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INFORMED DECISION-MAKING FOR HOLISTIC SUSTAINABILITY



FORT BRAGG, NC • THOUGHTS ON POVERTY • CH2M HILL AND SOLAR MAPPING
NATIONAL SECURITY AND CLIMATE CHANGE
POWERING WITH BIO • AN OPEN LETTER TO THE OBAMAS
BOLIVIA'S MELTING GLACIERS • PATRICIO ROBLES GIL AND WILD9



Colors and Cultures. Energies and Rhythms. Nature's World as a Library of Design.



Jin Jiang Joy, a textile company founded by American conservation photographer Robert Glenn Ketchum, is exploring photographic imagery derived from nature and applied to fine fabric, personal items and home accessories. Ketchum's organic, intricately patterned creations are abstracted from his huge library of photographs. This artist believes working from pictures of nature infuses his designs with energies and rhythms no drawing could replicate or convey. He also thinks that such images bring nature's energy into the urban environment, thus promoting more positive personal surroundings.

California-born Ketchum views his designs as permeated with the vibrant colors of Pacific Rim cultures. But he also employs colors and color relationships that promote positive energy in order to resonate with certain body chakras to stimulate joy, clarity and overall health. "Launch," the high-quality 22" x 72" lustrous silk scarf shown here has been produced in a signed, limited edition of 200. The identical pattern is printed on 50 flat-black silk crepe shawls with

fringe ends. Each retails for \$250 USD. The astounding luminosity of the colors and the subtlety of hues have been faithfully reproduced by a 16-color printing process – close to the limit of what current technology allows.

Named by Audubon magazine as one of the 100 people who have helped to "shape the environmental movement of the 20th Century," Ketchum is probably most recognized for using his landscape photography as a kind of "visual journalism" to advocate conservation. His images and strategies have helped lead national media campaigns to protect Alaska's Bristol Bay salmon, Alaska's Tongass rainforest, New York's Hudson River and California's San Simeon ranch properties, among many others.

For more information about Ketchum and his conservation projects, please go to www.robertglennketchum.com. To purchase the scarf shown above, or the shawl, please call 310-406-0401. All major credit cards are accepted.



Jin Jiang Joy & Robert Glenn Ketchum
Nature-Infused Design



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A New Vision for Humanity

“Unprecedented steps have been taken to stop the global financial meltdown and to enable the world to recover from the economic crisis that emerged in 2008. But the world also faces a climate crisis which has been building over a much longer period of time. If we do not bring to this challenge the same determination and sense of common cause with which we have addressed the economic crisis, not only will the climate crisis feared by the scientific community occur, but recovering from it will be an impossibility. Fortunately, the appropriate responses to the climate crisis can also contribute to long-term economic prosperity.

“Scientists warn that global emissions must peak within a decade or we will face grave consequences, particularly in the developing world, where the vast majority of humanity lives and where the vulnerability to climate impacts is greatest. If rising incomes in the developing world are to be achieved through high-emissions growth, such as that pursued by today’s developing countries, then our environmental fabric will be stretched to the breaking point.

“Indeed, the tremendous scale of the climate challenge reflects two centuries of unchecked emissions growth. . . . The sad fact is that we have missed multiple opportunities to change course. Developing countries are the first – and worst – sufferers from a problem for which, from a historical perspective, they bear the least responsibility. Issues of equity and burden-sharing must be addressed. . . . As the advanced economies have the resources and the responsibility to lead the way, they will be required to make bold commitments to reducing their emissions and to helping developing nations undertake mitigation and adaptation.

“There is no single blueprint for achieving these goals. . . . There are huge synergies to be generated through big investments in energy efficiency, renewable energy, reduction of vulnerability and broader development projects. This will necessitate truly integrated policy responses, as well as enormous adjustments in the global economy. Yet, we must demand no less of ourselves if we are to put the world on a more sustainable path of development. . . .” – Ban Ki-Moon, United Nations’ Secretary-General

According to the United Nations’ 2009 World Economic and Social Survey, “Promoting Development, Saving the Planet,” the advanced countries “have, since 1950, contributed as much as three-quarters of the increase in emissions despite the fact that they account for less than 15 percent of the world’s population.” Historically, I understand how this happened; but, ethically and morally, I don’t understand how this is continuing, especially considering the dire consequences of such actions.

Americans have always prided themselves on doing what’s “right,” but it now seems that what’s “right” is taking a back seat. In a 2009 survey by The Shelton Group, only 26 percent of respondents said they’d choose the environment over their comfort or convenience, even though their choices “were harming the environment.” I can’t comprehend this mindset, particularly given the urgency of “saving the planet.” However, what I do understand is that until Americans learn how to demand and to make better choices, the fabric of life, particularly within the developing nations, will be in increasingly grave danger. Now is the time to stand up for the single most important cause of our generation and for those to come – to have a new, holistic vision based upon sustaining the quality of *all* life on Earth.

“One Earth. One Family. Live Better. Be Part of It.”

Rosemarie Calvert, Independence, WV



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Now is the time . . . to have a new, holistic vision based upon sustaining the quality of all life on Earth.

We Travel in GOOD Circles

The Carpet and Rug Institute, is part of a global initiative to promote positive environmental progress through our commitment to sustainability.

Our members have worked hard to establish the ANSI/NSF 140-2007 Sustainable Carpet Standard – the only one of its kind in the floor covering industry designed to create performance requirements for public health and the environment. Our Seal of Approval program has grown to more than 180 participating manufacturers with approximately 500 certified products and close to 700 service providers, all united in upholding product care standards that ensure product sustainability. We support the energy behind the Carpet America Recovery Effort (CARE), which promotes innovative ways to keep post-consumer carpet out of landfills and transform it into new products; in 2008, 243 million pounds of carpet were recycled and 292 million pounds were diverted from landfills.



Sustainability - it's an idea whose time has come around. Join our circle; visit us on the Web at www.carpet-rug.org, and participate in the sustainability discussion at our blog, www.criblog.org.



Sustaining America the Beautiful

A Team Effort by World-Renowned Photographer Robert Glenn Ketchum, the U.S. Department of Defense and Private Industry to Promote Sustainability

Support the Military Services and the new Administration as they embrace sustainability for a better world by participating in America's first-ever national exhibit on sustainability best practices. This historic event will tour more than 100 U.S. military installations, post-secondary schools, art museums and other landmark locations, reaching more than 2 million Americans. Ketchum and his fellow International League of Conservation Photographers will also produce a companion hardcover book to supplement the exhibit.

For participation information and opportunities contact Rosemarie Calvert, 304-892-3811 or rcalvert@centerforabetterlife.com.

A limited number of partnerships and sponsorships are available on a first-come, first-served basis.



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© Photograph: Robert Glenn Ketchum. For more information on Ketchum go to www.robertglennketchum.com

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In Memoriam

livebetter is dedicated to John G. Colson, who passed away from lymphoma in 2007. He was not only a consummate publisher, but also a good friend.



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Below is a partial list of some really great human beings who have been kind enough to share their time, energy and enthusiasm with us to promote the importance of sustainability.

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Thank you for caring deeply about the world, humanity, the environment and its many inhabitants. 

Creating a Path to Solar Adoption CH2M Hill and Solar Mapping

Most people think solar energy is a good idea. After all, the sun has been powering the Earth since the beginning of time. It's the sun's energy, for example, that helps a tiny acorn to become a mighty oak. Only recently has humankind been able to effectively harness this power source for conversion to electricity. Even with today's push on renewable energy, barriers continue to exist regarding its use in everyday life. However, thanks to forward-thinking companies and governments in partnership with practices like solar mapping, obstacles are giving way to increased adoption.

Photovoltaics (PV) involves the application of solar cells for energy by converting sunlight, including sun ultra-violet radiation, directly into electricity. Its production has been doubling every two years, which equals a 48 percent average increase each year since 2002. However, installation expense, quantified return on investment

and availability of experienced equipment installers and maintenance resources have continued to present challenges for even the most ardent enthusiasts.

Federal and state governments are removing these barriers and creating a path to more widespread adoption by providing cities and counties with clean energy funds. As a result, local governments are seeking ways to offer greater access to solar energy sources by easing permitting and licensing challenges, thus making it more available and affordable for home and business owners. One of the most dynamic means of supporting this transition has been the advent of the solar map.



Solar Mapping Portals

In its simplest form, a solar map utilizes Google Maps or Microsoft Virtual Earth to identify solar installations within a given area such as a city or a county. Applied to an online "solar portal" — a location point for residents and business owners to access detailed and area-specific solar information — the map provides a visual snapshot of the area's solar progress.

Aside from showing solar installations already in place, these portals can also address many factors involved in the decision-making process related to installing a solar energy system. These run the gamut from how to get started to solar electricity potential (based on geography and building characteristics), installation costs and contractor listings, estimated energy savings and rebate availability.

However, thanks to proprietary software used by Denver-based CH2M Hill, solar mapping has now been taken to a new level. The technology, Solar Automated Feature Extraction™ (SAFE), assesses the precise solar potential of each building in a city or neighborhood, rooftop by rooftop, through a combination of aerial imagery and advanced 3-D modeling by accurately measuring structural rooftop elements (including air conditioning units and ducting), the azimuth or sun direction, shadows cast by other structures and roof slant. In some instances, every structure on the map has been analyzed to calculate the estimated potential environmental benefits and monetary savings that would result from installing solar energy panels on the building. With these new detailed analyses, residents and building owners

... solar map portals offer state and local governments a proven method of jumpstarting their constituents' conversion to solar energy.

can perform return-on-investment calculations that would otherwise have taken numerous on-site visits and weeks to complete.

Thanks to the federal government's recent commitment to funding renewable energy and energy-efficiency programs, solar map portals offer state and local governments a proven method of jumpstarting their constituents' conversion to solar energy. Via property-specific solar estimates, residents and businesses can learn about the benefits of solar for their precise locations.

One such benefit is economic. Solar systems help building occupants save money by combining PV and traditional electricity by using "net-metering." When a system generates more electricity than needed, the electricity meter will run backward. If the opposite occurs and more electricity is needed than the PV system can generate, it's provided by the utility as usual. This combined set-up reduces an electricity bill to the difference between how much a solar system produces and how much electricity is used.

Solar America Cities

Municipalities are getting support from the federal government in their efforts to harness the sun as an electric power source through the Solar America Cities program. The program (<http://www.solaramericacities.energy.gov/Home.aspx>) is a partnership between the U.S. Department of Energy (DOE) and a select group of American cities committed to accelerating solar energy technologies' adoption at the local level. Teaming up with state and local agencies, nonprofit

organizations, universities, utilities, developers and solar companies, the cities' goal is to make solar electricity from PVs cost-competitive with conventional electricity forms from the utility grid by 2015. As a result, several municipalities have completed or are in the process of creating solar mapping portals.

"The Solar America Cities were deemed such because they've taken a leadership role in the nation's adoption of solar energy," said David Herrmann, a project manager from CH2M Hill, a firm leading the way in solar mapping. "America is watching their progress in order to learn from their efforts and successes. The solar mapping portal has been a highly visible component of many city programs by allowing a window into the city's solar potential and by helping to speed the adoption of solar — rooftop by rooftop."

Solar Mapping in Action

San Francisco was the first city to determine the solar potential of every building in a city by using the SAFE analysis technique. Integrating a map as the cornerstone of a solar portal, it provides the City and County of San Francisco's Department of the Environment a one-stop site to engage citizens in solar outreach efforts.

As part of the project the Web portal, <http://sf.solarmap.org/>, enables residents and building owners to easily log on, view their rooftops, calculate the available square footage for panels, mock up solar panel placement, estimate how much money people will save, choose from a listing of available installers and





is underway. Masdar, which means “the source” in Arabic, is building Masdar City, a carbon-neutral, zero-waste city powered entirely by renewable energy. The initiative is leveraging established renewable energy industries such as solar but also investing in its own future-energy innovations.

An international movement similar to the DOE’s Solar America Cities program has also been in place since 2004. The International Solar Cities Initiative’s objective is to support the United Nations’ energy and climate policies by stimulating interest in becoming benchmark cities that commit to ambitious emission reduction goals. The Initiative helps cities integrate renewable and energy-efficient technologies and industries into environmental, economic and city planning while providing scientific support for the validation and design of effective measures and policies for its solar cities.

“Our barriers to solar implementation in America are not unique. Though the burden of cost and responsibility for implementation may be allocated differently, a solar mapping portal provides the same benefit for a home in Abu Dhabi as it does in Alabama. The faster we can break down those barriers, the more efficient our alternative-energy economies will become around the globe,” said Herrmann.

get detailed information on tax rebates. Residents can also see whether their neighbors have adopted solar energy and which buildings in town have solar applications. Since the portal has been implemented and made available to the public, PV installations have grown by 60 percent, and the amount of solar electricity generated has doubled.

According to Johanna Partin, renewable energy program manager for the San Francisco Department of the Environment, “CH2M Hill’s solar mapping solution will help the City and County of San Francisco reach its goal of 10,000 solar roofs by 2012. This would give the city an annual savings of more than \$7 million in energy costs and an annual carbon savings of almost 46,000,000 pounds – the equivalent of taking more than 3,500 vehicles off the road.”

Other cities currently investing in solar mapping include Portland, Sacramento and San Diego, as well as Los Angeles County.

International Solar Initiatives

Seventy-five percent of the world’s greenhouse gas emissions come from cities. So, naturally, the world – not just the United States – is exploring solar as a solution to this growing problem. As more people begin to implement alternative energy as their primary electricity source to mitigate the effects of rising oil prices and environmental degradation, solar maps will become an important tool for conversion to this abundant energy source.

One such ambitious undertaking is, ironically, in the oil-producing nation of Abu Dhabi, where the Masdar Initiative

Benefits Provided by Solar Portals to Citizens, Businesses and Municipalities

Increased access to information.
Solar mapping portals establish a web-based method of visualizing site-specific solar placement, which ties technical, financial and contractor data together in a consumer friendly manner.

Enhanced productivity.
Portals reduce costly, time-consuming on-site solar PV survey.

Public benefit.
Portals provide a common reference point to quickly inform both the government and the public about solar’s benefits.

Enhanced investment.
Portals provide an authoritative information source that encourages greater citizen and countywide buy-in and are frequently used to assess city and county building solar potential.

Response to state and federal goals.
Portals lead to wider use of renewable, clean energy by helping to meet local, state and federal goals.

Improved collaboration.
Portals serve as a single information site, which helps to aggregate potential solar projects into a larger, single county-funded program.

Cost savings.
Wider use of solar reduces utility consumption, thus it also lowers consumer and county utility budgets.

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Bolivia's Melting Glaciers

Dirk Hoffmann | Coordinator, Bolivian Mountain Institute, La Paz, Bolivia

“The world’s highest ski slope with a lift,” as Chacaltaya is identified in most travel guides to Bolivia, ceased to exist a few years ago. Even though the lift has also gone out of operation, until recently one could still view an occasional skier laboriously making his/her way up Chacaltaya Mountain from the ski hut and parking lot at 5,200 meters (m) altitude. Sadly, all that’s left to see is a glacier that’s now melted away but for one ice patch, as a July 2009 visit demonstrated. Global warming has taken its toll on the 18,000-year-old surface, once the Earth’s highest ski resort.

The Chacaltaya Glacier is not only the best-known glacier of the 1,830 Bolivian glaciers counted by German geographer Ekkehard Jordan but also the best-studied one. Since 1991 a French-Bolivian team of experts has been measuring the La Paz glacier’s shrinkage and documenting the major environmental disaster of our day as well as in decades to come: climate change. According to the World Glacier Monitoring Service (WGMS), 25,908 km² of glacier area exists in South America; that represents less than 0.2 percent of the global glacierized area of 15,861,766

km². The 566 km² of Bolivian glaciers* are a mere 2 percent of the South American total.

