Delta in a precarious situation. The delta is, by nature, low-lying. The problem for Egypt is that the delta is also heavily populated—the vast majority of its population lives there—and it's the site of many of its major cities. The Nile Delta and Mediterranean Coast are responsible for at least 30-40 percent of the country's total agricultural production, which could be devastated by increases in saltwater

intrusion. Furthermore, 30 percent of Egypt's labor force works in the agriculture sector, mostly in the Nile Delta. A lack of progress in addressing the problem of sea level rise and the Nile Delta's health could contribute to the erosion of the legitimacy and resiliency of current and future Egyptian governments, possibly contributing to further security and foreign policy crises for the United States.

In the Arctic, dramatic changes to sea ice cover, driven in large part by climate change, may have a significant impact on resource disputes, particularly given a petroleum-rich sea bed and hazy territorial boundaries. The expected increase in commercial activities in the Arctic may also lead to security complications as nations attempt to manage large stretches of open ocean that were previously inaccessible.

Climate change may also place stresses on food security by increasing the severity, frequency, and variability of crop-damaging events like droughts and floods. Because of the nature of the global food market, this could sometimes result in spikes in world food prices, increasing the likelihood of instability in places like Egypt that depend on affordable imported food. This is part of a larger phenomenon Dr. Troy Sternberg calls "the globalization of hazards," where natural hazards in one region can have a significant impact on regions halfway across the globe. In the case of countries such as Egypt that are of such strategic significance to the US, instability fundamentally can change the global security architecture that the US defends.

Lastly, climate change can exacerbate the social, economic, and environmental stresses that plague fragile states, thus heightening the probability of massive population displacements and instability. In Syria, a severe drought from 2006 to 2011, along with severe natural resource mismanagement by the Assad regime and other stresses, led to the displacement of around 1.5 million farmers and herders. As we noted in our report *The Arab Spring and Climate Change*, this drought was part of a

(continued on page 8)

What Carbon Costs Us

Elizabeth A. Stanton

Appropriately valuing the cost of carbon dioxide (CO₂) emissions to society is critical to good long-term decision-making in the energy industry and other key economic sectors. It is also a point of contention, as demonstrated most recently by reactions to the US Environmental Protection Agency's (EPA's) Clean Power Plan (Section 111(d) of the Clean Air Act), which aims to cut carbon emissions from the power sector by 30 percent below 2005 levels.

In her speech announcing the Clean Power Plan in June 2014, EPA Administrator Gina McCarthy said the ruling was not just about protecting the environment, but about protecting local economies and jobs. "Climate inaction is costing us more money, in more places, more often," she said. "2012 was the second most expensive year in US history for natural disasters. Even the largest sectors of our economy buckle under the pressures of a changing climate, and when they give way, so do businesses that support them and local economics that depend on them."

In stark contrast, Marita Noon, executive director for Energy Makes America Great Inc., described the Clean Power Plan in a blog post for the Heartland Institute as a "forced, premature elimination of American's electric capacity," claiming it would threaten America's electric reliability, chase away American industry, and kill hundreds of thousands of jobs, while having "virtually no impact on the reported goal of stopping global climate change." Also opposing the Clean Power Plan are 12 states that have decided to sue the EPA. West Virginia Attorney General Patrick Morrisey said that, among these, the EPA's proposed rule will have "devastating effects on West Virginia's jobs and its economy" by forcing some coal-fired plants to close.

Similar arguments regarding economic impacts have been used for decades by parties opposed to regulation of pollutants. When it comes to CO₂, what the doomsayers fail to recognize is that federal agencies have used a dollar figure to estimate the climate benefits of rulemaking in various sectors, including the energy sector, since 2010. Called the social cost of carbon

(SCC), the value is a measure of the damages expected to occur from an additional ton of CO₂ emitted into the atmosphere in a given year. Including the SCC value in a cost-benefit analysis helps federal agencies better understand whether a proposed rule will result in net benefits. Factoring the SCC into rulemakings has yet to have wrecked the US economy; however, if not calibrated to our best, most up-to-date scientific understanding of our climate crisis, the SCC value could have a negative impact by failing to give the appropriate value to expected climate damages.

