The Climate and Energy Nexus: Challenges and Opportunities for Transatlantic Security

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Energy and climate security: Two sides of the same coin

The United States and Europe have recently experienced economically devastating and deadly weather events, and have recognized the strategic and environmental risks from over-reliance on imported oil or gas. The Delegation of the EU to the United States asked CNA to examine the relationships among energy policies, climate change, and national security within the context of the transatlantic relationship. CNA held a workshop in June 2012 that convened international experts and policymakers, along with members of CNA’s Military Advisory Board, to examine these issues and formulate recommendations for strengthening the community’s collective security. This report presents a summary of their findings, supplemented by research conducted by CNA and the Royal United Services Institute (RUSI) in London.

Facing the facts

Energy security and climate security are two sides of the same coin. Excessive reliance on oil—or any other critical fuel source—creates economic vulnerability to volatile global prices, supply lines, and the actions of foreign governments. In 2011, 96 percent of the U.S. transport sector ran on fuels from refined oil, just under half of which was imported. In 2010, the European Union relied on natural gas for a quarter of its electricity, and imported 62 percent of that gas. Such reliance creates sensitivities that distort foreign and security policies. For militaries, reliance on a single fuel raises costs and generates logistical requirements that can put lives at risk and hinder freedom of action.

Burning hydrocarbon fuels also contributes to climate change. In May 2013, the average concentration of CO₂ in the atmosphere measured by US monitors was 400ppm over a 24 hour period for the first time in human history. The last time concentrations were this high, the world was several degrees warmer and sea levels were 20-40 meters higher. Looking ahead, intensified droughts, storms, flooding, and sea-level rise pose various risks to communities and their security. The United States and Europe are already experiencing stress. Future climate models show that global warming and associated extreme weather events will alter agricultural patterns, compromise critical infrastructure (including energy and water production plants), uproot communities, and in some cases, elevate the chance of humanitarian crises, instability, and even armed conflict. Over the coming decades, climate change will alter our way of life and raise new risks to our national security.

The evidence that our atmosphere and seas are warming, driven in part by the burning of hydrocar-

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¹ CNA Military Advisory Board, Ensuring America’s Freedom of Movement, October 2011: www.cna.org/EnsuringFreedomofMovement


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bon fuels, is clear and robust.\textsuperscript{4} The concentration of CO\textsubscript{2}, the leading greenhouse gas, in the atmosphere is soaring. Earth’s air and oceans are warming. Arctic ice is melting, precipitation patterns are shifting, and high-altitude water reserves are dwindling. People around the world who in recent years have suffered intense droughts, floods, wildfires, and storms know first-hand how new weather and climate patterns endanger lives and livelihoods.

Despite overwhelming scientific evidence, some people question the relationship between humans’ energy use and changes in the environment. Political leaders, including many in the United States, refuse to accept short-term costs to address long-term dangers even though the future costs of responding to disasters after they occur will be far greater. Policy formulation is complicated by the fact that even the best science and climate models cannot predict when or how the various effects of climate change will evolve, given feedback loops and other complex elements of Earth’s natural systems.

Uncertainty about details, however, should not stop governments from working to lower the risk of worst-case scenarios and from planning for and preventing impacts. As a former U.S. Army Chief of Staff put it: “We never have 100 percent certainty. We never have it. If you wait until you have 100 percent certainty, something bad is going to happen on the battlefield.”\textsuperscript{5}

\textbf{Energy, climate, and national security}

Secure, reliable access to affordable fuel and energy sources is a fundamental element of national security. In war, access to fuel can make the difference between victory and defeat. In times of peace, energy and fuel are essential to any economy.

Reliance on foreign sources, or on prices set within the global marketplace, creates economic vulnerability and instability. Since the first OPEC-related oil shocks of the 1970s, the United States has been concerned about its dependence on oil imports from the volatile Middle East.\textsuperscript{6} Today the share of oil the United States imports from that region is at the lowest level—less than 20 percent of its total imports—since the 1970s.\textsuperscript{7} Still, the U.S. economy is highly sensitive to supply shocks and price fluctuations, regardless of the source of the oil. Even new, domestic sources of oil and gas do not free the United States from the risks of over-reliance, because the prices of these commodities will be determined by global markets.