Tropical Glaciers

By a different count Bolivian glaciers make up 20 percent of all tropical glaciers in the world. Although very close to the Equatorial sun, they have been able to exist for thousands of years, primarily thanks to their high altitudes. Now, with the effects of global warming in full swing for the past two or three decades, tropical glaciers have become a “species in extinction.” And, Chacaltaya is only the most visible sign of this. A large number of the smaller glaciers at altitudes between 5,000 and 5,500 m have already melted away. They are unnoticed by the wider public.

Global warming is doubly dangerous to tropical glaciers as the warming rate is about twice as high in high altitudes of 5,000 m or more as scenarios from global climate models show. Figures for Switzerland have already confirmed this tendency for the past 30 years: The Swiss Alps have warmed at an average of 0.6° Celsius per decade while the lowlands warmed at the global average of only 0.3° Celsius. So, glaciers continue to lose their ice mass – often at unprecedented speed – and render expert estimates obsolete virtually the moment they’ve been pronounced in many cases. Only a few years ago, the investigative team of glacier and climate

“And while my father-in-law won skiing championships on Chacaltaya . . . my little son will not remember having once played on the last remains of ice . . .”



© Photograph: Dirk Hoffmann

experts expected Chacaltaya to last another 10 to 15 years yet, by 2010, the last little patch of ice will have disappeared.

In Bolivia only in the past two or three years have melting glaciers become a subject of some public interest. Until recently, the Bolivian Andean Club harbored plans to save their skiing site by either placing a plastic cover over it or by installing snow machines. Apart from the economic impossibility, these ecologically questionable methods, copied from the European Alps or North American Rockies, would not have worked because of special conditions affecting glaciers at high tropical altitudes. What had not been considered were inherent differences from glaciers of Northern latitudes. While the Alps or Rocky Mountains have a long winter period “feeding” the glaciers with new snow on their upper areas and putting up winter accumulation against summer loss, tropical conditions under a warming tendency create a basically year-around loss situation. Winter is a cold but dry season with summer wet but warmer.

Socio-Economic Impacts

While the world is mourning the loss of a ski slope and some scenic beauty of the Andean Cordillera mountain range, something more devastating is actually happening. Vanishing glaciers have severe impacts on the hydrological regime and, thus, on water availability downstream. While impacts on agriculture or biodiversity are more difficult to measure, there is now a first study on socio-economic impacts quantifying the relevance of glacier melting for the drinking water supply to growing El Alto – La Paz. The predictions are frightening; as early as the end of the dry season (October 2009), the first water shortages may be expected.

Scientists are also now beginning to calculate the economic damage caused to poor countries like Bolivia and Peru, which will see their hydroelectric energy production capacity, as well as their capability to deliver drinking water to major population areas like Lima, La Paz or El Alto, severely affected. New water storages will have to be constructed high up in the mountains, which will have not only a serious impact on biodiversity but also on the peasants’ irrigation facilities at a cost of hundreds of thousands of additional dollars.

No campaign to “save the mountain whales” can have any effect upon saving Chacaltaya or the rest of the Tropical Andes glaciers, if one considers the climate system’s inertia. Even if all greenhouse gas (GHG) emissions stopped on this very day, global tem-

perature would rise for a few more decades. Ironically, emissions from post-war decades are what’s currently killing glaciers. Impacts of more recent – and much larger – GHG emissions are still in line to take their turn in 20 or 30 years’ time.

And while my father-in-law won skiing championships on Chacaltaya in the 1970s, my little son will not remember having once played on the last remains of ice when he has grown up. What am I to do? I take as many photographs as I can, keep measuring glacier tongues in a few chosen places, document the disappearance of those icy dinosaurs of the Andes as accurately as possible and try to alert the world about the impacts climate change is already having on a good part of the Bolivian population.

The glacier will be all gone by next year. The Andean Club of Bolivia (Club Andino de Bolivia or CAB) will have lost its major asset, this unique skiing slope going up to 5,400 m.a.s.l. – the highest in the world with its own ski lift. What is to happen with the mountain cabin built of local stone in 1939? It dates back to the ski and mountaineering pioneers of the 1930s and 1940s. And what about the marvelous smaller wooden cabin with the ski lift’s engine, which dangles dangerously over the precipice? Jointly, the Andean Club, owner of all installations on Chacaltaya, and the Bolivian Mountain Institute (BMI) have started to implement what they call a “New Vision for the Chacaltaya.”

The CAB is modernizing the larger cabin by adding comfort and sleeping capacity and by offering snacks and coca tea to fight altitude sickness. As a result, the mountain cabin is well on its way to becoming not only a tourist attraction with excellent views of the surrounding mountains easily reached by car in less than two hours from La Paz city center but also a high-altitude training and acclimatization center. Parallel to this effort, the BMI is presently fundraising to turn the smaller cabin, which hosts the ski lift engine, into a “Chacaltaya Glacier and Climate Change Museum.”

The Bolivian Mountain Institute (BMI) is a La Paz-based non-profit foundation dedicated to applied research in Bolivian high mountain areas. Inspired by the International Year of Mountains (IYM 2002), the BMI was founded in the same year with its own modest offices by 2004. In accordance with the United Nations’ Agenda 21, the mission of the BMI, as established in its founding charter, is as follows: “Contribute to a sustainable development of mountain regions in Bolivia by means of scientific investigation, capacity building and technical assistance, exchange of experience and the realization of projects.” For more information please visit the website at www.bolivian-mountains.org or email Dirk Hoffmann at bolivian-mountain-institute@gmx.net.

* This data is from the late 1980s. As of 2009 the probable total is now approximately 20-25 percent smaller.



© Photograph: Dirk Hoffmann

Increasing Efficiencies in Technology Update on Solar Energy Research

Emily Wilmsen

Solar energy is back on the front burner with more companies and major research institutions entering the market. However, solar-powered energy technology is still incubating, say industry and scientific experts in Colorado, which is one of the national leaders in creating “green” technologies and jobs. Costs are coming down, and efficiencies are going up thanks to new advances. But, prices are just now becoming attractive enough for the average consumer. Some scientists estimate that the next major strides will be five years away, which is a relatively short timeframe compared to the hundreds of years that the world has relied upon coal as its primary means of generating electricity.

“Most people in the field think we need new materials or better ways of putting those materials together to get more efficient electron transport,” said Ellen Fisher, chair of the Department of Chemistry at Colorado State University (CSU). Scientists in her department are working on everything from creating new materials that conduct solar

electricity to developing innovative methods for energy storage. “How do you get those electrons out of the solar cell and back to something that’s going to run the light bulbs in your house?”

Why Solar

The photovoltaic conversion of sunlight into electricity is the most direct, efficient way to use the sun’s energy. With the reemergence of worldwide interest in alternative energy sources and in the “green” workforce, there is an increasing maturity in solar-thermal applications and in progress toward efficient decomposition of water to produce hydrogen. This progression also extends to other strate-



© Photograph: Dan Bihn

“If we could actually create a photovoltaic material that was flexible and inexpensive, that would completely revolutionize the solar industry.” - Ellen Fisher

gies for solar-generated energy storage.

In Colorado the state’s top research institutions – CSU, the Colorado School of Mines and the University of Colorado – are working closely with National Renewable Energy Laboratory (NREL) federal researchers, the Governor’s Energy Office and industry partners to develop long-term renewable energy alternatives. This unique partnership is called the “Colorado Renewable Energy Collaboratory” (CREC).

Solar, one of the CREC’s long-term alternatives, is becoming a popular Colorado option for a number of reasons. For starters, the state is graced with more than 300 days of sunshine per year. Additionally, Colorado Gov. Bill Ritter’s “Climate Action Plan” calls for a 20 percent reduction in greenhouse gases by 2020 and for deeper emissions cuts by 2050 – goals he expects to achieve with the creation of new renewable energy sources and jobs.

As an example of the confluence of university research meeting private industry initiatives, officials at Abound Solar, a CSU spinoff, claim they’re leading the industry in reducing renewable energy costs. The company’s economical manufacturing process at its Longmont, Colo. factory is driving down the cost of solar electricity for its commercial and utility customers. Solar panels will begin rolling off manufacturing lines at rates that could be comparable to those of traditional electricity. Lower costs will eventually trickle down to consumers. (For more information about Abound Solar, please read this issue’s “Sustainable Solutions” on page 63.)

The Colorado Governor’s Energy Office has estimated that the state potentially could produce as much as 83 million megawatt-hours of electricity per year from solar technologies. Through the Office’s Pilot and Solar Rebate Programs, 499 solar energy systems were installed across Colorado since 2008; they generated 3.4 gigawatt-hours of annual solar energy. With the average Denver home’s annual electricity usage of 7000 kWh/yr, that’s enough energy to power 486 Denver homes with 100 percent solar energy.

Not surprisingly, as the amount of solar energy production has grown the state’s solar industry has also expanded despite challenges that include lack of conforming community regulations and still-expensive technology, said Colorado Solar Energy Industries Association Executive Director Beth Hart. The state’s solar industry has grown from 56 companies in 2004 to more than 200 in 2009; their employees have increased from about 200 people to 2,000, Hart said.

“We really hope to be at that place in the residential sector where it’ll be just like going out and getting a car and getting a loan. And, it won’t be as regulated as it is now,” Hart said.

The Next Big Thing

According to Fisher, CSU chemists, mechanical engineers and biologists are working on the next big thing in solar to help get it into the mainstream. She divides their research into three categories:

1. Developing new organic materials or modifying existing materials to improve their function.

CSU Chemistry Professors Mike Elliott and Eugene Chen are researching how to create new polymers – long chains of organic or carbon-based fragments – that could conduct solar electricity. Fisher said to think of it this way: Imagine using a strong but flexible material like aluminum foil that you could roll out on your roof for capturing solar energy.

She explained further: “Organic materials are not the best electron conductors; they tend to be insulators. If we could actually create a photovoltaic material that was flexible and inexpensive, that would completely revolutionize the solar industry. It would be much more commercially viable to sell to the general public.”

2. Creating new inorganic materials, silicon or cadmium telluride, for example, that could be placed inside solar panels to produce electrical current.

“We’re trying to find an efficient material for solar cells that contains only earth-abundant, non-toxic elements,” said another CSU chemistry professor, Amy Prieto. “There is still much to be understood about how the material we’re now using works – how it absorbs photons and converts them to current.”

3. Increasing the surface area of materials that are actually exposed to sunlight.

CSU Chemistry Professor Alan Van Orden is developing semiconductor nanocrystals from inexpensive materials so that they will have the ability to absorb energy from sunlight and to transport the energy as electricity.



© Photograph: Dan Bihn



interdisciplinary collaboration not only within the University but also with NREL and the CREC.

Cross-institutional lines have blurred even more in the past year: CSU is one of three Colorado research universities that now have a seat on NREL's board of directors. In summer 2008 the U.S. Department of Energy announced the selection of the

Alliance for Sustainable Energy LLC as the management and operating contractor for the Laboratory. The Alliance, which includes Midwest Research Institute and Battelle, subsequently named five research universities to its board of directors: CSU, Colorado School of Mines, University of Colorado at Boulder, Stanford University and Massachusetts Institute of Technology. At the time Colorado State administrators said they believed the Collaboratory's success led the Alliance to choose the aforementioned institutions for its management team.

Energy Partnerships

The CREC has organized Centers around wind, solar, biofuels, carbon management and energy efficiency – all designed to build collaboration between industry and academia with the ultimate goal of creating commercialized technologies and jobs. The Center for Revolutionary Solar Photo-conversion (CRSP) launched April 2008 to conduct basic and applied research leading to the development of new solar energy technologies or advancement of existing systems for direct solar energy conversion. CRSP is designed to create technologies

that will be both highly efficient and cost-effective. Fourteen companies now belong to the Center: Applied Materials Inc., Ascent Solar Technologies, DuPont, Evident Technologies, General Motors, Konarka, Lockheed Martin, Motech Industries, QuantumSphere, Sharp, Solasta, Sub-One Technology, SunEdision and Toyota.

The Collaboratory has three goals: to commercialize renewable technologies, to help renewable energy become an economic driver and to educate engineers and scientists for academia and industry. "Universities are very happy to educate Ph.D.s who are finding jobs in the renewable energy industry," said David Hiller, former energy advisor for then-U.S. Sen. Ken Salazar now U.S. Secretary of the Interior, who is executive director of the CREC.

Xcel Energy, Abengoa Solar, SunEdison, the City of Aurora, Colo., and the Midwest Research Institute are working together on the Collaboratory's Solar Technology Acceleration Center (SolarTAC). The SolarTAC facility is a place where the solar industry can research, test, validate and demonstrate the full range of solar technologies and components. SolarTAC is now under construction near Denver International Airport and is 100 percent privately funded, Hiller said.

"CREC's role is to provide talent for companies that want to conduct research related to technologies being tested at SolarTAC," Hiller said. "I really believe this is going to be one of the world's premier solar testing and demonstration centers and it will be a great magnet for the state. I think you'll see the solar industry congregating around SolarTAC – building from testing and demonstration activities to research to manufacturing in Colorado. The state's solar future is very bright."

The same can be said for Earth's solar future, thanks to researchers within the U.S. and around the world. 🌱

Fisher explained: "It's comparable to using a bunch of little marbles instead of one big marble. If the function that you're looking for all takes place on the surface, even though there are more of them, you wouldn't have to make a bigger device to get more efficiency."

Other Advances

In mechanical engineering at Colorado State, Professor Venkatesan "Mani" Manivannan is working with students to create an integrated solar power system that has a cheaper overhead cost and is more energy-efficient than current systems. The goal includes developing a high-density battery that could increase solar power storage capacity.

Fisher, whose work focuses on altering surface properties to make existing materials more efficient, is confident that basic research at CSU and at other universities around the nation will ultimately lead to low-cost solar options for consumers. She said, "Changes are going to come out of this fundamentally based research that promotes an understanding of how materials work to build a better solar cell." She noted that research often involves



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Federal Sustainability's Impact

Edwin Pinero | Manager, Sustainable Development, ESS, Parsons Corporation
Alex Beehler | Independent Consultant and former Principal Deputy to the Deputy Under Secretary of Defense (I&E)

Amidst the high-profile, highly charged Federal political scene dealing with topics such as health care and terrorism is a very successful, relatively quiet success story – Federal sustainability. A review of recent reports on accomplishments within the Federal community and of award winning agency performances clearly document how much progress has been made. More significantly, sustainability has become a core value and fundamental business practice in the Federal government, regardless of who is in the White House or on Capitol Hill.

On the broader scene, sustainability is the new “in thing.” It is commonly referenced not only in trade journals but also within mainstream media in company and product advertisements as the reason to do things or to buy certain products. It is important to

note that sustainability, in its simplest form, means “the ability to sustain.” In other words, it relates to practices and behaviors that can go on successfully for extended time periods. In this context, the word is commonly used as a catch-all term for activities and practices with regard to the environment and natural resources. However, sustainability not only involves the environment but also economic viability and impact on lifestyle and society.

Put another way, “sustainability” means the ability to balance environmental stewardship (which, for this discussion, includes energy and natural resources), economic reality and quality of life; the operative word is “balance.” It does not mean focusing on only one of the three. Therefore, the cheapest or greenest or most lifestyle-enhancing option is usually not the most sustainable. The sustainable option is the one that balances all three.

One can argue that developed countries, such as the United States, had evolved from profit at all costs to environmental protection at all costs, superimposed with, at a minimum, maintaining, if not constantly improving, our quality of life. The evolution is now progressing to a more balanced approach. This is not unique to developed countries, but the focus on which of the three sustainability components is most important varies. For example, today's developing countries tend to figure in environmental and social issues more prominently earlier in their economic development than the U.S. and Europe did during their respective industrial revolutions.

In the global marketplace we have seen corporate and organizational commitments and initiatives evolve from “going green” to being “sustainable” to now being “socially responsible.” “Going green” focused on environmental protection. “Being sustainable” meant environmental stewardship in the context of sound economic and market factors. And “socially responsible” reflected environmental stewardship executed in an economically smart fashion with a stronger emphasis on and integration with social issues.