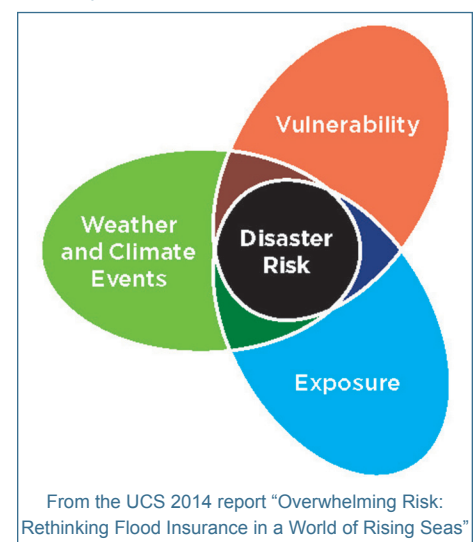
The SCC is developed by the US Interagency Working Group on Social Cost of Carbon, which, in addition to the EPA, includes participants such as the Departments of Agriculture, Commerce, Energy, Transportation, and Treasury. In 2013, the Working Group updated the 2010 SCC estimates (the values are dollar-year- and emissions-year-specific). The resulting increase is a step in the right direction: A higher SCC means more stringent regulations are approved. However, the methodology the Working Group has used to arrive at this figure is flawed and likely underestimates the true cost of climate damages.

The Working Group relies on three integrated assessment models (IAMs) of climate and economy to calculate the SCC: DICE, PAGE, and FUND. This choice of models has not been adequately justified. Before the group released the 2010 SCC, it held no public hearings and did not solicit comments on its methodology or model choices. The technical support document released by the group says little about the decision to use these models other than that they are "frequently cited in the peer review literature and used in the [Intergovernmental Panel on Climate Change] assessment." When the update to the SCC was released in 2013—again, without prior announcement or public hearing—the methodology was unchanged. The values changed simply because the three models each released new estimates.

The Working Group should be more transparent about its choice of models and invite public discussion prior to any future

updates, particularly in light of the fact that the three IAMs fail to represent state-of-the-art research on climate impacts. Two of the models, DICE and PAGE, are among the simplest climate economics models—hardly an ideal criterion for selecting models used to set critical governmental policy. Neither model approaches the level of complexity in estimating damage costs that is represented in the current climate economics literature. The third model, FUND, offers a more complex analysis, but assumes that there are important climate benefits from higher temperatures (for instance, reduced space heating costs and increased agricultural productivity in some regions). The optimum temperatures assumed by FUND are based on outdated literature; the most recent documentation cites no sources published since 1996 in the discussion of agriculture estimates. As a result, FUND produces average SCCs that are dramatically lower than those produced by DICE or PAGE.

The three models have other shortcomings: They underestimate potential damages from catastrophic events, devaluing the important role that climate policy can play as insurance against worst-case scenarios. The 2013 update to the SCC was based primarily on revisions to the PAGE model, including its treatment of catastrophic events; but the other two models were not similarly updated. In addition, these IAMs



(continued on page 8)

What Carbon Costs Us

(continued from page 7)

are run as “scenario models” that evaluate potential futures based on exogenous events instead of investigating the impact of mitigation efforts. The five scenarios of future emissions used in the analysis are essentially arbitrary choices selected with little explanation from other models.

Finally, the Working Group’s current methodology approaches the task of monetizing damages from CO₂ emissions from the problematic angle of cost-benefit analysis. Since it is impossible to put a meaningful price on damages to human lives and livelihoods, vulnerable ecosystems, and the continued existence of particular species, the Working Group would do well to explore, instead, the use of cost-effectiveness analyses. Cost-effectiveness analyses set a physical limit (e.g., a maximum permissible temperature increase, or an

inflexible cap on emissions) and determine which policy solutions are most cost-effective given this constraint. This approach would allow the Working Group agencies—and ideally other members of society in public fora—to determine a cap on emissions that absolutely cannot be surpassed, instead of weighing the continued destruction of invaluable resources against the financial benefits of emitting CO₂.