Numerous EU member states also import their energy from a small set of producers, many of which are state-controlled oil companies. Their supplies, like those of the United States, are prone to state manipulation, distorted by corruption, and vulnerable to political and economic instability. Worse, some of the revenues from oil for countries such as Venezuela, Iran, Libya, and Saudi Arabia have wound up in the hands of terrorist groups.\textsuperscript{8}

\textsuperscript{4} U.S. National Academy of Sciences, “America’s Climate Choices: Limiting the Magnitude of Future Climate Change,” Climate Change at the National Academies, May 19, 2010: http://nas-sites.org/americascclimatechoices/
\textsuperscript{5} CNA Military Advisory Board, National Security and the Threat of Climate Change, 2007.
\textsuperscript{7} Neelesh Nerurkar, “U.S. Oil Imports and Exports,” Congressional Research Service Report, 7-5700, R42465, 4 April 2012, p 4-5.
\textsuperscript{8} According to published reports, Venezuela’s Chavez government provided modest support to the FARC for several years; Iran is the chief patron of Hezbollah; former Libyan leader Gaddafi for years promoted various violent insurgent groups; and individuals and groups linked to the Saudi government have provided support to various fundamental Islamic groups associated with terrorism, including Al-Qaeda.
The U.S. and EU energy sectors run on vast, complex systems of shipping lanes and ports, pipelines, and electrical supply grids supporting just-in-time economies. These systems are vulnerable to market stress, accidents, natural disasters, and cyber-attacks. Internationally, oil production and refinement zones in areas of conflict and instability, such as Nigeria, Iraq, and the Caucasus, as well as shipping routes through sensitive chokepoints such as the Strait of Hormuz, pose significant economic and security threats.

Climate security issues related to the effects of global warming are less understood because they involve complex global and regional atmospheric and oceanic factors as well as ever-changing human economic activity. Negative impacts, however, are already evident. Hundreds of millions of people in East Africa, South Asia, and the Middle East already face shortages of fresh water for consumption and farming. Intensified floods, heat waves, and sea-level rise afflict billions of people who live on islands or along coastlines, in river valleys, or in urban slums. Shifting geographic patterns of diseases, of both humans and animals, and changes in agricultural and marine zones are driving human migration. The opening of access to new resource reserves, particularly in the Arctic, will alter maritime commercial routes, natural resource industries, and naval missions and strategies.

The United States is not immune to these impacts. Climate change is affecting every region of the United States. Much of the South is drought-stricken. Growing beetle activity is devastating pine forests across the Rocky Mountains. Traditional industries, like maple syrup production in New England, are disappearing. Receding coastlines in the Southeast and Gulf states threaten homes, infrastructure, and tourist destinations. In the West, droughts and wildfires grow more intense every year, endangering traditional ranching and farming in many states. Still, climate projections indicate that in future years these temperatures, droughts, and other events will become “new normal” conditions.

Long-predicted effects of climate change on infrastructure are becoming apparent. During the record U.S. heat wave in 2012, high-ways cracked and buckled; train tracks kinked, causing derailments; and nuclear power plants had to be shut down because water reserves were too warm to cool them safely. After Hurricanes Katrina (2005), Ike (2008), and Sandy (2012), among other smaller storms, buffeted the U.S. Gulf and East Coasts, taking hundreds of lives and causing tens of billions of dollars in damage.

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dollars in damages, coastal states and communities are concerned about rising risks of future storms.

Miami, Florida, has $400 billion worth of coastal property at risk from sea level rise. A report by Tufts University assessed that by 2070, the sea level around Miami could potentially rise by 27 inches, leaving 70 percent of Miami-Dade County vulnerable to flooding and threatening infrastructure. Researchers at Cornell University found that global warming will make heat waves more frequent and intense in New York City, and intensify fluctuations in rainfall, all of which will pose enormous challenges to water supply, transportation, and energy infrastructure.