“What does the future hold? If the pattern continues, the Federal government will evolve from being sustainable to being more socially responsible.”

How does this relate to the Federal government's progress? One can see the same patterns in government. As far back as 1969, in the opening section to the National Environmental Policy Act (NEPA), is a commitment for the government to operate and to protect the environment in a sound and viable manner for generations to come. It was and is an undertaking that is a precursor to the sustainable development definitions that proliferated in the 1970s, '80s and '90s – so well captured by the famous Brundtland definition often used by many organizations.

This commitment manifested itself early in how the law was applied to Federal tax dollar use in the context of environmental impact assessments. Then, in the late 1980s, efforts aggressively ramped up to “green” federal operations and to better manage the government's own footprint. As we entered the 1990s with the Clinton Administration, a series of Executive Orders mandated recycling, waste reduction, energy efficiency and transportation fuel conservation. This characterized the “going green” phase of the aforementioned cycle.

In the late 1990s and early 2000s these practices became more integrated, and a visible connection to the economic and lifestyle value of such practices in the Federal government was crystallizing. In 2007 a new Bush Administration Executive Order (EO 13423) was issued. It built on the successes of earlier Executive Orders and practices by integrating various goals of separate orders into one. While reducing the number of pages, the new order more importantly memorialized the transition from “going green” to being “sustainable.” It integrated practices to capture the benefit of synergy by tying efforts more closely to fiscal and economic prudence and by making it clear that the goal is not only a cleaner and healthier environment but also a more efficient government with a more productive workforce and agency mission success.

Two very important points are evident from this progress. First, the government is becoming more aware of its role as a consumer of goods and services and its impact on the national and global marketplace. In other words, the government realizes that by implementing these sustainable practices, it not only helps its own environmental, social and economic footprint; but it also helps catalyze markets for society's benefit. Examples are the Federal commitment to high-performance sustainable buildings and to sustainable electronics. The government's immense buy-

ing power and market share with respect to these products guarantees greater availability for the general marketplace.

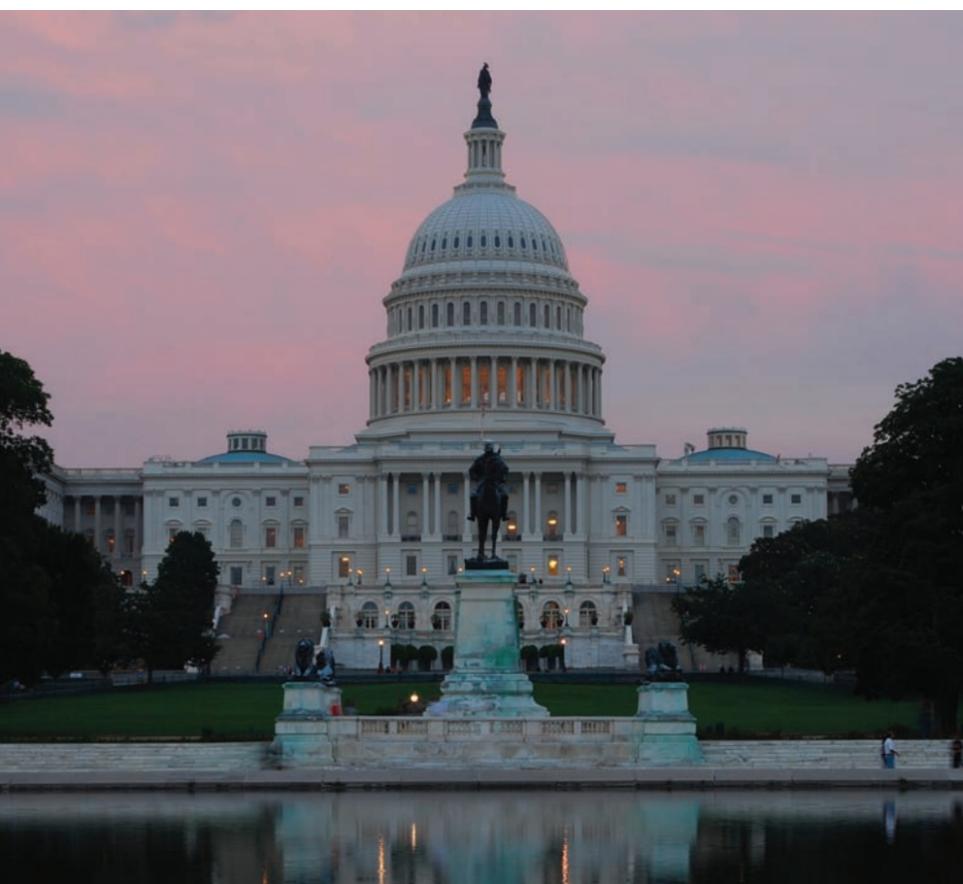
Second, this Federal sustainability evolution occurred across several Presidents of both parties. And the current administration's apparent commitment not only to continue on this path but also to go even further helps demonstrate that Federal sustainability is here to stay. These requirements have become fundamental elements of how agencies operate, and we are rapidly approaching a point where NOT having these goals and commitments would be disruptive and counterproductive. Although clearly each President will put his or her “flavor and mark” on the goals, the fundamental point is that the government wants to be sustainable, and it sees the benefits. Sustainability is now so ingrained in normal agency operations that arguably it is not even political, let alone partisan. Most of the government is, after all, composed of career public servants, not political appointees. If sustainability is inherent to that broader workforce, then it is not political.

However, at least in the beginning politics played a role because Executive Orders are presidential documents that survive only as long as the sitting President wants them to survive. So there had to be “political” value to a new administration to continue the effort – especially if it were something that a prior President had implemented. But in 2007 a sea of change occurred when Congress, through legislation, began to memorialize elements of these Executive Orders. In other words, they became the law of the land. The Energy Independence and Security Act of 2007 memorialized many elements of Executive Order 13423. And pending legislation will continue to blur the line between executive branch and legislative branch origins of requirements. This further demonstrates the “depoliticizing” of Federal sustainability.

What does the future hold? If the pattern continues, the Federal government will evolve from being sustainable to being more socially responsible. This means taking sustainability to the next level with more emphasis on the impact on lifestyle and the social condition. The current President's strong commitment to energy independence and climate change demonstrates a greater visibility of elements that have strong social components. This will bode well for all Americans. We will benefit from a government that strives to be more efficient with our tax dollars, to be better stewards of our resources and to lead by example via catalyzing markets so that we can all afford to be sustainable. 🌱



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Oat Hulls and Waste Byproducts Powering with Bio

Thomas Hickey, PE | Stanley Consultants, Muscatine, Iowa

Imagine displacing 25,000 tons of coal per year with Quaker Oats' oat hulls. Sound crazy? Not so, thanks to Ferman Milster, P.E. and University of Iowa Associate Director for Utilities and Energy Management. Milster, who is no stranger to sustainability, was instrumental in converting a coal-fired boiler at the University's main power plant to burn biomass oat hulls delivered from a nearby Quaker Oats facility. The technique, implemented to reduce the power plant's regulated pollutants and greenhouse gas, reduces expenses (oat hulls cost considerably less than coal) and provides a stable fuel supply. This creative engineering process also generates revenue for Quaker Oats while serving as an outlet for oat hull waste.

Biogas, biomass, biofuel, biodiesel . . . with success stories like this one, it's easy to understand the hype about "bio." The root word "bio" means "life"; and, thanks to today's "green" revolution,

every one is beginning to understand its importance. From recycling a single aluminum can to recycling the contents of an entire city landfill, such practices are critical to conserving the planet and the organisms it sustains. And technology is fast becoming a primary player in converting old techniques into newer, more holistic ones that successfully care for the Earth while simultaneously allowing organizations to preserve and to enhance their primary missions.

A Continuing Commitment

In 2003 the University of Iowa made a legally binding commitment to reduce its



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"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect . . ."

- Aldo Leopold

greenhouse gas emissions when it joined the Chicago Climate Exchange (CCX), the voluntary greenhouse gas trading exchange. In 2008 Iowa President Sally Mason expanded upon this undertaking by declaring a campus-wide green initiative and by launching a "go green" campaign to reduce the University's environmental footprint.

Because the University of Iowa has positioned itself as a forward-thinking, environmentally conscious institution, it was no coincidence that Mason announced the initiative on Earth Day. It was her goal to increase awareness and to place significant importance on sustainability. During her speech Mason quoted Aldo Leopold, a great American and Iowa native, who said "We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect . . . the land ethic simply enlarges the boundaries of the community to include soils, waters, plants and animals or, collectively, the land." Leopold was in the correct mindset when he spoke these words, and that University is taking steps to ensure his vision becomes a reality.

Mega-Watts & Gas-Fired Engines

To pursue this plan in concert with a promise to reduce its power generation impact upon the planet, the University retained Stanley Consultants, a Muscatine, Iowa engineering firm, to design a cogeneration facility that would produce heat and electrical energy. Known as the Oakdale Electrical Generation Upgrade Project, the operation will utilize two 1.4

MW gas-fired engine generator sets at the University's Oakdale Research Campus. To put the size of this facility into perspective, one mega-watt is 1,000,000 watts, which makes 1.4 MW equal to 1,400,000 watts. If the University were to power only 100-watt light bulbs with these two 1.4 MW generator sets, the complex would have the capacity to power 28,000 100-watt bulbs (14,000 bulbs per generator).

Although gas-fueled generator sets are common in many installations, this site is unmatched because it is incorporating newly developed technologies. The Oakdale gas-fired engines will be capable of burning traditional natural gas or biogas, which could be supplied to the University from offsite sources or generated through a gasification process on site. By recovering and utilizing jacket water and exhaust heat for campus heating as well as by supplying adsorption chillers with heat for the process in the future, this facility can become a trigeneration site, which would be unique for a university within the United States.

The Oakdale Electrical Generation Upgrade Project is scheduled for completion by early 2010. When fully operational, it will displace use of the existing natural gas-fired boilers and will generate electricity – all from landfill source or biogas.

Benefits of Biogas

Gasification, the process by which biogas is made, typically refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen. Biogas originates from biogenic material and is

a type of biofuel or low-cost fuel alternative in many countries. It has been used in some parts of the world for a variety of purposes such as heating college campus buildings or cooking noodles in a dorm room. Another perk: Biogas is a renewable fuel, qualifying for renewable energy subsidies all over the world, including in Iowa. In fact, the Iowa Office of Energy Independence offers financial assistance for projects meeting certain criteria through the Iowa Power Fund.

Biogas can be produced in anaerobic digester plants where microorganisms break down biodegradable material in the absence of oxygen. Digester plants can be fed energy crops such as maize silage or biodegradable wastes, including municipal sewage sludge and food waste. Landfill gas is produced by wet organic waste decomposing under anaerobic conditions (lacking oxygen). The waste is covered and compressed mechanically and naturally because of gravity and because of the material's weight deposited from above. This outcome prevents oxygen from accessing waste and allows anaerobic microbes to produce gas, which builds up and is slowly released into the atmosphere if the landfill site has not been engineered to capture the gas.

Using Landfill Gas

Proper use of landfill gas is beneficial to the environment for a number of key reasons: 1.) The methane contained within a landfill is 20 times more potent as a greenhouse gas than carbon dioxide. Therefore, uncontained landfill gas that escapes into the atmosphere significantly contributes to the effects of global warm-





ing; 2.) Fuel costs, and the corresponding taxation burden, have been rising steadily, thus leading to increased direct and indirect user costs; 3.) Incentives to maximize the use of renewable energy sources continue to accelerate, thus increasing bottom-line deliverables.

Trapping landfill gases and using them for beneficial practices protect the environment because decomposing matter is completely sustainable and available in abundance. Utilizing this form of energy reduces the consumption of less-sustainable fuel like natural gas and coal.

Although biogas is less refined and contains more impurities than its natural gas counterpart, it remains an advantageous alternative to natural gas. The process by which biogas and natural gas is refined to make them usable is very similar, given that neither gas is completely pure and must be processed fully.

Natural gas, for instance, consists primarily of methane; but other materials must be filtered out before the gas can be used as fuel. Biogas must often undergo additional filtering, including moisture removal processes, to meet an engine

manufacturer's requirements for proper combustion. Failure to maintain fuel parameters within a manufacturer's specified tolerances can cause accelerated corrosion and wear, which can lead to more frequent maintenance and/or reduce engine life.

Depending upon its biogas source, the Oakdale project's compressors may be required to pressurize gas and transport it to the site. Engines may also need higher pressures of biogas for proper combustion, which may also require gas compressors. One potential additional benefit may be the resale of energy back to local utility companies if the process is a success. "Success," in this case, is defined as "energy being generated cost effectively and on a continuous basis."

Integrated Visions

The University of Iowa's initiative parallels Iowa's Green Government Initiative, which aims to ensure that clean energy, environmental protection and resource conservation are integrated into government policies and procedures. It was from this goal that the University's Green Power Task Force was born. Its mission: Posi-

tion the University as a national leader in alternative and sustainable energy; prepare a long-range plan to compete for funding that would support renewable energy research and increase support for new, clean-burning power facilities at the University of Iowa.

One task force objective was to determine options for future steam and electric capacity needs that would expand the University's use of renewable fuel and that would provide education and research opportunities. Major initiatives are under way for the main campus and for the Oakdale Campus, including direct tie-ins with the University of Iowa's research and educational missions.

Hopefully, other institutions . . . will make a serious commitment to sustainability. . .

Milster is an active supporter of this sustainable venture. He has said, "The biogas generators and accompanying new district heating and cooling system currently in the works for the Oakdale campus are a monumental breakthrough for the University's sustainability mission. I am pleased to know that we are leading the way for others interested in developing highly efficient, fuel-flexible district energy systems."

Hopefully, other institutions will follow the example set forth by the University of Iowa and will make a serious commitment to sustainability – whether through something as simple as campus-wide recycling or by delving into similar types of trigeneration projects. The current U.S. trend toward exploring renewable energy technologies on a large-scale basis makes it an exciting, cost-effective and worthy goal for other higher education, healthcare and private industry campuses, as well as military installations, to emulate. 🌱

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National Security and Climate Change



In April 2007, CNA completed a national security implications assessment of global climate change in order to “better inform U.S. policymakers and the public” about effects and potential threats. This non-profit research organization, which operates the Center for Naval Analyses and the Institute for Public

Research, convened a Military Advisory Board (MAB) of 3-4 star retired generals and admirals, as well as national security experts, in order to accomplish this task. The MAB and study team received briefings from a wide array of intelligence, climate science and business experts, as well as United Kingdom state leaders. In

addition, the well-respected MAB members presented their own views based upon years of hard-core, real world experience. The resultant Report is historic in that it succeeded in painting a bull’s eye on a subject of grave military concern that had heretofore not been adequately addressed by Congress or the then current administration.

Although “National Security and the Threat to Climate Change” is 2-years old, the majority of the document remains current and valid as evidenced by MAB members continuing to brief U.S. and international leaders and organizations on its findings. Below are selected excerpts taken directly from the Report found at www.cna.org.



U.S. Air Force photo by Senior Airman Jacqueline Kabuyen

“During our decades of experience in the U.S. military, we have addressed many national security challenges from containment and deterrence of the Soviet nuclear threat during the Cold War to terrorism and extremism in recent years. . . . Global climate change presents a new and very different type of national security challenge. . . . Carbon dioxide levels in the atmosphere are greater now than at any time in the past 650,000 years, and average global temperature has continued a steady rise. This rise presents the prospect of significant climate change and while uncertainty exists, and debate continues regarding the science and future extent of projected climate changes, the trends are clear.