Giving an explicit value to [carbon emissions] to prevent damages from climate change... has yet to drag our economy to a halt.

Given the modeling limitations of the Working Groups cost-benefit methodology, it is likely that the current SCC underestimates damages. The Intergovernmental Panel on Climate Change agrees, as noted in its *Fourth Assessment Report*. So far, placing a price on carbon emissions—and giving an explicit value to preventing damages from climate change in our assessments of federal regulations—has yet to drag our economy to a halt. Naysayers to both the Clean Power Plan and to raising the SCC need to support their claims with fact-based evidence, not hyperbole and scare tactics. Tough climate regulations based on sound science will protect both our economy and the well-being of future generations.

Dr. Elizabeth A. Stanton is a senior economist at Synapse Energy Economics.

Climate Security 101: Why the US National Security Establishment Takes Climate Change Seriously

(continued from page 6)

pattern of increased drying in the Mediterranean and Middle East beginning in 1973, which was strongly associated with climate change in a 2011 NOAA report. Though it would be folly to argue that climate change caused the Syrian civil war, it is certainly possible that the region’s plummeting winter precipitation levels played a role in exacerbating the environmental drivers of massive population displacements in Syria, and that this insecurity contributed to popular dissatisfaction with the Assad regime.

In short, climate change threatens to make fragile states even more fragile, which can lead to the potential for destabilizing violence, which can present direct security challenges to the United States and its allies. This concern is so acute that the US DoD, through its Minerva Initiative, is investing resources to map comprehensively the security implications of climate change in Africa, a continent of increasing strategic interest to the US.

Why climate change is a national security threat at least as significant as other traditional national security threats

But, you might ask, do these security threats really compare to other threats, like the proliferation of nuclear weapons and materials? From a security perspective, the answer is yes. Climate change is what risk analysts would call a “high probability, high impact” risk, meaning that it is very likely to occur (between a 90 and 97% likelihood) and will have a very large and widespread impact on security. (For example, the *2014 Global Risks Report* ranked climate change highest, next to “fiscal crises,” in this regard). On the other hand, a study commissioned in 2005 by Senator Richard Lugar produced a median response of a 10 percent likelihood of “an attack involving a nuclear explosion” in five years, and a 20 percent likelihood in 10 years. Of course, in the case of a nuclear detonation, the price of that 10 or 20 percent likelihood materializing is devastating and unacceptable; so it makes all the sense in the world to prevent it or adequately prepare

for it. But the same goes for climate change, especially given a relatively high degree of certainty about its occurrence and the scale of its impact over time.

Conclusion

The US national security community doesn’t have the luxury of waiting for 100-percent certainty. There is a high enough degree of certainty that climate change has the capacity to be, and already is, a multiplier of direct and indirect threats to the United States. That’s why US national security planners put time, personnel, and resources into mitigating and adapting to its effects. Climate change as a security threat is not just a narrative nor a political talking point. It’s a reality. The US military and the US intelligence community get it. Our policymakers should, too. And while a recent US Senate hearing on *Extreme Weather Events: The Costs of Not Being Prepared* is a welcome recognition of this risk, the US will need to go a lot further than that.

Caitlin Werrell & Francesco Femia are cofounders & directors of The Center for Climate and Security.

The Economic Impacts of Future Coal Production in West Virginia

Jeremy Richardson

Last month colleagues and I published in the journal *Environmental Research Letters* a paper focusing on the economic impacts of future coal production on West Virginia. Using scenarios for projected coal production published by the Energy Information Administration in its *Annual Energy Outlook*, we set out to understand how these projections might impact the economy of West Virginia, the second largest coal-producing state in the United States.