European countries have also suffered recently from extraordinary climate-related events, particularly heat waves and floods. In 2003, a heat wave in Europe killed over 80,000 people. That disaster, along with Hurricane Katrina in 2005, demonstrated that natural disasters can quickly overwhelm the resources of even the most developed regions. As average global temperatures continue to rise, these impacts will grow, bringing unpredictable effects across complex natural systems.

The security impacts of global warming are likely to be more severe in less developed regions of the world, especially in low-lying island and coastal cities and communities, and in mountainous areas. The combination of environmental change and poor state capacity can be devastating. Projections indicate that in future decades countries in South Asia, North and East Africa, the Middle East, and Central America will likely suffer resource shortages in the midst of population booms, a combination that could threaten state stability in countries with weak government institutions and poor public service delivery. In regions already prone to ethnic conflict and/or state failures, climate change and associated resource pressures raise the chances of humanitarian crises and armed conflict.

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14 Elizabeth A. Stanton and Frank Ackerman, Florida and Climate Change: The Costs of Inaction, Tufts University, Nov. 2007, available at www.ase.tufts.edu/gdae/Pubs/rp/Florida_lr.pdf


The Levant—Syria, Lebanon, Jordan, Israel, and the occupied Palestinian territory—is already among the world’s most conflict-prone regions. Climate change threatens to worsen tensions before 2050, by reducing water availability, tightening food security, hindering economic growth, and changing disease and population patterns. These impacts could sharpen resource competition, accelerate migration, and potentially encourage the militarization of strategic resource management.\textsuperscript{20}

The loss of fresh water resources appears to pose an especially acute threat in many regions. Though there is little evidence that water scarcity tends to cause inter-state conflict,\textsuperscript{21} at the state level it is already driving some communities, such as in the Sahel region, to seek new lands for their crops and livestock, and others to abandon traditional lifestyles and move, most likely to cities. Competition between agriculture and industry will also increase. These points of climate stress will create conditions for further inter-ethnic fighting and for the growth of criminal gangs, insurgent organizations, and terrorist groups, all of which recruit from displaced and economically desperate populations.

A study recently published in the Proceedings of the National Academy of Sciences finds strong historic linkages between civil war and temperature in Africa, with warmer years leading to significant increases in the likelihood of war. When combined with climate model projections of future temperature trends, this correlation suggests a roughly 54 percent increase in armed conflict incidence by 2030, or an additional 393,000 battle deaths (assuming that future wars are as deadly as recent wars) if global warming continues at the current rate.\textsuperscript{22}

For the United States and Europe, additional risks to national security will come from climate change impacts on less developed and resilient, neighboring countries. One traditional response to social and economic stress in those regions is emigration to Europe and the United States. Security and emergency forces will also be called upon ever more frequently to provide emergency and humanitarian crisis response. The need to support these kinds of missions on a regular basis will likely generate a growing cost burden for these forces.

U.S. initiatives: Incentives, standards, and local planning

In the United States, politicians and policymakers disagree over climate and energy issues, and some still question whether the earth is warming at all. Nevertheless, far-sighted leaders at the national, state, and local levels are leading various initiatives to improve the nation’s energy and climate security.


\textsuperscript{22} Marshall B. Burke et al., “Warming increases the risk of civil war in Africa,” Proceedings of the National Academy of Sciences 106, no. 49, 8 December 2009.
Under President Obama, the White House sponsors the dissemination of information regarding climate change and its effects on the country. For example, the biannual National Climate Assessment provides citizens the latest research from across a dozen U.S. agencies about the impacts of climate change where they live. A Global Change Research Program supports research and dialogue on climate change around the world and its effects on the national interest.

The executive branch has also taken various actions to reduce greenhouse gas (GHG) emissions. The government offers tax breaks for purchasing higher-efficiency home appliances and vehicles and for building and refurbishing homes to improve energy efficiency. In 2011 the U.S. Environmental Protection Agency ordered higher emissions standards for all U.S. light-duty vehicles. New rules from the Department of Transportation mandate that by 2025 the estimated average miles per gallon (mpg) across every automaker’s fleet of cars and trucks sold in the United States will be at least 54.5. The government has also raised efficiency standards for most public facilities and operations.