“The nature and pace of climate changes being observed today and the consequences projected by the consensus scientific opinion are grave and pose equally grave implications for our national security. . . . The consequences of climate change can affect the organization, training, equipping and planning of the military services. . . . Climate change can act as a threat multiplier for instability in some of the most volatile regions of the world, and it presents significant national security challenges for the United States.” — *The Military Advisory Board: General Gordon R. Sullivan, USA (Ret.); Admiral Frank “Skip” Bowman, USN (Ret.); Lieutenant General Lawrence P. Farrell Jr., USAF (Ret.); Vice Admiral Paul G. Gaffney II, USN (Ret.); General Paul J. Kern, USA (Ret.); Admiral T. Joseph Lopez, USN (Ret.); Admiral Donald L. “Don” Pilling, USN (Ret.); Admiral Joseph W. Prueher, USN (Ret.); Vice Admiral Richard H. Truly, USN (Ret.); General Charles F. “Chuck” Wald, USAF (Ret.), and General Anthony C. “Tony” Zinnie, USMC (Ret.).*

CLIMATE CHANGE AND THE SCOPE OF THIS STUDY

“Although there is a great deal of agreement among the world’s climate scientists regarding the overall picture of a changing climate, there is also some disagreement about the extent of future changes. . . . Regardless of this continuing discussion, the board’s view is quite clear: The potential consequences of climate change are so significant that the prudent course of action is to begin now to assess how these changes may potentially affect our national security . . .

“This approach shows how a military leader’s perspective often differs from the perspectives of scientists, policymakers or the media. Military leaders see a range of estimates and tend not to see it as a stark disagreement, but as evidence of varying degrees of risk. They don’t see the range of possibilities as justification for inaction. Risk is at the heart of their job: They assess and manage the many risks to America’s security. Climate change, from the Military Advisory Board’s perspective, presents significant risks to America’s national security.”

“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. That’s something we know. You have to act with incomplete information. You have to act based on the trend line. You have to act on your intuition sometimes. . . . The Cold War was a specter, but climate change is inevitable. If we keep on with business as usual, we will reach a point where some of the worst effects are inevitable. . . . The situation, for much of the Cold War, was stable. And the challenge was to keep it stable, to stop the catastrophic event from happening. We spent billions on that strategy. Climate change is exactly the opposite. We have a catastrophic event that appears to be inevitable. And the challenge is to stabilize things – to stabilize carbon in the atmosphere. Back then, the challenge was to stop a particular action. Now, the challenge is to inspire a particular action. We have to act if we’re going to avoid the worst effects.” --- *General Gordon R. Sullivan, USA (Ret.), Chairman, Military Advisory Board and former Chief of Staff, U.S. Army.*

GEO-STRATEGIC IMPLICATIONS OF CLIMATE CHANGE

“One reason human civilizations have grown and flourished over the last five millennia is that the world’s climate has been relatively stable. However, when climates change significantly or environmental conditions deteriorate to the point that necessary resources are not available, societies can become stressed, sometimes to the point of collapse.”

The Destabilizing Impacts of Climate Change

Reduced Access to Fresh Water “Adequate supplies of fresh water for drinking, irrigation and sanitation are the most basic prerequisites for human habitation. Changes in rainfall, snowfall, snowmelt and glacial melt have significant effects on fresh water supplies, and climate change is likely to affect all of those things. In some areas of the Middle East, tensions over water already exist.

“Forty percent of the world’s population derives at least half of its drinking water from the summer melt of mountain glaciers, but these glaciers are shrinking and some could disappear within decades. . . . Most countries in the Middle East and northern Africa are already considered water scarce, and the International Water Resource Management Institute projects that by 2025, Pakistan, South Africa and large parts of India and China will also be water scarce. To put this in perspective: The U.S. would have to suffer a decrease in water supply that produces an 80 percent decrease in per capita water consumption to reach the United Nations’ definition of ‘water scarce.’”

“Climate change poses many challenges to water resources managers because it is one of the fundamental drivers of the hydrological cycle. The U.S. Army Corps of Engineers (USACE) is actively preparing for the challenges of climate change and its potential implications to national security with research, planning and policy.

“USACE collaborated with the U.S. Geological Survey, the Bureau of Reclamation and the National Oceanic and Atmospheric Administration to write 'Climate Change and Water Resources Management: A Federal Perspective,' released February 2009, <http://pubs.usgs.gov/circ/1331/>. The report provides a comprehensive assessment of approaches to climate variability and change in water resources management on which future agency policies, methods and processes will be based. The assessment highlighted several key concerns, including scientific evidence indicating: climate change is occurring, although effects differ regionally; climate change could affect all sectors of water resources management; it is but one of many challenges facing water resource managers; and it has and will result in changes to sea level and the hydrologic cycle that impact water availability and quality.

“This summer USACE issued a new policy, 'Incorporating Sea-Level Change Considerations in Civil Works Programs.' It reflects our philosophy that we must be prepared to implement flexible planning and engineering adaptations that account for a range of possible changes in order to enhance public safety and protect federal, state and local infrastructure investments. This is just the first new policy that we plan to issue as we prepare our water resources managers for the future.

“Climate change and the resulting vulnerabilities have the potential to increase conflicts related to water availability and water quality around the world. But this increased conflict is not inevitable. For decades federal water resources managers have been honing their skills at balancing competing interests and now may be uniquely positioned to help de-escalate conflict in the case of climate change challenges.” --- *Lt. General Robert L. Van Antwerp, Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers. (Note: Lt. Gen. Van Antwerp was neither a member of the CNA’s MAB nor a participant in the original Report. However, livebetter elicited his perspective as a preeminent military authority on water resources management per his highly regarded, worldwide engineering expertise.)*



Photo by Sgt. Martin Newton

Impaired Food Production “Access to vital resources . . . can be an additional causative factor of conflicts, a number of which are playing out today in Africa. Probably the best known is the conflict in Darfur between herders and farmers. . . . Probably more than any other recent conflict, Darfur provides a case study of how existing marginal situations can be exacerbated beyond the tipping point by climate-related factors. . . . Worldwide food production will be affected by climate change in a variety of ways. Crop ecologists estimate that for every 1.8°F rise in temperature above historical norms, grain production will drop 10 percent.”

Health Catastrophes “Climate change is likely to have major implications for human health. . . . The major concern is significant spreading of the conditions for vector-borne diseases, such as dengue fever and malaria, and food-borne diseases, such as salmonellosis. The decline in available fresh water in some regions will also have an impact, as good health and adequate supplies of clean water are inextricably linked.”

“I was a total agnostic. I had spent most of my life in the space and aeronautics world and hadn’t really wrestled with the extent to which fossil fuel emissions were affecting the climate. I was open-minded. . . . As I looked at it on my own . . . I was utterly convinced of this connection between the burning of fossil fuels and climate change. And I was convinced that if we didn’t do something about this, we would be in deep trouble.

“One of the things that struck me on my first day in space is that there is no blue sky. It’s something that every human lives with on Earth, but when you’re in space, you don’t see it. . . . But when you look at the earth’s horizon, you see an incredibly beautiful, but very, very thin line. You can see a tiny rainbow of color. That thin line is our atmosphere. And the real fragility of our atmosphere is that there’s so little of it.” --- Vice Admiral Richard H. Truly, USN (Ret.), former NASA Administrator, Shuttle Astronaut and the first Commander of the Naval Space Command.

Land Loss and Flooding: Displacement of Major Populations “About two-thirds of the world’s population lives near the coastlines, where critically important facilities and infrastructure, such as transportation routes, industrial facilities, port facilities and energy production and distribution facilities are located. A rise in sea level means potential loss of land and displacement of large numbers of people. Even in our own nation, Hurricane Katrina showed the social upheaval and tensions that can result from land loss and displaced populations.

“Storm surges will also take a greater toll on coastal communities and infrastructure as sea levels rise. According to a Pacific Institute study, a 6-inch rise in the water level of San Francisco Bay would mean a fairly routine one-in-ten-year storm would wreak as much damage as a far more serious ‘hundred-year storm’ would have caused before sea level rise. . . . As sea levels rise and storm surges increase, saline water can contaminate groundwater, inundate river deltas and valleys and destroy croplands.”

Security Consequences of these Destabilizing Effects

Greater Potential for Failed States and the Growth of Terrorism “Many developing countries do not have the government or social infrastructures in place to cope with the types of stressors that could be brought on by global climate change. When a government can no longer deliver services to its people, ensure domestic order and protect the nation’s borders from invasion, conditions are ripe for turmoil, extremism and terrorism to fill the vacuum.”

Mass Migrations Add to Global Tensions “. . . when water or food supplies shift or when conditions otherwise deteriorate (as from sea level rise, for example), people will likely move to find more favorable conditions. Although climate change may force migrations of workers due to economic conditions, the greatest concern will be movement of asylum seekers and refugees who, due to ecological

devastation, become settlers.

- By 2025, 40 percent of the world’s population will be living in countries experiencing significant water shortages.
- Over the course of this century, sea level rise could potentially cause the displacement of tens of millions of people from low-lying areas such as Bangladesh.”

Potential Escalation of Conflicts over Resources “To live in stability, human societies need access to certain fundamental resources, the most important of which are food and water. The lack, or mismanagement, of these resources can undercut the stability of local populations; it can affect regions on a national or international scale. . . . Resource scarcity always has the potential to be a contributing factor to conflict and instability in areas with weak and weakly supported governments.”

“Climate change will provide the conditions that will extend the war on terror. . . . More poverty, more forced migrations, higher unemployment. Those conditions are ripe for extremists and terrorists. . . . Dealing with instability and how you mitigate that leads to questions about the role U.S. security forces can play. What can we do to alleviate the problems of instability in advance? And keep in mind this will all be under a challenged resources situation. This is very complicated. Of course, the military can be a catalyst for making this happen, but it can’t do it all. This is also about economics, politics and diplomacy.” --- Admiral T. Joseph Lopez, USN (Ret.), Former Commander-in-Chief, U.S. Naval Forces Europe and of Allied Forces, Southern Europe.

THE WESTERN HEMISPHERE

Risks for the United States

“The primary security threats to the U.S. arise from the potential demand for humanitarian aid and a likely increase in immigration from neighbor states. It is important to remember that the U.S. will be dealing with its own climate change issues at the same time.”

Increasing Water Scarcity and Glacial Melt “Drought and decreased rainfall is projected to also affect the central southern U.S. . . . The High Plains (or ‘Ogallala’) aquifer . . . provides water for 27 percent of the irrigated land in the country and supplies about 30 percent of the groundwater used for irrigation. In fact, 3 of the top grain-producing states – Texas, Kansas and Nebraska – each get 70-90 percent of their irrigation water from the Ogallala aquifer. Human-induced stresses on this groundwater have resulted in water-table declines greater than 100 feet in some areas. This already difficult situation could be greatly exacerbated by a decrease in rainfall predicted for the region. Similarly, a recent study by the National Research Council on the Colorado River Basin (the river is the main water source for tens of millions of people in the Southwest) predicted substantial decreases in river flow, based on higher population coupled with the climate change affects.”

Storms and Sea Level Rise “Flooding could increase with sea level rise, especially in the low-lying areas of North America. Inundation models from the University of Arizona project that a sea level rise of 3 feet would cause much of Miami, Fort Myers, a large portion of the Everglades and all of the Florida Keys to disappear.”

Increased Migration/Refugee Flows into the U.S. “The rate of immigration from Mexico to the U.S. is likely to rise because the water situation in Mexico is already marginal and could worsen with less rainfall and more droughts. Increases in weather disasters, such as hurricanes elsewhere, will also stimulate migrations to the U.S.”



U.S. Army photo by Sgt. Corran Redcliffe



U.S.N. photo by Photographer's Mate 1st Class Marvin Harris

“. . . the critical factors for economic and security stability in the twenty-first century are energy, water and the environment. These 3 factors need to be balanced for people to achieve a reasonable quality of life. When they are not in balance, people live in poverty, suffer high death rates or move toward armed conflict. . . . In my view, military planning should view climate change as a threat to the balance of energy access, water supplies and a healthy environment, and it should require a response. Responding after the fact with troops – after a crisis occurs – is one kind of response. Working to delay these changes – to accommodate a balance among these staples – is, of course, another way.” --- General Paul J. Kern, USA (Ret.), former Commanding General, U.S. Army Materiel Command.

Direct Impacts on Military Systems, Infrastructure and Operations

Weapons Systems and Platforms “Operating equipment in extreme environmental conditions increases maintenance requirements – at considerable cost – and dramatically reduces the service life of the equipment. . . . climate change – whether hotter, drier or wetter – will add stress to our weapons systems. . . . A stormier northern Atlantic would have implications for U.S. naval forces. More storms and rougher seas increase transit times, contribute to equipment fatigue and hamper flight operations.”

Bases Threatened by Rising Sea Levels “U.S. bases abroad are situated to provide a worldwide presence and maximize our ability to move aircraft and personnel. Climate change could compromise some of those bases. . . . Closer to home, military bases on the eastern coast of the United States are vulnerable to hurricanes and other extreme weather events. In 1992, Hurricane Andrew ravaged Homestead Air Force Base in Florida so much that it never reopened. In 2004 Hurricane Ivan knocked out Naval Air Station Pensacola for almost a year. Increased storm activity or sea level rise caused by future climate change could threaten or destroy essential base infrastructure. If key military bases are degraded, so, too, may be the readiness of our forces.”

DoD Energy Supplies Vulnerable to Extreme Weather “The Department of Defense (DoD) is almost completely dependent on electricity from the national grid to power critical missions at fixed installations and on petroleum to sustain combat training and operations. Both sources of energy and their distribution systems are susceptible to damage from extreme weather. . . .”

Engagement Opportunities “If the frequency of natural disasters increases with climate change, future military and political leaders may face hard choices about where and when to engage. Deploying troops affects readiness elsewhere; choosing not to may affect alliances. And providing aid in the aftermath of a catastrophic event or natural disaster can help retain stability in a nation or region, which in turn could head off U.S. military engagement in that region at a later date.”

FINDINGS AND RECOMMENDATIONS

Findings

1.) Projected climate change poses a serious threat to America’s national security. 2.) Climate change acts as a threat multiplier for instability in some of the most volatile regions of the world. 3.) Projected climate change will add to tensions even in stable regions of the world. 4.) Climate change, national security and energy dependence are a related set of global challenges.

Recommendations

1.) The national security consequences of climate change should be fully integrated into national security and national defense strategies. 2.) The U.S. should commit to a stronger national and international role to help stabilize climate changes at levels that will avoid significant disruption to global security and stability. 3.) The U.S. should commit to global partnerships that help less developed nations build the

capacity and resiliency to better manage climate impacts. 4.) The DoD should enhance its operational capacity by accelerating the adoption of improved business processes and innovative technologies that result in improved U.S. combat power through energy efficiency. 5.) The DoD should conduct an assessment of the impact on U.S. military installations worldwide of rising sea levels, extreme weather events and other possible climate change impacts over the next 30-40 years.

“We are living in a challenging era when our choices today will be as consequential for this century as George Washington’s were for America more than two centuries ago. . . . These challenges are daunting, but they must be faced. Since the release of our first report, some critical work has begun. . . . The 2008 National Intelligence Assessment confirmed our finding that climate change is a serious threat to national security and long-term global security. Congress has directed Defense officials to include climate change considerations in their planning. Efforts are underway to increase the U.S. military’s coordination with other nations to help prevent, mitigate or adapt to the likely consequences of climate change.

“Chief among our Report’s finding was the conclusion that climate change, national security and energy dependence are an interwoven set of global challenges. That was the focus of our subsequent Military Advisory Board report, which was released in May 2009. . . . Our dependence on fossil fuels leaves us vulnerable to hostile regimes and terrorists, no matter oil’s price and availability. Moving toward low carbon domestic energy alternatives lessens that danger and helps us confront the serious challenge of global climate change.

“And although the issue of oil dependence is one that affects our nation as a whole, the Department of Defense, as the world’s number one consumer of energy, has an important role to play in redefining the nation’s relationship to energy and providing the kind of strategic decision-making that can ripple across the rest of the economy – acting, if you will, as a solution-multiplier. . . . We must harness America’s innovation and creativity to create a new clean-energy future for our nation and to restore American leadership on climate change and energy.” --- Sherri Goodman, CNA Vice President and General Counsel, and former Deputy Under Secretary of Defense for Environmental Security.