Findings include:

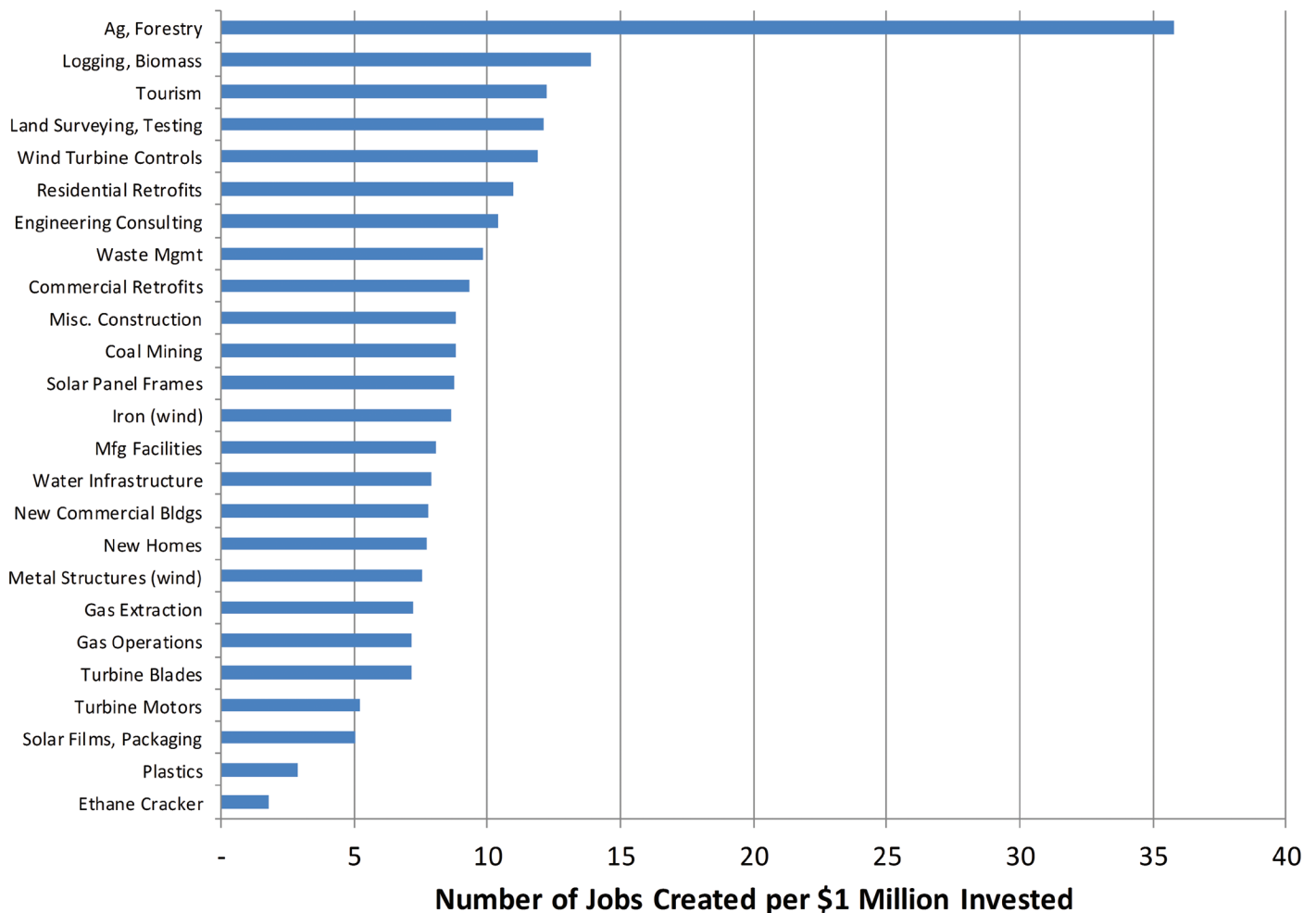
- In 2010, just three companies controlled more than 60 percent of the coal

produced in West Virginia. *All three were headquartered out of state.* At least 89 percent of production was ultimately owned and controlled by out-of-state companies, meaning that profits generally leave the state.