**Department of Energy programs**

The U.S. Department of Energy supports research and development of alternative sources of energy and fuel by funding innovation hubs and multidisciplinary research centers to develop new technologies for renewable energy (solar, wind, biomass, geothermal, hydropower) biofuels, electricity storage, and building and home efficiency. The Department of Energy’s research funding also focuses on security-related issues, including the use and availability of rare critical minerals, and the safety and resilience of our national power system.

These research projects leverage international expertise and issues of common concern, particularly through the exchange of thousands of U.S. scientists who are working with colleagues in Europe, and thousands of European scientists at work in the United States.

The Department of Energy also coordinates the Clean Energy Ministerial, an international working group made up of ministerial-level representatives from 23 industrialized nations. The Clean Energy Ministerial promotes policies and programs that advance clean energy technology, shares lessons learned and best practices, and encourages the transition to a global clean-energy economy. The ministerial promotes open dialogue and technical cooperation on these issues without undue political interference, and includes collaboration with energy industry leaders.

**Military programs**

Because fuel and energy dependence affects the U.S. military in so many ways, the U.S. armed forces are at the forefront of national efforts to increase efficiency, reduce costs, and diversify fuel supplies. The military’s commitment to improving fuel efficiency and flexibility is partly the result of its experience in Afghanistan, where the real cost of vehicle fuel at the front lines was exorbitant and fuel supplies proved to be a critical vulnerability.

The U.S. military has conducted significant research and development efforts and operational analyses to learn where fuel and energy efficiency gains are most possible, without sacrificing flexibility or prowess. Today, biofuels are used in some of

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23 www.globalchange.gov/what-we-do/assessment

24 www.globalchange.gov/

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its most advanced aircraft and vehicles, and renewable energy technologies, including solar and wind sources, contribute to powering U.S. defense facilities around the world, reducing their operating risks and costs.

**USS Makin Island**, the first U.S. Navy ship to deploy using a hybrid-electric propulsion system, returned from its maiden deployment in June 2012. Its propulsion system runs on electric auxiliary propulsion motors at low speeds and on gas turbines at higher speeds. With this system, the Navy expects to see fuel savings of over $250 million over the course of the ship’s lifecycle.26

At facilities around the world, the military has put in place new technologies and standards to maximum fuel and electrical efficiency and to boost reliance on local renewable energy sources. Colorado’s Fort Carson, for example, is modeling an aggressive strategy to achieve net-zero status: “…producing as much energy on-site from renewable energy generation, or through the on-site use of renewable fuels, as it consumes in its buildings, facilities, and fleet vehicles.”27 The U.S. Army has also opened a System Integration Laboratory to practice, under field conditions, the use of new technologies and practices aimed at reducing water use by 75 percent and fuel use by 20 percent.

**Newly available U.S. oil and gas reserves**

Efforts to diversify U.S. energy supplies have received a boost from new domestic natural gas and oil projects, made possible by improved extraction techniques. According to the International Energy Agency, the United States could soon be self-sufficient in natural gas and oil, and could even be a major oil exporter by 2035.

Cheap, widely available natural gas is replacing coal in U.S. power generation, lowering greenhouse gas emissions and water demands. Partly as a result, U.S. GHG emissions from energy production have dropped to their lowest levels in 20 years.28

Despite these benefits, however, the increased domestic production of oil and natural gas is not a panacea for the country’s energy security dilemma. Importing more oil, even from stable partners like Mexico and Canada, does not affect oil prices in a global market, so U.S. drivers and the economy will remain vulnerable to price swings.

Moreover, natural gas is not presently a substitute for petroleum due to the difficulty and cost of delivering natural gas to pump stations. The current natural gas boom in the United States—though beneficial for driving down emissions at electrical plants—hardly affects the reliance of the U.S. transport industry on oil. Much better would be a steady increase in the use of gas (and other cleaner sources) for the production of electricity, combined with greater use of electric vehicles.