Note: According to David Catarious, Ph.D. and CNA senior researcher, within the 2 years since the Report has been published “none of the things that we said have been proven to be untrue or off the mark, except for the fact that climate change impacts have moved quicker than what we had anticipated based on the original data. Most of the scientists and their models predicted some sort of an anomaly happening in the 2030s wherein the Arctic Ocean ice cover would decrease significantly and dramatically and, thereafter, be at a permanently decreased state. For one reason or another, that anomaly has already begun to occur. The Arctic is changing about three decades ahead of schedule.

“I’m not sure people have fully realized the implications of climate change. I think they intellectualize but don’t really understand what it means. That’s why CNA is doing more work on this to figure out what the impacts are, such as agriculture in Africa decreasing by 40-50 percent by the middle of this century,” said Catarious.

The researcher continued to explain that one of the problems is that Americans have yet to experience these impacts as per the rest of the world, such as in Europe where mass migrations of Africans into Spain, France and Italy are already occurring. Another example is the 2003 heat wave in France and Western Europe, which killed, conservatively, 35,000 people. Catarious cautioned that Naval Research Laboratory experts have predicted that similar events will happen around the world every 3-to-5 years by mid-century. As U.S. precipitation begins to decrease, particularly in the Southwest, U.S. temperatures will continue to increase.

“It’s going to hit us in a way that we’re not prepared for,” explained Catarious. 🌿



U.S. Marine Corps photo by Cpl. Randall A. Clinton

Leading America's Next Great Transformation

The current economic storm has most organizations “hunkering down” for safety and security until weather patterns become more favorable. With few exceptions, companies seemingly serious about sustainable business practices and about transforming corporate cultures are, once again, back to “business as usual.” Many would argue that this mindset caused the economic meltdown in the first place, which would make such a backslide even more problematic. Those companies putting their sustainability commitments and investments on the back burner have clearly signaled that economic considerations come first. At the same time, leaders like Wal-Mart have clearly signaled that the way to increased profitability and operational capability is through sustainability, regardless of the state of the economy. For Rear Admiral Philip Cullom, Director of the U.S. Navy’s Task Force Energy, “It’s all about the ‘art of the long view.’”



With wisdom not unlike Sun Tzu's *Art of War*, Cullom explains that the farther out one goes, the "less clear and crisp the future necessarily is. But if you don't have some ability to vision what that future will be like, then you won't be able to make good choices today so that we're properly prepared for tomorrow. At the end of the day, it's also about whether leadership is focused on this and committed to change, and whether they have the long-range vision." Clearly, Secretary of the Navy (SECNAV) Ray Mabus, Chief Naval Officer (CNO) Admiral Gary Roughead and Commandant of the Marine Corps (CMC) General James Conway do. The Dept. of the Navy (DON) understands that operational capability depends upon environmental sustainability, which is inextricably linked to energy security and efficient resource use. According to Conway, "We get it." As a result, the DON is stepping up to take the lead in what is sure to become America's next great transformation.

"Getting It"

"The United States consumes 25 percent of the world's oil," explains Mabus, "but controls production of only 3 percent. To a certain extent, we have ceded a strategic resource – one that is difficult to guarantee – to other nations. This creates an obvious vulnerability to our

"Altering the Department of the Navy's consumption patterns will have a broad, noticeable effect and will serve as an example for the rest of our country."

- Secretary of the Navy Ray Mabus



U.S. Navy photo by Mass Comm. Spc. 1st Class Tiffini Jones Vanderhoff

energy security and to our national security and to our future on this planet. The stakes of the status quo extend even further beyond the military and cause second- and third-order effects on our environment. The carbon that's emitted from our ships, aircraft and vehicles is a contributor to global warming and to climate change. In short, we have not acted as very responsible stewards of our environment."

The SECNAV believes "the Navy and the Marine Corps have an obligation to do something now" about their impact on the environment – to enact changes that will reduce their energy footprint while simultaneously improving their core warfighting efforts. He continues: "The Department of Defense uses more than 90 percent of all energy used by the Federal government and 2 percent of all energy used in the United States of America. Altering the DON's consumption patterns will have a broad, noticeable effect and will serve as an example for the rest of our country."

Roughead shares this mindset and notes that "we can't deny the link between oil and climate change and the disasters that can be imposed globally because of that. Our reasons to change our investments and our culture go beyond the threats of the risks; they also go to the opportunities. It's important that we really institutionally focus on energy security and then the savings of money and resources and, clearly, environmental stewardship. We have to be able, in the energy security area, to find a better way through conservation, technology and alternative sources. It's important that we seek out those opportunities ahead of us."

Moving to a Better Future

As head of the finest expeditionary force in the world, Conway adds a unique perspective: "We pride ourselves on being very, very expeditionary – fast, austere and lethal. But we have to contribute to that mindset the thought process of self-sustainment. Once we get to where we're going, we have to realize that we should not have to be dependent upon a supply line coming from Lord knows where to do what we have to do. There will be other Afghanistans. And the nature of an ungoverned space is just that – it's where people don't normally live. It's where nobody else wants to go. So we have to have the ability to go there and function and do what has to be done but also to be able to supply ourselves with sufficient energy and a much more efficient way of doing things than we are today."

"Getting it" is about taking the inextricable trends, coupled with uncertainties that can change the dynamics of those inextricable trends, putting it all together and then laying out a future," explains Cullom. "Those inextricable trends will focus us in some ways. We have to see things moving us toward a better future – one that has less carbon, one that conserves a lot more and one that is more efficient."

Bold Goals and Targets

In an October 2009 Kennedyesque speech at a Washington, D.C., DON Energy Forum, Mabus encouraged everyone "to dream what might be instead of simply accepting what is" as he committed the Navy and Marine Corps to bold and ambitious energy goals. He reminded everyone that "bold steps are in our nature as Americans" and that "no one has ever gotten anything big done by being timid." The SECNAV's 5 new, revolutionary energy targets are as follows:

1. Changing the way the Navy and Marine Corps award contracts. The lifetime energy cost and the fully burdened fuel cost of the program or system will be a mandatory evaluation factor. Industry will be held contractually accountable for meeting energy targets and system efficiency requirements. Plus, the overall energy efficiency and the energy footprint of a competing company will be used as an additional factor in acquisition decisions.

2. Creating a "green" Strike Group. The Navy will demonstrate in local operations by 2012 a "green" Strike Group, composed of nuclear vessels and ships powered by biofuel. By 2016 the Strike Group will sail as a "Green Fleet," composed of nuclear ships, surface combatants equipped with hybrid electric alternative power systems running biofuel and aircraft flying only biofuels. And, it will be deployed.

3. Reducing DON commercial vehicle fleet petroleum use by half. By 2015 petroleum use in the DON's commercial fleet of 50,000 vehicles will be reduced by 50 percent. Retired vehicles will be replaced with a new composite fleet of flex-fuel vehicles, hybrid electric vehicles and neighborhood electric vehicles. Mabus believes that "moving to biofuels and electric vehicles will benefit the local communities where our bases are located and will spur adoption of similar vehicles in those neighborhoods."

4. Producing at least one-half of shore-based installation energy requirements from alternative sources by 2020. "We will boost our uses of renewable energy and, in some cases, we're going to supply energy to the grid from solar, wind, ocean or geothermal sources generated by the base," says Mabus.

5. Providing one-half of the DON's total energy consumption for ships, aircraft, tanks, vehicles and shore installations from alternative sources by 2020. According to Mabus, 17 percent of the DON's current energy consumption comes from alternative sources.

Chokepoints and Competition

"Energy powers our way of life, and energy from nonrenewable resources is what we rely on today. We should not delude ourselves into believing that access to those energy sources – primarily oil and gas – is guaranteed for the future. As we all know, they are limited; and we may not know the when, but we know at some point

that they are going to be depleted. We can't predict with certainty how or when scarcity or abundance will affect the global system, and that alone affects our stability and our security as a nation," explains Roughead.

According to the CNO, regardless of availability, those energy sources are uncertain because of potential conflicts and world disorder. Movement of that energy on the "maritime commons" is a critical consideration because the "chokepoints where much of that energy passes can be push buttons for disorder in the future." And it's not just about those chokepoints, explains Roughead; it's also about future resource competition. "The competition, as countries fuel and feed their people and their industry and their growth, is going to continue to take place in the traditional areas where we have been extracting resources. But also, I believe, you're going to see competition that will begin to take place in the South China Sea, in areas of Africa and, as we move up into the northern regions, in the Arctic."

Task Force Energy

In December 2008 CNO Roughead charted Task Force Energy (TFE) after seeing his fuel bill go from \$1.2 billion to about \$5.1 billion in one year. TFE Director Cullom "knew we needed this to be a total team effort with the entire Navy . . . because energy touches all of our lives no matter what part of the Navy responsibilities we may each have. TFE is about combat capability. Where efficiency meets combat capability, it allows us to expand or to extend our tactical reach. And this is absolutely about saving lives as well. Whether that Sailor or Marine is on the ground, on a ship or in the air, we all have a 'fuel tether' that dictates our operational capability."

As a man who's passionate about making the world a better place, Cullom believes that if the changes the military makes can serve as examples for others, the combined effort could fundamentally change the entire nation's energy reliance and further reduce the potential for conflict. In addition, the TFE Director believes "there are going to be a lot of changes as a result of people realizing the need to value energy in all of its forms. That's why carbon is such an important part of this. We have to understand the interconnectedness of the strategic value of energy. As we shift to alternative sources, as we conserve and go for different efficiencies, we also reduce our carbon footprint."

Cullom believes this is also about a fundamental cultural shift to thinking and working green. "Through greater discussion will come greater understanding, and through a greater understanding will come a change in behavior and innovative thought. The next great effort has to be a 'regeneration,' which is exactly what much

of this effort is about. The Navy can be an early adopter in a way that really does help lead the nation," says the TFE Director. And what does the Navy get out of this? According to Cullom, "We'll get everything we want – from assuring mobility, expanding tactical reach and lightening the load to protecting critical infrastructure and greening our footprint."

A Greener Footprint

"You may not have seen it or read about it; but on the shore side of the Navy, we've never been without a goal that we've been chasing for energy reduction during my entire 30-year career," says Rear Admiral Wayne "Greg" Shear, Commander, Naval Facilities Engineering Command (NAVFAC). "Clearly, there's every good reason to increase efficiency and to adopt a greener footprint. One, typically there's always been an Executive Order. And two, the cost savings are very substantial; and that money can be used elsewhere in the Navy, which is why we've been working this very hard.

"Something we're really excited about now is wave energy, which we're researching with the Office of Naval Research and the Navy Research Laboratory. We're also interested in ocean thermal energy conversion, which is sending pipes deep below the ocean surface to take advantage of the different temperature strata to generate energy. We're using wind energy from turbines, but we're also investigating energy from tidal changes and rivers – putting turbines under water, which then spins energy under water. We're looking at very common technology – the photovoltaic (PV) – but using it in exciting new ways; and every new building in the Navy is now LEED Silver or better. It increases costs marginally, but the life-cycle and total ownership costs are reduced. I'm very proud of what we do. Frankly, it's the right thing to do. And if we can save money and reduce carbon, we get a 'two for one' so you can't argue with that," explains the Engineering Chief.

NAVFAC has always been a visionary organization on the forefront of new technology. Thanks to its championing a little-known energy form – geothermal – back in the 1970s and '80s, China Lake became "net zero" before the phrase was even coined. Not only does the naval base produce 20 times more energy than it consumes, it also produces revenue as a result of selling the excess energy back to utility companies.

"Every dollar we save heating or cooling, lighting a building more efficiently or powering our vehicles better is a dollar we can use to keep our guys forward and operating – completing the mission. As a result, we have an implicit Commander's intent to be as efficient as we can on shore. For 30 years the Navy has always paid attention to this in the context of our shore establishments. But now it's become much bigger," comments Shear.

Saving Lives and Limbs

The Marines are equally as ambitious and committed in their sustainable transformation. "We want to reduce our energy consumption by 30 percent by 2015. In terms of our water consumption, we want to reduce that by 16 percent by 2015, and we want to increase our renewable electric power by 25 percent by 2025. Our objective is 'net

“. . . 80 percent of our casualties in Afghanistan come from IEDs (Improvised Explosive Devices), and about 10 percent of those come from our resupply convoys.”
- General James Conway

zero' – for our bases and stations to provide as much energy as they make use of. The bottom line is 'we get it.' That's our good news story, and we give ourselves a 'B' or 'B+' in that particular arena. That said, we're not doing so well with regard to our expeditionary capabilities. The problem, I think, is a matter of consumption plus inefficiency equals waste," explains the Commandant of the Marine Corps.

According to Conway, the 2nd Marine Expeditionary Brigade in Afghanistan uses more than 88,000 gallons of fuel per day with an astonishing fully burdened cost per gallon, in a worst case scenario, of \$400. Although the price per gallon is \$1.04 to \$1.05, it has to be transported via a "very tenuous supply line across Pakistan, where we're paying large amounts of money to tribes so they don't fight each other and raid our supply lines – not to mention the security cost, the overhead, the air cover and those types of things for our own convoys. Today 80 percent of our casualties in Afghani-



U.S. Navy photo by Journalist for Class James G. Frick

stan come from IEDs (Improvised Explosive Devices), and about 10 percent of those come from our resupply convoys. So it's not just about expense; it's not just about consumption. At some point we're talking lives and limbs here in terms of what these inefficiencies are creating. And that, therefore, gives us great motivation to simply get better."

Potable water is a similar problem. Although it's available in-theatre, "water trucks are carrying 60-ounce plastic bottles traversing bridges and rivers getting to their destination. If you have a mental picture of that, it should cause you a problem. It does me as I look at how we get more efficient with our water supply," comments Conway. The Marines want to drill, purify, test and approve their

water in-theatre. "And we'd like to do that on station and not see any more 40-foot trailers carrying cases and cases of water from places unknown so that we can distribute these plastic bottles everywhere we go. It's estimated by our assessment team that we can take 50 trucks per week off the roads by doing this. Think back again to

"At some point we're talking lives and limbs here . . . And that, therefore, gives us great motivation to simply get better." - General James Conway



U.S. N. photo by Matt Comm. Spec. 1st Class Chad J. McHenry

what that means in terms of exposure to IEDs, being blown up and, in some cases, being maimed or killed," explains the CMC.

Thanks to the newly formed Marine Energy Assessment Team (MEAT), as well as to an aggressive pursuit of new ideas, new resource efficient technologies and new partnerships, these and other problems are being transformed into opportunities to save lives and limbs while increasing the Marines' expeditionary capability.

Environmental Stewardship

"Meeting our energy needs and our environmental goals cannot be two separate areas of concern. They have to be pursued together," explains Major General E. Gray Payne, ADC I&L (Facilities), Headquarters Marine Corps. "Protection of our natural resources and of our air and water is an absolute top priority for the Marine Corps. It's not only the right thing to do for our nation and for the communities surrounding our bases and stations, it's also the right thing to do for the Marine Corps. It's the only way we can maintain the quality of life that we want for our Marines, our Sailors and their families."

Aside from visionary alternative energy programs, the USMC is underway with a number of green initiatives at their bases and stations. Some are the more obvious, such as a greater emphasis on recycling because, as Payne explains, "like it or not, we're in the landfill business." Some are more aggressive, such as the elimination of plastic bags at three Marine Corps Exchanges, with efforts under way to eliminate them in the remainder as well as in some commissaries. Coupled with this is a significant reduction in the use of Styrofoam, which also has a negative landfill impact.