- Most scenarios suggest a decline in coal jobs and economic activity by 2020, compared to the reference case for the state as a whole; but this hides drastic differences between southern and northern counties.
- Hypothetical investments in other sectors of West Virginia’s economy represent greater job multipliers than

coalmining. Those sectors include agriculture, forestry, logging, energy efficiency retrofits for residential and commercial buildings, and even producing components for the renewable energy industry.

Our study points to an urgent need for states like West Virginia to take strong action to spur economic development in other areas of the economy, instead of fighting the EPA’s statutory obligations to reduce pollution from power plants.



(continued on page 10)

The Economic Impacts of Future Coal Production in West Virginia

(continued from page 9)

Baby Steps

The West Virginia legislature took a small step in that direction earlier this month, passing a bill establishing the Future Fund. Originally focused only on natural gas taxes, the House version puts a portion of all severance taxes—including coal—into the Fund. Concerned about tight budgets, however, legislators also approved restrictions that will effectively prevent deposits into the Fund until at least 2020.

We'll plan for the future ... someday.

The complete article can be found at <http://iopscience.iop.org/1748-9326/9/2/024006/>

Jeremy Richardson is a senior energy analyst in the Climate and Energy Program, conducting analytical work on the Environmental Protection Agency's carbon regulations. Formerly, Dr. Richardson was a Kendall Science Fellow and researched the fundamental cultural and economic drivers of coal production in West Virginia. He has a PhD and MS in physics from the University of Colorado at Boulder. You can read the original paper at <http://iopscience.iop.org/1748-9326/9/2/024006/>.

ENSTA Bretagne (Brest), University Pierre Mendès France (Grenoble), the Institut d'Etudes Politiques of Grenoble, and EPS-France will host the **19th Annual International Conference on Economics and Security in Grenoble, France, on June 25-27, 2015**. Call for papers at <http://www.defense-realms.com/events/event-2015/>

PLEASE JOIN US

EPS's efforts depend heavily on the support of its members. By joining today, you unite with dedicated individuals committed to reducing dependence on military power, and to searching for political and institutional change through peaceful democratic processes.

Our members contribute not only financially, but also with research, articles, and as speakers at events. Your membership helps to ensure that reasoned perspectives on essential economic issues continue to be heard.

Member benefits

For those who desire monthly updates, we send our electronic newsletter, NewsNotes. Four times yearly, look for our print newsletter, the EPS Quarterly, featuring in-depth articles on the economics of peace, war and security. With these publications you'll always have your finger on the pulse of EPS's work and see how essential your support is to our success. Members also receive invitations to EPS events.

Most importantly, you join our global network of concerned academics, researchers, business leaders and people from all segments of society who believe that economists have something valuable to bring to the search for peace in our world.

Levels of membership

\$10 - \$34	Low Income/Student Membership
\$35 - \$49	Basic Membership
\$50 - \$99	Supporting Member
\$100 - \$249	Sustaining Donor
\$1000+	Sustaining Patron

Donations to EPS are charitable contributions and tax-deductible to the extent the law provides.



Like us on Facebook and keep up with our latest activities and upcoming events.

EPS now has a group page on LinkedIn. If this is your preferred social network, check in with us.



EPS at the AEA\ASSA Annual Meetings

Boston, Massachusetts January 3-5, 2015

Inequality: Challenge of the Century? (Panel Discussion)

Saturday, Jan 03, 2015 2:30 pm, Boston Marriott Copley,
Grand Ballroom—Salon E

Panel Moderator: James Galbraith (University of Texas-Austin)

- Olivier Giovannoni (Bard College)
- Branko Milanovic (City University of New York)
- Stephen Rose (Georgetown University)
- Joseph Stiglitz (Columbia University)

**US-Russia: Avoiding a New Cold War, Session in honor of
Michael Intriligator** (Panel Discussion)

Sunday, Jan 04, 2015 10:15am, Boston Marriott Copley,
Grand Ballroom—Salons J & K

Panel Moderator: Richard Kaufman (Bethesda Research Institute)

- Ruslan Grinberg (Russian Academy of Sciences)
- Aleksandr Nekipelov (Russian Academy of Sciences)
- Sergey Shakin (Moscow School of Economics)
- William Hartung (Center for International Policy)
- Michael Lind (New America Foundation)
- Robert Skidelsky (Warwick University)
- Jeffrey Sachs (Columbia University)

Please come visit us in the exhibit hall at Booth #129.