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State and local level efforts

Several U.S. states are way ahead of the federal government in improving energy efficiency and reducing greenhouse gas emissions. Ten states in the northeast and mid-Atlantic regions already participate in a cap-and-trade program to reduce CO2 emissions from electric power plants, and California plans to establish a similar program in 2013. Other states have developed climate action plans, and are implementing their own renewable electricity standards, energy efficiency standards, and smart growth initiatives. In 2011, renewable energy sources accounted for over 15 percent (and in some states, as high as 90 percent) of total electricity generation in 14 states.

Many cities are also planning now to improve their resilience in the face of future heat waves, water shortages, and other effects of global warming. Three cities—Chicago, Fort Collins (Colorado), and Miami-Dade County—have begun far-reaching programs to improve their infrastructure and planning and to encourage the use of local renewable energy sources.

Ambitious targets and innovative urban engineering in Europe

Europe faces security and energy security problems similar to those of the United States. A quarter of Western Europe’s energy comes from Russian gas supplies, which Moscow cut in 2006 and 2008 in a dispute with Ukraine. Much of Europe’s oil comes from Middle East and North Africa, where sources are threatened by political turbulence. The European Union’s electricity grid is fragmented and vulnerable to crisis and shutdown. In recent years, exceptionally intense storms and heat waves have cost billions of euros and thousands of lives. Changing weather patterns are affecting traditional agriculture and other industries, and sea level rise threatens several coastal cities and communities.

Similar to the situation in the United States, differences among EU Member States in terms of their economies, energy sectors, and political cultures complicate collective efforts to address energy and climate security. Nevertheless, the European Union and its Member States adopted and implemented policies and measures to reduce GHG emissions, promote energy efficiency and supply diversity, and improve resilience.

In 2008, the EU member states agreed on a Climate Action Plan, committing themselves to reduce their greenhouse gas emissions by 20 percent, and to obtain 20 percent of their energy from renewable sources, before 2020. The European Union aims to achieve these goals through various instruments. The European Union’s GHG emissions trading system is the world’s largest, covering 11,000 power stations and industrial plants in 31 countries. By 2020, the system will have reduced the region’s emissions by 21 percent over 2005 levels.

Several regulatory initiatives help the EU pursue those targets. The EU has also set a minimum vehicle fuel efficiency standard of 46 miles per gallon, for 2015, and similar standards for the aviation industry. To promote new energy technologies, the European Union offers subsidies for new power plants that will utilize carbon capture and storage technologies. Several countries, including the United Kingdom, Sweden, Germany, and Ireland, have created carbon taxation systems to promote efficiency and the use of renewable sources, and Denmark has announced a plan to achieve independence from hydrocarbon fuels before 2050.

Furthermore, the EU and several Member States have also begun to develop and implement adapta-

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tion plans to improve their resilience to the effects of climate change. In 2013 the European Commission adopted an EU Strategy on Adaptation to Climate Change. This includes a European Climate Adaptation Platform to collect and disseminate information on Member State adaptation plans and to showcase best practices, so that others can apply new knowledge and technologies to their own efforts.31

**Military programs**

Several of Europe’s armed forces have, like their American counterparts, raised their energy and fuel efficiency in contingency operations. At operational bases in Cyprus and Kenya, the UK military has integrated battery storage, energy demand management, and renewable energy sources with traditional diesel generators, resulting in a 46 percent cut in the use of fuel for the generation of electricity. The Greek Cypriot National Guard is adopting similar standards and technologies in its operations.32

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**Local level efforts**

As in the United States, many cities in Europe are at the forefront of efforts to improve energy efficiency, reduce harmful emissions, and strengthen their resilience to the effects of climate change. Rotterdam, the Hague, London, and Newcastle have all announced plans to reduce their carbon emissions dramatically in the coming years, and a regional Covenant of Mayors—in which almost 4,000 cities have agreed to participate—promises emissions cuts of at least 20 percent before 2020.33 Copenhagen and London are among the European cities in the vanguard of adaptation measures. Both cities have responded to temperature rise by creating new green spaces to cool urban areas, and London is drawing up new plans to manage higher risks of flooding during heavy rainfalls.