"We need to continue leading forward with our efforts on bases and stations and operating forces, but we must also be mindful of unintended consequences. Mutual solutions must consider trade-offs, which balance short-term benefits against long-term sustainability. We can't go after energy conservation solutions that depend to a great extent, either in the manufacturing or in the maintenance, on water because that's becoming a scarce resource. Nor can we go after solutions that rely on scarce and declining minerals. We also have to be mindful of invasive species as well as the protection of threatened and endangered species on our bases and stations. We cannot take two steps forward only to find ourselves taking one back. More importantly, we can't take one step forward to find ourselves taking two steps back," comments Payne.

World Security

Environmental protection, energy security, resource exploitation and competition, and climate change have grave national and world security implications. According to Vice Admiral Sam Locklear,

Director of Navy Staff, the U.S. Navy is uniquely positioned to assist with these burgeoning challenges given its mobility and flexibility of how and where it's deployed. One of the problems is that, relative to potential global requirement and the probable increased need for worldwide humanitarian assistance, the U.S. Navy requires additional capacity. Currently at only about 285 ships, Locklear states that "at a minimum, the Navy needs 313 ships."

The Navy currently responds to specific tsunami, hurricane and other relief on a limited scale. But, according to Locklear, they could never do so on a massive scale. "What we can do through our response is to teach people how to respond themselves. We can empower them through training," explains the Director of Navy Staff. Pertaining to diminished or scarce water resources, he also thinks the American government and Navy could respond with new technologies – processes like reverse osmosis and/or desalination plants. And he thinks the Navy could assist with teaching nations how to manage these plants as national security assets.

"Our core responsibility is to protect this country. But we are learning how to use our forces in a dual-purpose way that allows us to expand our reach and influence in a good way for the future of society. Maybe it's a little idealistic, but that's OK. There's nothing wrong with being idealistic. It's a good thing to be able to go and help people. Will we do more of this? Yes. As a nation we have a responsibility to do these things. If you're a world leader, you have to lead in all directions, and I think this is part of the United States Navy because we are forward and, because in many cases, we are a strategic force. We have access to billions of people around the world, and we will take more and more advantage of that access where we can with the resources that the American people give us," explains Locklear.

Task Force Climate Change

In May 2009 CNO Roughead established Task Force Climate Change (TFCC) to address the impact of climate change on the Navy with an initial Arctic focus. According to Locklear, they're looking for places where the Navy can best help and best invest to gain a better understanding of the science. TFCC Director and Navy Oceanographer Rear Admiral Dave Titley says, "We need to better understand the science of climate change in order to answer questions about extremes. Are droughts going to be drier? Are floods going to be wetter? Are high temperatures going to be hotter and low temperatures colder? Are there going to be more hurricanes? I just don't know, which is why it's critical to put forth a very credible scientific effort."

One particularly worrisome problem for the Navy's Oceanographer is ocean acidification, which is caused as CO2 is deposited into



U.S.N. photo by Mass Comm. Spec. Sgt. Brian Daniel A. Barber

the atmosphere and then dissolved by the oceans. According to Titley, “It’s not going to take a lot of acidification to start to potentially, and very significantly, disrupt the base of the food chain. If you take out the zooplankton and the phytoplankton that the critters eat, the scenario that keeps me up at night is what happens if we wake up in 50 years to find out that we don’t have protein for 1-2 billion people? What does that trigger?”

Another concern for Titley is sea level rise. He explains that “nobody is looking for perfect knowledge, but there are very big gaps in the science right now. An 8-inch rise in sea level by 2100 in Norfolk really doesn’t have much of an impact, but a 3-to 3½-foot rise is something that we’d have to take a very hard look at to understand the impacts. A lot of people don’t think 3½ feet of sea level rise is a big deal, but ask anybody on the Mississippi or Gulf Coast. How much of the Outer Banks will still exist? Ask the people in Bangladesh what a meter in sea level rise will mean to them. That’s a very, very big change. It’s hard for people to understand right now, but these will become significant issues.”

The Road Ahead

“Climate change, energy security and national security are inextricably linked. They can’t be considered in isolation; they need to be looked at in a very comprehensive way. We can no longer be content to argue back and forth about what exactly is climate change. Is it real, and is there anything we can do about it? We need to get beyond that. These are challenges to national security, and the military has a role to play not simply in their traditional service roles but also by providing a leadership role for the entire country. When folks sitting on the fence, unsure what to think, understand that the U.S. military is actually doing something about climate change and energy security, it has to give them pause to rethink their own positions and what we,

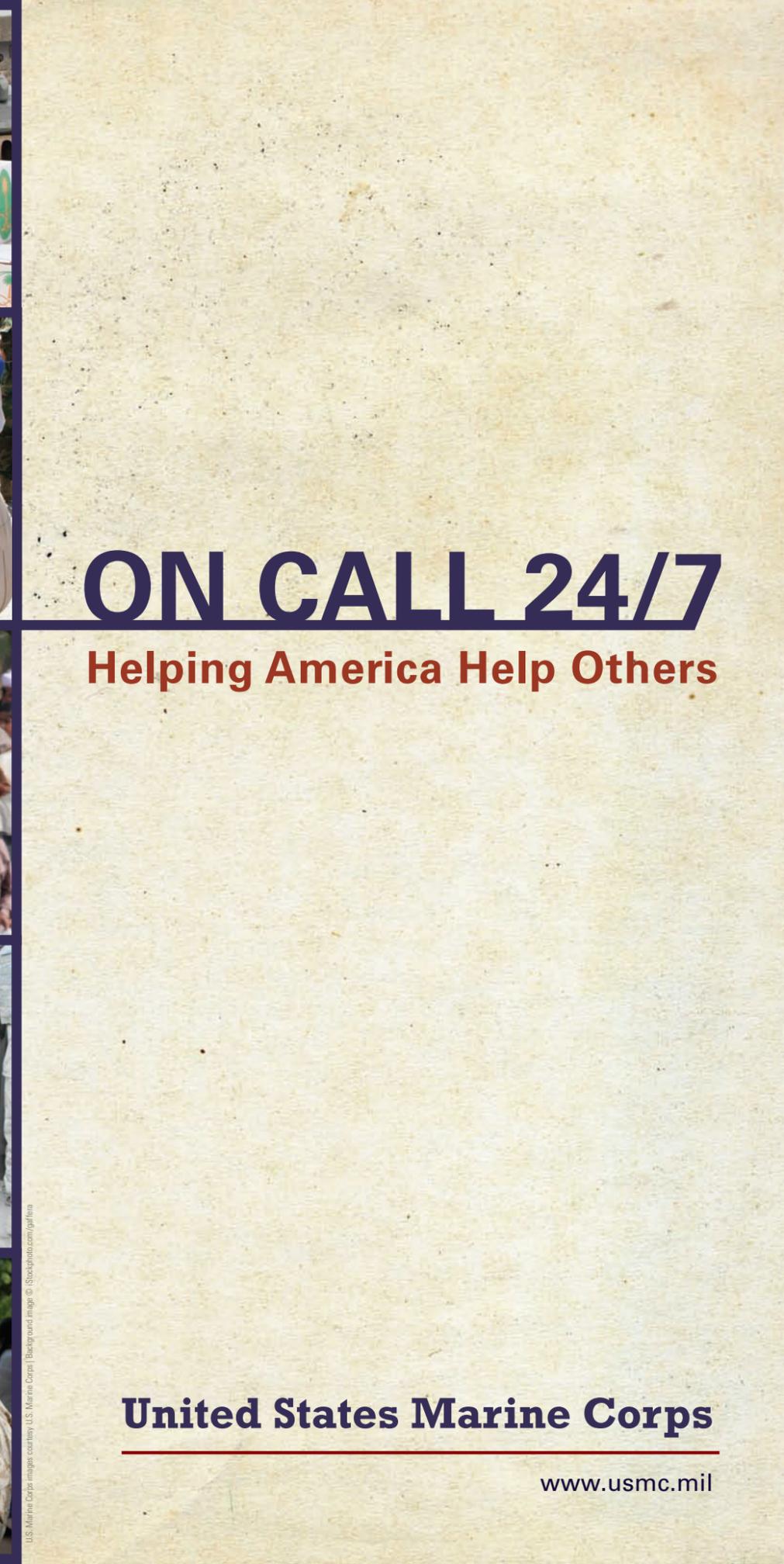
... at the end of the day, it’s about leading by example and transforming America toward a safer, healthier and more prosperous future for everyone.

as a nation, should be doing,” explains Vice Admiral (Ret.) Dennis McGinn, CNA Senior Fellow, Military Advisory Board.

McGinn continues: “Across the country, most people are ‘getting it’ when it comes to energy security. However, not everyone is ‘getting it’ when it comes to climate change. Things like Hurricane Katrina can give people a sense of the climate problem. More Katrinas happening more intensely and more frequently throughout the world, but especially in the United States along our East and Gulf Coasts, would have tremendously adverse impacts on human security, health and the economy – not just for weeks or months – but for years. That starts to make climate change real for most people and would encourage them to learn and to do more about it.”

“The average American has a real stake in climate and in the security of this country. Therefore, Americans have a big stake in where we go as a country on energy,” explains Mabus. And at the end of the day, it’s about leading by example and transforming America toward a safer, healthier and more prosperous future for everyone.

“I would very much like to see the DON viewed as an organization that ‘gets it,’ that’s not afraid of change and that’s driving that change. But I believe that, in order to be perceived as such, we have to do something and not simply put a bumper sticker on the back of our cars and drive around. So, to me, it’s all about action; but we have led in other areas, and we can do it again. And, that’s where I want to be,” explains CNO Roughead. 🌱



ON CALL 24/7

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29 December 2008

Michelle and Barack Obama

Chicago, IL and Washington, D.C.

United States of America

Dear Michelle and Barack,

We write to you as fellow parents concerned about the Earth that will be inherited by our children, grandchildren and those yet to be born. Barack has spoken of “a planet in peril” and noted that actions needed to stem climate change have other merits. However, the nature of the chosen actions will be of crucial importance. We apologize for the length of this letter, but your personal attention to these “details” could make all the difference in what surely will be the most important matter of our times.

Jim has advised governments previously through regular channels. But, urgency now dictates a personal appeal. Scientists at the forefront of climate research have seen a stream of new data in the past few years with startling implications for humanity and all life on Earth. Yet the information that most needs to be communicated to you concerns the failure of policy approaches employed by nations most sincere and concerned about stabilizing climate. Policies being discussed in national and international circles now, which focus on “goals” for emission reduction and “cap and trade,” have the same basic approach as the Kyoto Protocol. This approach is ineffectual and not commensurate with the climate threat. It could waste another decade by locking in disastrous consequences for our planet and humanity.

There is a profound disconnect between actions that policy circles are considering and what the science demands for preservation of the planet. A stark scientific conclusion – that we must reduce greenhouse gases below present amounts to preserve nature and humanity – has become clear to the relevant experts. The validity of this statement could be verified by the National Academy of Sciences (NAS), which can deliver prompt authoritative reports in response to a presidential request. NAS was set up by President Lincoln for just such advisory purposes.

Science and policy cannot be divorced. It is still feasible to avert climate disasters, but only if policies are consistent with what science indicates to be required. Our three recommendations derive from the science and include logical inferences based on empirical information about the effectiveness or ineffectiveness of specific past policy approaches.

1. Moratorium and phase-out of coal plants that do not capture and store CO₂.

This is the sine qua non for solving the climate problem. Coal emissions must be phased-out rapidly. Yes, it is a great challenge, but one with enormous side benefits. Coal is responsible for as much atmospheric carbon dioxide as the other fossil fuels combined, and its reserves make coal even more important for the long run.

Oil, the second greatest contributor to atmospheric carbon dioxide, is already substantially depleted, and it is impractical to capture carbon dioxide emitted by vehicles. But if coal emissions are phased-out promptly, a range of actions including improved agricultural and forestry practices could bring the level of atmospheric carbon dioxide back down out of the dangerous range.

As an example of coal’s impact, consider this: Continued construction of coal-fired power plants will raise atmospheric carbon dioxide to a level at least approaching 500 parts per million (ppm). At that level a conservative estimate for the number of species that would be exterminated (committed to extinction) is one million. The proportionate contribution of a single power plant operating 50 years and burning approximately 100 rail cars of coal per day (100 tons of coal per rail car) would be about 400 species!

Coal plants are factories of death. It is no wonder that young people (and some not so young) are beginning to block new construction.

2. Rising price on carbon emissions via a “carbon tax and 100 percent dividend.”

A rising price on carbon emissions is the essential underlying support needed to make all other climate policies work. For example, improved building codes are essential, but full enforcement at all construction and operations is impractical. A rising carbon price is the one practical way to obtain compliance with codes designed to increase energy efficiency.

A rising carbon price is essential to “decarbonize” the economy, i.e., to move the nation toward the era beyond fossil fuels. The most effective way to achieve this is a carbon tax (on oil, gas and coal) at the well-head or port of entry. The tax will then appropriately affect all products and activities that use fossil fuels. The public’s near-term, mid-term and long-term lifestyle choices will be affected by knowledge that the carbon tax rate will be rising.

The public will support the tax if it is returned to them – equal shares on a per capita basis (half-shares for children up to a maximum of two child-shares per family) deposited monthly into bank accounts. No large bureaucracy is needed. A person reducing his carbon footprint more than average makes money. A person with large cars and a big house will pay a tax much higher than the dividend. Not one cent goes to Washington. No lobbyists will be supported. Unlike cap-and-trade, no millionaires would be made at the expense of the public.

The tax will spur innovation as entrepreneurs compete to develop and to market low-carbon and no-carbon energies and products. The dividend puts money in the pockets of consumers by stimulating the economy and by providing the public a means to purchase the products.

A carbon tax is honest, clear and effective. It will increase energy prices, but low and middle income people, especially, will find ways to reduce carbon emissions so as to come out ahead. The rate of infrastructure replacement, thus economic activity, can be modulated by how fast the carbon tax rate increases. Effects will permeate society. Food

"Coal plants are factories of death."



requiring lots of carbon emissions to produce and to transport will become more expensive and vice versa, thus encouraging support of nearby farms as opposed to imports from half way around the world.

The carbon tax has social benefits. It is progressive. It is useful to those most in need in hard times by providing them an opportunity for larger dividend than tax. It will encourage illegal immigrants to become legal, thus to obtain the dividend. And, it will discourage illegal immigration because everybody pays the tax, but only legal citizens collect the dividend.

"Cap and trade" generates special interests, lobbyists and trading schemes and yields non-productive millionaires – all at public expense. The public is fed up with such business. Tax with 100 percent dividend, in contrast, would spur our economy while aiding the disadvantaged, the climate and our national security.

3. Urgent research and development (R&D) on 4th generation nuclear power with international cooperation.

Energy efficiency, renewable energies and a "smart grid" deserve first priority in our effort to reduce carbon emissions. With a rising carbon price, renewable energy can perhaps handle all of our needs. However, most experts believe that making such presumption probably would leave us in 25 years with still a large contingent of coal-fired power plants worldwide. Such a result would be disastrous for the planet, humanity and nature.

Fourth generation nuclear power (4th GNP) and coal-fired power plants with carbon capture and sequestration (CCS) at present are the best candidates to provide large baseload, nearly carbon-free power (in case renewable energies cannot do the entire job). Predictable criticism of 4th GNP (and CCS) is: "It cannot be ready before 2030." However, the time needed could be much abbreviated with a presidential initiative and congressional support. Moreover, improved (3rd generation) light water reactors are available for near-term needs.

In our opinion, 4th GNP deserves your strong support because it has the potential to help solve past problems with nuclear power – nuclear waste, the need to mine for nuclear fuel and release of radioactive material. Potential proliferation of nuclear material will always demand vigilance; but, that will be true in any case, and our safety is best secured if the United States is involved in the technologies and helps define standards.

Existing nuclear reactors use less than 1 percent of the energy in uranium and leave more than 99 percent in long-lived nuclear waste. Fourth GNP can "burn" that waste, leaving a small volume with a half-life of decades rather than thousands of years. Thus 4th GNP could help solve the nuclear waste problem, which must be dealt with in any case. Because of this, a portion of the \$25 billion that has been collected from utilities to deal with nuclear waste justifiably could be used to develop 4th generation reactors.