EPS Quarterly

c/o the Levy Institute
Box 5000
Annandale-on-Hudson, NY 12504
USA
Tel: +1 845.758.0917
Fax: +1 845.758.1149
Email: info@epsusa.org
www.epsusa.org

Nonprofit Organization
US Postage
PAID
Kingston, NY
Permit No. 917

RETURN SERVICE REQUESTED

BOARD OF DIRECTORS

Chair: James K. Galbraith
Secretary: Lucy Law Webster
Vice chair: Richard F. Kaufman
Treasurer: Kathleen Stephansen
Members at large:
Linda Bilmes
Lloyd J. Dumas
Michael Lind
Richard Parker
Allen Sinai

BOARD OF TRUSTEES

Clark Abt
George Akerlof
Oscar Arias
Kenneth J. Arrow
William J. Baumol
Barbara Bergmann
Andrew Brimmer
Robert J. Gordon
Walter Isard
Richard Jolly
Lawrence R. Klein
Eric Maskin
Daniel McFadden
Roger Myerson
Douglass C. North
George A. Papandreou
Robert Reich
Thomas Schelling
Amartya Sen
William F. Sharpe
Robert M. Solow
Joseph E. Stiglitz

AFFILIATE CHAIRS

Australia: David Throsby
Canada: Kanta Marwah
Chile: Aedil Suarez
Egypt: Nabil Fahmy
France: Jacques Fontanel
Germany: Wolfram Elsner
Greece: Eftychia Nikolaidou
India: Darvesh Gopal
Israel: Alex Mintz
Netherlands and Belgium:
Philip Verwimp
Russia: Stanislav Menshikov
Spain: Juan Carlos M. Coll
South Africa:
Terry Crawford-Browne
United Kingdom: J. Paul Dunne

YOU ARE CORDIALLY INVITED
TO JOIN US IN HONORING

Robert Skidelsky

SUNDAY, JANUARY 4, 2015

RECEPTION AT 6:30PM

DINNER AT 7:30PM

Boston Marriott Copley Place
110 Huntington Avenue
Boston, MA 02116

To register for the dinner, please email Thea Harvey-Barratt at theaharvey@epsusa.org

LORD SKIDELSKY is Emeritus Professor of Political Economy at the University of Warwick. His three volume biography of the economist John Maynard Keynes (1983, 1992, 2000) received numerous prizes, including the Lionel Gelber Prize for International Relations and the Council on Foreign Relations Prize for International Relations. He was made a life peer in 1991, and was elected Fellow of the British Academy in 1994. He is chairman of the Governors of Brighton College and Andrew D. White Professor-at-Large at Cornell University. He is a director of the Moscow School of Political Studies and was the founder and executive secretary of the UK/Russia Round Table. Since 2002, he has been chairman of the Centre for Global Studies. In 2010, he joined the Advisory Board of the Institute of New Economic Thinking.

In the 1980s, he began to take a more active interest in politics. He was a founder member of the Social Democratic Party (SDP) but later joined the Conservatives. He was made Chief Opposition Spokesman in the Lords, first for Culture, then for Treasury Affairs (1997-9), but he was sacked for publicly opposing NATO's bombing of Kosovo. In 2001, he left the Conservative Party for the cross benches. He is currently a member of the All Party Parliamentary Group on Extraordinary Rendition.

He writes a monthly column for Project Syndicate, "Against the Current", which is syndicated in newspapers all over the world. His account of the current economic crisis, *Keynes: The Return of the Master*, was published by Penguin Allen Lane in September 2009.