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**Voice of experience:**

“The biggest thing we could do right now to address climate change and its national security effects would be to decrease the amount of carbon we pump into the atmosphere, and the biggest thing we could do about that would be to have a comprehensive energy policy that addresses not only the amount and diversity of our energy but how clean it is.

“Military planners have to think long-range, because the decisions we make today about equipment acquisitions will stay with us for 30 or 40 years. Climate change has to be a part of those considerations. If not, a lot of the events we plan for, the assumptions we make, and the activities we prepare to do will be overrun by the demands brought on by climate change impacts.

“The reality for the United States is that we cannot afford to do everything in the world, so we have to decide and find out a way to be partners with people and use alliances in better way to solve problems. Between them, the United States and the European Union have over $30 trillion in GDP and significant political influence. That’s a good group to start with.”

— **General Charles F. “Chuck” Wald, USAF (Ret.), Former Deputy Commander, Headquarters U.S. European Command (EUCOM)**
International energy and security cooperation

The United States and its European partners have several channels for dialogue and cooperation, from the ministerial level (e.g., the U.S.-EU Energy Council and its various working groups, and the Clean Energy Ministerial) down to numerous technical and research engagements. Agencies and departments of energy, environmental protection and management, and defense, as well as public research labs, have been collaborating for years.

Various channels exist for the sharing of local-level policies and experiences internationally. One example is the work of the Northern Virginia Regional Commission, which has created an institutionalized process of transferring lessons and technical programs from leading European cities in Germany and the Netherlands, to be applied within existing Virginia law. Lessons transferred and implemented in the Washington, D.C. suburbs include district models for heat recovery and distribution and stormwater management. In Europe, the EU Convention of Mayors initiative provides a framework for the sharing of best practices and technologies across the region. Another example is the collaboration between the U.S. National League of Cities and the National Association of Swedish Eco-municipalities—a total of 1,700 cities—on urban sustainability studies and projects.

Measures to strengthen and expand transatlantic cooperation on energy and climate security

The United States and European countries differ in their views and approaches to climate and energy security. Many elected leaders in the United States fail to grasp or distrust the scientific evidence for global warming. To some, the revelation of newly accessible oil and gas reserves across North America seems to resolve the problem of reliance on oil imports—a position we regard as misguided. In Europe, while most citizens are aware of climate change and support government action to address climate security, in practice countries are divided over policies and approaches.

Nevertheless, similarities in recent U.S. and EU policy trends demonstrate common interests in addressing climate and energy security.34 We offer the following recommendations to strengthen existing channels of dialogue and cooperation, and to expand these efforts into new areas.

- In the United States, improve the public dissemination of scientific information about our changing climate and its effects on citizens’ well-being and national security. U.S. citizens and their political leaders should advocate for efforts like the National Climate Assessment that provide sci-

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cientific analysis and guidance about these risks and options for mitigation and adaptation.

- **Require that the effects of our changing climate and its implications for energy costs be explicitly included in government and military planning.** Future policy planning and threat analyses, at the domestic and international levels, should be grounded in realistic assumptions about future fuel and energy costs, supply chains, and changing climate conditions.

- **Publicize innovative local efforts at energy and fuel efficiency and improving climate resilience, and support initiatives for the sharing of experiences and lessons internationally.** U.S. and European cities should be encouraged to form city-to-city partnerships to share their experiences with new policies and technologies. Lessons from public prototypes like U.S. Army Fort Carson, and from successful cases like the Northern Virginia Regional Commission, should be made widely available.

- **Plan for cooperative, multinational humanitarian assistance operations led by NATO.** Storms, droughts, floods, and other disasters are expected with ever greater frequency and intensity, and the transatlantic community has armed forces and disaster response agencies well-equipped to lead and to train multinational forces.

- **The transatlantic community should take a multilateral, instead of a bilateral, approach to scientific and technological engagement with other key partners in Asia and South America.** Inter-governmental partnerships and scientific and technological exchange programs that the United States and European Union have created bilaterally with China, India, Japan, Brazil, and other partners would be more cost-effective and productive if they were multilateral.