The principal issue with nuclear power, and other energy sources, is cost. Thus an R&D objective must be a modularized reactor design that is cost competitive with coal. Without such capability, it may be difficult to wean China and India from coal. But all developing countries have great incentives for clean energy and a stable climate, and they will welcome technical cooperation aimed at rapid development of a reproducible safe nuclear reactor.

Potential for cooperation with developing countries is implied by the interest South Korea has expressed in General Electric's design for a small scale 4th GNP reactor. I do not have the expertise to advocate any specific project, and there are alternative approaches for 4th GNP. I am only suggesting that the assertion that 4th GNP technology cannot be ready until 2030 is not necessarily valid. Indeed, with a presidential directive for the Nuclear Regulatory Commission to give priority to the review process, it is possible that a prototype reactor could be constructed rapidly in the United States.

CCS also deserves R&D support. There is no such thing as clean coal at this time, and it is doubtful that we will ever be able to fully eliminate emissions of mercury, other heavy metals and radioactive material in the mining and burning of coal. However, because of the enormous number of dirty coal-fired power plants in existence, the abundance of the fuel and the fact that CCS technology could be used at biofuel-fired power

plants to draw down atmospheric carbon dioxide, the technology deserves strong R&D support.

Summary

An urgent geophysical fact has become clear: Burning all the fossil fuels will destroy the planet we know – Creation – the planet of stable climate in which civilization developed. Of course, it is unfair that everyone is looking to Barack to solve this problem (and other problems), but they are. He alone has a fleeting opportunity to instigate fundamental change and the ability to explain the need for it to the public.

Geophysical limits dictate the outline for what must be done. Because of the long lifetime of carbon dioxide in the air, slowing the emissions cannot solve the problem. Instead, a large part of the total fossil fuels must be left in the ground. In practice, that means coal.

The physics of the matter, together with empirical data, also define the need for a carbon tax. Alternatives such as emission reduction targets, cap and trade and cap and dividend do not work, as proven by honest efforts of the "greenest" countries to comply with the Kyoto Protocol:

(1) Japan accepted the strongest emission reduction targets and appropriately prides itself on having the most energy-efficient industry. And, yet, its use of coal has sharply increased as have its total CO2 emissions. Japan offset its increases with purchases of credits through the clean development mechanism in China, which was intended to reduce emissions there, but Chinese emissions increased rapidly.

(2) Germany subsidizes renewable energies heavily and accepts strong emission reduction targets, yet plans to build a large number of coal-fired power plants. They assert that they will have cap-and-trade with a cap that reduces emissions by whatever amount is needed. But the physics tells us that if they continue to burn coal no cap can solve the problem because of the long carbon dioxide lifetime.

(3) Other cases are described on my Columbia University web site, e.g., Switzerland finances construction of coal plants; Sweden builds them, and Australia exports coal and sets atmospheric carbon dioxide goals so large as to guarantee destruction of much of the life on the planet.

Indeed, "goals" and "caps" on carbon emissions are practically worthless if coal emissions continue because of the exceedingly long lifetime of carbon dioxide in the air. Nobody realistically expects that the large readily available pools of oil and gas will be left in the ground. Caps will not cause that to happen; caps only slow the rate at which the oil and gas are used. The only solution is to cut off the coal source (and unconventional fossil fuels).

Coal phase-out and transition to the post-fossil fuel era requires an increasing carbon price. A carbon tax at the wellhead or port of entry reduces all uses of a fuel. In contrast, a less comprehensive cap has the perverse effect of lowering the price of the fuel for other uses and undercuts clean energy sources. In contrast to the impracticality of all nations agreeing to caps, and the impossibility of enforcement, a carbon tax can readily be made near-global.

A presidential directive for prompt investigation and prototyping of advanced safe nuclear power is needed to cover the possibility that renewable energies cannot satisfy global energy needs. One of the greatest dangers the world faces is the possibility that a vocal minority of anti-nuclear activists could prevent phase-out of coal emissions.

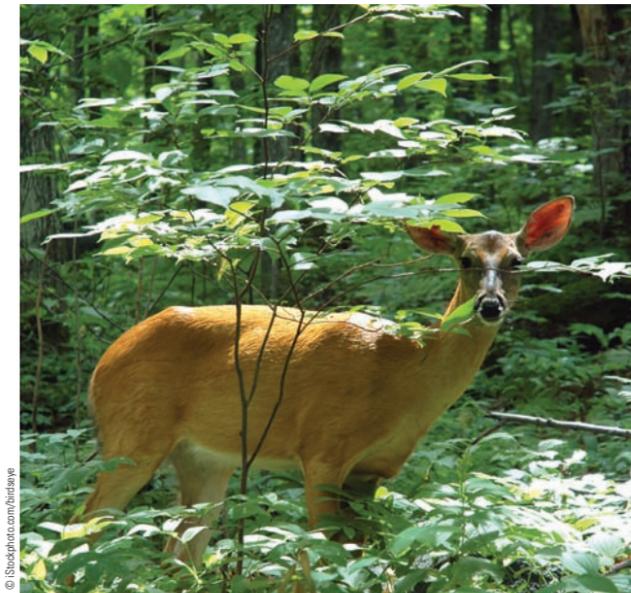
The challenges today, including climate change, are great and urgent. Barack's leadership is essential to explain to the world what is needed. The public, young and old, recognizes the difficulties and will support the actions needed for a fundamental change of direction.

James and Annick Hansen

Pennsylvania
United States of America

Note: Dr. James E. Hansen is the Director of the NASA Goddard Institute for Space Studies.

Fort Bragg Jumping into Sustainability



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Many people are unaware that the traditionally conservative Southeast boasts a city of almost 300,000 that is fully committed to sustainability and whose strategic plan's No. 1 goal is to become a Sustainable Community. In addition, this city is the co-founder of a non-profit organization to support sustainability efforts throughout the surrounding 8-county region. Winner of numerous state, national and even White House awards for its efforts, the city's most unique claim to fame, by many people's standards, is that it is a United States Army Installation.

Since 2000 Fort Bragg, a premier power projection platform with troops deployed around the world, has led the way in creating a sustainable Army and a sustainable region. Located in North Carolina's scenic Sandhills region – nestled between Raleigh, Charlotte and the popular beaches of the Outer Banks – the installation

is home to a diverse array of military units, including the XVIII Airborne Corps, 82nd Airborne Division and U.S. Army Special Operations Command. These soldiers have a worldwide reputation of professionalism and mission accomplishment, thanks to their steadfast spirit and uncompromising values of loyalty, duty, respect, selfless service, honor, integrity and physical courage.

Fort Bragg's mission is to maintain the Army's strategic crisis response force, which is manned and trained to deploy rapidly by air, sea and land anywhere in the world and prepared to fight upon arrival and win. The phrase "18 hours to wheels up" is literal at Fort Bragg as this elevated readiness state must be maintained at all times. Training, operations, facilities, equipment and transportation are geared to support a global mission.

This "city" supports almost 300,000 soldiers, military dependents, retirees, civilian workers and on-site contractors. Like most cities its size, it boasts a modern 1,000,000 square-foot medical center, 11 shopping centers with numerous restaurants, nine schools, libraries, churches, child-care centers, its own airfield and dozens of recreational facilities. And, despite heavy utilization on its 160,000 acres of training lands, Fort Bragg protects and preserves five endangered species, including the red-cockaded woodpecker (RCW).

The future holds even more challenges for this bustling city as a result of the Base Closure and Realignment Commission (BRAC) decision to move two additional Army major commands to Fort Bragg as well as to transfer the adjacent Pope Air Force Base to Army control. By 2011 the installation will have more general officers than any other military base besides the Pentagon. To accommodate these additional units and soldiers, Fort Bragg is in the process of executing \$2 billion in new construction over the next three years.

The demands of Fort Bragg's real world mission to fight and to defend U.S. interests in conflicts around the world, combined with its rapid growth, provide unique challenges and opportunities to its sustainability vision. How did this military installation become a national leader in sustainability?

© Sergeant Major Kelly Luster

“... we had to find a better way to incorporate environmental and community considerations to find true win-win solutions for the environment, community, and mission.” - Paul Wirt



The First Sustainable Installation

In 2000 the Army recognized the need to develop innovative solutions for its environmental challenges. As such, under the direction of Raymond Fatz (then Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health), it began its search for a candidate installation to pilot these new sustainability concepts. At the time Fort Bragg certainly faced numerous challenges. Encroachment by surrounding communities along the installation's borders significantly restricted training exercises and permanently shut down a critical drop zone. Its aging infrastructure – such as a water plant built in 1918, when “Camp Bragg” had only a few thousand residents – presented further obstacles.

“With increasingly stringent environmental laws and regulations, and public concerns about the Army’s commitment, we felt that Fort Bragg would be ideal to put sustainability in action. Fort Bragg has always been critical to the overall military mission, and sustainability seemed to be a possible solution,” said Fatz.

The Army found eager allies at Fort Bragg in Colonel (COL) Tad Davis IV, Fort Bragg’s then Garrison Commander and Fatz’s subsequent successor at the Pentagon, and Paul Wirt, Chief of the Environmental Branch. Wirt was eager to create an environmental “master plan,” and the Army’s idea to set long-range, bold goals that would help address the installation’s biggest environmental issues

was exactly what he was looking for.

According to Wirt, “Fort Bragg takes great pride in never failing its mission, but we had to find a better way to incorporate environmental and community considerations to find true win-win solutions for the environment, community and mission.” Under Davis’ leadership and vision, Wirt and key Garrison staff embraced the opportunity to approach the installation’s challenges in a novel way.

After a year developing the installation’s environmental baseline, Fort Bragg’s first major milestone was to host the first-ever Army Executive Sustainability Conference in April 2001. More than 250 diverse stakeholders from stationed units, headquarters and local communities attended and were challenged to set ambitious 25-year goals

that would establish Fort Bragg’s collective, long-term vision. From this collaboration emerged 10 cross-functional sustainability goals addressing ongoing challenges in air, water, solid waste, energy, transportation, green procurement, training lands and transportation. Each threatened the long-term viability of both the installation and its mission.

A critical component of a successful sustainability plan was early buy-in from leadership and key stakeholders. “We knew that we could not personally engage every person who lived and worked at Fort Bragg,” said Wirt. Thus, much of Wirt’s and his staff’s initial efforts were spent negotiating buy-in from the most influential individuals on the Garrison staff, including the installation transportation chief, master planner, engineer chief and military training officer. These individuals did not have an environmental agenda but were highly involved in the soldier support mission; therefore, they had the greatest opportunity to effect real changes.

For sustainability to work at such a large municipality, leaders had to break down functional area “stove-pipes” and to create cross-functional teams that shared a common vision in addressing mutual challenges. One of those leaders was Mike Lynch, the installation’s military training officer. Prior to sustainability, Lynch’s responsibilities – to provide the best possible training to soldiers – were often at odds with the environmental community’s oversight of the Sandhills fragile ecosystem. “When all parties finally sat down at the table together and defined the installation that we all envisioned for the future – a Fort Bragg where soldiers could actually have an even higher level of quality training in 25 years than they are able to perform now – it suddenly became much easier to find common ground in addressing our challenges,” said Lynch.

With engaged, integrated sustainability

... despite heavy utilization on its 160,000 acres of training lands, Fort Bragg protects and preserves five endangered species ...

teams, Sustainable Fort Bragg served as a blueprint within the next four years for what would become “The Army Strategy for the Environment.” George Carellas, one of the strategy’s primary architects while working at the Pentagon, explained: “Fort Bragg’s efforts were a key benchmark for the military in helping to define the Army’s sustainability efforts and fostering a sustainability ethic. Our goal was to deploy the lessons learned throughout the Army to strengthen its operations, enhance well-being and drive innovation. With the Army Strategy, we were better able to articulate the great things that Fort Bragg and other installations were doing in the context of a Triple Bottom Line of sustainability – Mission, Environment and Community.”

In 2005 Fort Bragg began the next major step in changing its processes and policies to ensure all 5,000-plus Garrison staff members understood the sustainability Triple Bottom Line and applied it to not only specific projects but also to day-to-day work activities. The Plans, Analysis and Integration Office (PAIO) partnered closely with Wirt and his sustainability planners to revise completely the Garrison strategic planning process to incorporate sustainability into all aspects of the Garrison’s Strategic Plan. Each Garrison activity was analyzed based on the Triple Bottom Line principles and integrated with traditional planning tools such as the Malcolm Baldrige National Quality Award criteria and the Balanced Scorecard perspectives.

This process resulted in true enterprise-wide goals – all of them with sustainability principles integrated throughout – articulating Fort Bragg’s vision of “emulating the Spirit of the Fort Bragg Soldier in the quality of our work, stewardship of our resources and commitment of our people.” Strategic Goal No.1 captures this vision perfectly by driving Fort Bragg to become “a sustainable community meeting the needs of the Soldier today, tomorrow and forever.” The Sustainable Communities’ goal is the heart and soul of the installation’s strategic plan and consists of six strategic objectives organized around the following: military training/land use, sustainable facilities, materials/commodities, utilities, transportation and people/sustainable culture. Every established objective was developed to enhance the mission, to provide for soldiers and their families, and to encourage participation of the surrounding communities.

Sustainable Sandhills

Fort Bragg recognizes that public and community involvement are critical because long-term challenges neither start nor stop at the installation boundary. Since the sustainability kick-off conference in April 2001, the military installation has focused on developing partnerships throughout the state, region and nation. These partnerships play an essential role in Fort Bragg’s sustain-

ability success.

As an example, one of the installation’s key initiatives was formed in collaboration with the North Carolina Department of Environment and Natural Resources (NC DENR). In 2003 Fort Bragg leadership, under Davis’ guidance, partnered with the NC DENR to form the regional nonprofit known as “Sustainable Sandhills.” This landmark partnership was the first compact between an Army installation, an environmental regulatory agency and surrounding communities to work toward improving the overall regional economic and environmental conditions for better quality of life. As Davis stated, “If we all work together, we can make the region surrounding Fort Bragg one of the most sustainable places to live and to work in America, for both current and future residents of the Sandhills.”

William Ross, Jr., Secretary of NC DENR in 2003, had similar thoughts: “It’s our challenge to remember that what we are setting out to accomplish is important. It will be hard – there is no other choice – and through cooperation we can find the right route to bring a higher quality of life to the region.”

“The support of the Army has enabled Sustainable Sandhills to engage local governments and nonprofits and, most importantly, the residents and businesses of the region in a grassroots effort to create sustainable communities around Fort Bragg,” stated Jon Parsons, Executive Director of Sustainable Sandhills. Examples of Sustainable Sandhills’ programs include city-wide recycling programs, green school and business initiatives, an “urban farm” tour and the creation of a network of greenways and trails. (For more information about Sustainable Sandhills, please visit <http://sustainablesandhills.org>.)

The Army, Sustainable Fort Bragg and Sustainable Sandhills are dedicated to improving the quality of life in the Sandhills communities’ region. The ongoing partnership has led to multiple round-table workshops with key regional partners to ensure sustainability is incorporated in a way that guarantees a sustainable Fort Bragg



Examples of Sustainable Sandhills' programs include city-wide recycling programs, green school and business initiatives, an "urban farm" tour and the creation of a network of greenways and trails.



Leading the Way

Fort Bragg is a cornerstone in promoting sustainable behavior in the Army, in other military services and in North Carolina. Its original sustainability planning process has been fielded at more than 25 other installations worldwide and institutionalized as part of Installation Management Command's strategic planning process. The Department of the Army intends to systematically field this process to additional installations each year. In addition, NASA adopted and adapted the Army model at 13 of its Space Centers during 2007 to determine risks to on-going missions. The Air Force Space Command is also evaluating the Army's sustainability planning process for potential application.

The success of Fort Bragg's program has been recognized with numerous local and national awards. In 2003 and 2004 Fort Bragg and Sustainable Sandhills consecutively won the first two Sustainable North Carolina Awards. In 2004 and 2008 Fort Bragg was recognized with the White House Closing the Circle award for its sustainability initiatives. In 2008 Fort Bragg swept the first Secretary of the Army Sustainability Awards by

winning both the installation and individual categories. The installation award focused on Fort Bragg's innovative, integrated sustainability program and its significant contribution to Army sustainability while the individual award recognized Wirt for his vision and passion in guiding the program

from inception to the standard accepted throughout the Army.

"Fort Bragg has been the Army's leader within the past eight years in the drive to become a sustainable installation and to integrate the Triple Bottom Line into all facets of our Garrison operation. The commitment of our Garrison leadership to build strong cross-functional ownership of our strategic plan is what makes Fort Bragg unique," explains Wirt.

Influencing Change

Wirt is not alone in his belief that the Army can truly be a sustainability model for the rest of the country. After leaving the Pentagon, Raymond Fatz became President and CEO of Plexus Scientific Corporation and was later joined by George Carellas (former DOD Regional Environmental Coordinator for Region 4) and other Pentagon visionaries who wanted to continue their sustainability work. "It is incredibly rewarding to see how far the Army has come in the last decade by taking advantage of opportunities to influence change positively," declared Fatz.

Wirt agrees, "The ripple effects of the Army's efforts can truly help to create a cultural change that will secure a better future for the next generation."

The city of Fort Bragg has faced many challenges along its path to becoming sustainable – and will likely face many more to come – but there is no denying the valuable lessons its journey provides to other cities and corporations seeking a balance between the overall mission, economic drivers, environmental concerns and the community-at-large. This forward-thinking military installation's Environmental Management System policy statement says it all: "Sustainable Fort Bragg . . . securing the legacy of Fort Bragg for Soldiers, families and the community . . . The Right Way . . . The Green Way . . . All The Way!" 🌱

and region. Buy-in on this level gives the military a unique opportunity to stand with community planners and developers to present the needs of the installation and to include the importance of mission readiness while ensuring the communities have productive futures as well.



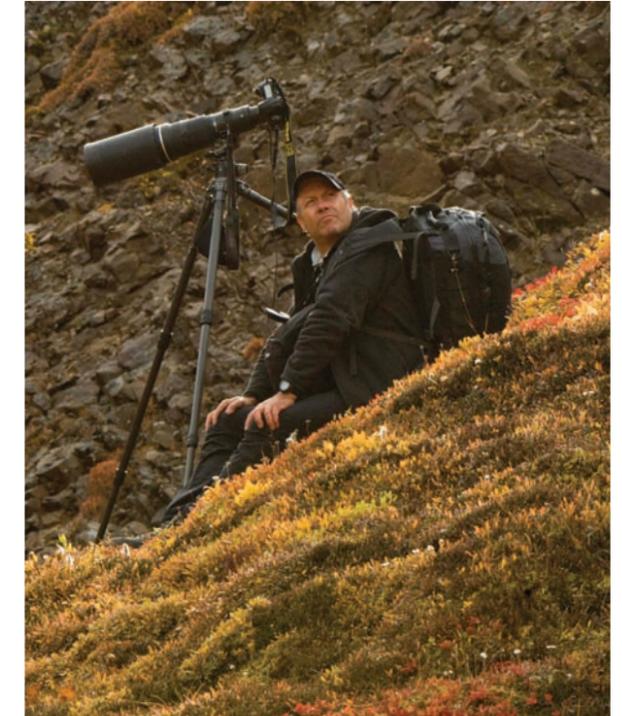
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THIS PUBLIC SERVICE ANNOUNCEMENT IS POWERED BY

Patricio Robles Gil



For millions of years we evolved within wilderness. It is interesting, now, how distant is that wild world and with what disregard it is treated by us city dwellers. In some ways this is understandable because there is no modern human comfort in wild nature, and some of the animals there can eat you.

I was 4 years old when I had my first encounter with nature. For me, a Mexico City kid, the northern mountains of Mexico were wild, remote and heaven-like. Just a few miles south of the Texas border in the state of Coahuila, Las Serranias del Burro changed my life.



The Passion and Essence of Nature



My early experiences with the wildlife of this special region convinced me that nature would always be my passion. In some way this unique transboundary-protected area, a “megacorridor,” became the cradle of my commitment with wilderness.

This region is still a sanctuary for wild nature where, for example, black bears are free to roam from Mexico to the USA and back. In these 10 million acres of solitude, the horizons are defined by mountains that erupt suddenly from the flat desert floor in different shades of blue, which prompt conservationists to refer to them as “sky islands.”

I’ve been described as a “conservation photographer.” Yes, I use photography as a medium through which to communicate wild nature to urban societies by trying to bridge that gap that has emerged between the two worlds. During this time, some 20 years, my understanding has brought me back to what I knew from the beginning – the importance of the essence of Wild Nature.

I started protecting endangered species through reintroduction programs and a wide range of communication initiatives (including producing books about global biodiversity and the human footprint). I gradually realized a simple fact; we need wild nature to survive. It is the place from where we come, and it is the place from which we can find solutions for our troubled world. If we protect wild nature, we safeguard the services that nature provides to humankind. We also conserve biodiversity.

Because I believe in the power of photography to work in this way, I was one of a group of photographers who attended the 8th World Wilderness Conference (WILD8) in Alaska four years ago. From that convocation and those meetings, the International League of Conservation Photographers (ILCP), www.ilcp.com, was founded by bringing together many of the most respected image-makers in the world today. Now, in November 2009, WILD9 (www.wild9.org) will be hosted in Merida, Mexico. The event has attracted a large community of conservationist com-

municators by designing a very ambitious agenda called “WILD SPEAK,” where filmmakers, photographers, writers, journalists, scientists and others will spend four days trying to find solutions to the important mission of closing that gap between humans and Nature.

One of the really exciting events within WILD9 is the Yucatán RAVE (Rapid Assessment Visual Expedition), to be staged by ILCP. Over the course of three months before WILD9 convenes – and for the first time ever before a global environmental forum – 25 photographers will document the region in which the conference is being held. The shoot will end on the day the first plenary session begins.

RAVE is a tool to help provide the conservation community with visual material about a specific natural area under threat. The Yucatán Rave will allow participating photographers and filmmakers to assemble a body of work that no single photographer could do alone. The Yucatán Peninsula has a unique and in-

teresting natural history, which endows it with a rich biodiversity and the development of sophisticated cultures that now, like so many other places in the world, are threatened by the increasing effects of global climate change.

WILD9 will convene November 6-13, 2009 in Merida, the “White City” of the Yucatán. Some 1200 delegates from 60 countries will meet and work, including global leaders from the corporate, conservation, government, communication and indigenous communities. Photography will be a major force at the conference. Central in the “WILD9 Expo” area are four big photography galleries displaying wilderness images from the Fellows of the ILCP. Some of those same photographers will also present on the plenary platform and/or at WILD SPEAK. This includes Robert Glenn Ketchum, Nick Nichols, James Balog, Art Wolf, Joel Sartore, David Doubilet, Jack Dykinga, Tom Mangelsen, Brian Sherry, Kevin Shaffer and others.



The World Wilderness Conference commitment to collaboration, in order to achieve practical conservation objectives, has spawned many hundreds of meetings with government agencies, NGOs and corporate leaders, all of whom have then created their own processes that will converge at WILD9. This opportunity has been a challenging and interesting pilgrimage for all of us, especially because Mexico has a nascent environmental movement with little overall public awareness. We even had to create a communications campaign to introduce a word for “wilderness” – “tierras silvestres.”

Now the Conference is just around the corner and I’m excited about those eight days. After all the work and preparation, I have a great sense of tranquility, almost the same kind of peace that I found in the mountains – the sanity that only solitude can bring when I’m in true Wilderness. 🌿

www.wild9.org

**Patricio
Robles Gil**

**President,
Unidos para la
Conservación AC**

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National Oceanic and Atmospheric Administration **FRANCE 24** and Radio France Internationale
 Carpet and Rug Institute U.S. Army Corps of Engineers Woods Hole Oceanographic Institution
 Survival International, London U.S. Navy Denver International Airport China Greentech Initiative

1 Fish-Killing Toxin Holds Promising Cancer Applications

National Oceanic and Atmospheric Administration (NOAA) – A powerful fish-killing toxin could have cancer-killing properties, according to collaborative research led by the U.S. Department of Agriculture’s microbiologist Paul V. Zimba and NOAA chemist Peter Moeller. The toxin, called euglenophycin, has a molecular structure similar to an alkaloid from fire ant venom known to inhibit tumor development.

Laboratory tests have shown that even low concentrations of euglenophycin lead to a significant decrease in cancer cell growth and can kill cancer cells. Preliminary studies have demonstrated that the toxin is especially effective in fighting renal cancer. Future research will test whether it also can prevent the formation of tumors. This work arose from observations of a mysterious disease killing fish in the ponds of a commercial North Carolina aquaculture facility in 2002. More than 21,000 striped bass died in July and August with losses valued at more than \$100,000.

“This preliminary work demonstrates the tremendous potential for discovery of novel and effective new treatments for a variety of human diseases, including cancer,” said Paul Sandler, Ph.D. and senior advisor to the NOAA administrator. “By studying freshwater and marine organisms, NOAA and its partners stand to make important gains for human health and well being.”

2 French President Sarkozy Announces Carbon Tax to Combat Global Warming

FRANCE 24 and Radio France Internationale – On Sept. 10, 2009 French President Nicolas Sarkozy announced plans to impose a new fuel tax next year on oil, gas and coal as part of a drive to combat global warming. The tax will not apply to electricity, which in France is largely generated by nuclear power, which does not emit greenhouse gases. The plan makes France the biggest economy in Europe to impose such a tax, called the “carbon tax” in France, on households and businesses, thus boosting Sarkozy’s “green” credentials ahead of the United Nations’ December climate change conference in Copenhagen.

“This is a significant effort,” said Sarkozy, adding that revenues from the new tax will be put back into taxpayers’ pockets through “green checks” and other tax cuts. “If things don’t change, it will be your children who pay the price.” The French President also announced plans for a “clean cars” program, which will offer a 5,000-euro bonus to people buying environmentally friendly cars.

In 1990 Finland was the first European country to introduce a carbon tax. It was followed by Sweden and Denmark.

3 Sustainability Takes the Floor

Carpet and Rug Institute (CRI) – The Carpet and Rug Institute promotes positive environmental progress

through a commitment to sustainability in its industry. CRI members have worked hard to establish the ANSI/NSF 140-2007 Sustainable Carpet Standard – the only one of its kind in the floor covering industry designed to create performance requirements for public health and for the environment. The CRI’s Seal of Approval carpet cleaning products, as well as its equipment testing and certification program, uphold high product care standards that ensure product sustainability. CRI supports work done by the Carpet America Recovery Effort (CARE) organization, which promotes innovative ways to keep old carpet out of landfills and to transform it into new products. In 2008, 243 million pounds of post-consumer carpet were recycled, and 292 million pounds were diverted from landfills.

For more information, go to www.carpet-rug.org, or participate in the sustainability discussion at the CRI blog at www.criblog.org.

4 The U.S. Army Corps of Engineers Becomes Sustainable Leader

Candice Walters, U.S. Army Corps of Engineers HQ (USACE) – As the Army’s construction agent, the USACE is building energy-efficient, environmentally friendly sustainable facilities to meet future missions and to support soldiers and their families. USACE-built facilities meet the U.S. Green Building Council LEED Silver level. However, at Fort Carson, the 4th Infantry, 1st Brigade and Battalion Head-

quarters building earned LEED Gold certification – one level higher. Under USACE’s Omaha District direction, the design team and contractors used native plants, natural daylight, an interior courtyard and reflective, energy-efficient, blast-resistant windows to create a livable, sustainable building.

In Fallujah, Iraq, the USACE has been installing solar-powered lighting as part of its infrastructure reconstruction work to provide power, to conserve natural resources and to improve air quality through reduced air emissions. This sustainable measure also helps to limit the petroleum movement through war zones, which means less risk to U.S. troops as a result of fewer petroleum convoys. In Afghanistan the USACE has taken an innovative approach to providing electric power to remote mountain villages with nearby streams by installing micro-hydro power generators. They are simple to install and to operate, are run by available water and are inexpensive and sustainable.

Other noteworthy renewable energy projects are Fort Sill’s geothermal heating and cooling project, which will save 2,500 barrels of oil per year, and Fort Knox’s solar walls and rehabilitation shops, which reduce annual oil consumption by 2,400 barrels. At the Nebraska Ordnance Plant, a Formerly Used Defense Sites cleanup project, the USACE is employing green remediation. The Plant’s wind-powered turbine supplies 30 percent of a groundwater recirculation well’s power with an added benefit: The treated water irrigates crops.

5 Rising Acidity Levels Could Trigger Shellfish Revenue Declines, Job Losses

Woods Hole Oceanographic Institution (WHOI) – Changes in ocean chemistry – a consequence of increased carbon dioxide (CO2) emissions from human industrial activity – could cause U.S. shellfish revenues to drop significantly in the next 50 years, according to a new study by WHOI researchers Sarah Cooley and Scott Doney. Intensive burning of fossil fuels and deforestation over the past two centuries have increased CO2 atmospheric levels by almost 40 percent. Oceans have absorbed about one-third of all human-generated carbon emissions, but CO2 buildup is pushing surface waters toward more acidic conditions.

This “ocean acidification” creates a corrosive environment for marine organisms such as corals, marine plankton and shellfish that build carbonate shells or skeletons. Mollusks – including mussels and oysters, which support valuable marine fisheries – are particularly sensitive to these changes. “Losses in primary revenue from commercial mollusk harvest – or the money that fishermen receive for their catch – could add up to as much as \$1.4 billion by 2060,” said Cooley.

Reduced mollusk harvests, as well as losses of predatory fish and other species that depend on mollusks for food, could lead to economic hardships for fishing communities. “Ocean acidification will impact millions of people that depend on

seafood and other ocean resources for their livelihoods,” said Doney.

6 Anglo-French Oil Company Threatened with Eviction by Amazon Tribes

Survival International, London -- AID-ESEP, a Peruvian Amazon Indians’ umbrella organization, has lodged an urgent appeal with the country’s Constitutional Tribunal to halt a giant Anglo-French oil project in “Block 67” of the Peruvian Amazon. AID-ESEP fears that the project, owned by Perenco, could have catastrophic consequences for uncontacted tribes living in the area. The oil company was given the “go-ahead” to start work in Block 67 just 13 days after the Amazon’s “Tiananmen,” an indigenous rights protest near the town of Bagua, where more than 30 police and civilians were killed.

Perenco denies the uncontacted tribes’ existence inside Block 67; however, a British news exposé alleged a company contracted by the oil company withheld evidence of their existence. Perenco’s project has aroused anger among northern Peruvian Indian communities. They’ve held large-scale protests and blocked the River Napo to stop Perenco’s boats from entering Block 67.

“How shameful that Peru’s Indians have to resort to the courts to try to get Perenco and the government to listen to them. After the Bagua tragedy, the authorities promised to consult with indigenous people before pushing ahead with these massive

projects. But, again, they're simply ploughing on against the local people's wishes," said Survival International Director Stephen Corry.

7 Navy Continues Science Commitment in Marine Mammal Studies

Tracey Moriarty, Chief of Naval Operations Environmental Readiness Division – The U.S. Navy, NOAA and the Bahamas Marine Mammal Research Organisation (BMMRO) recently completed two studies that monitored marine mammal responses to military exercises. The studies were conducted April 20-May 20 on the Atlantic Undersea Test and Evaluation Center (AUTEC) in northern Bahamas and July 15-28 on the Southern California Offshore Range (SCORE) off Coronado, Calif. "These studies are a major focus of the Navy's marine mammal research program, which is designed to understand the effects of man-made sound on marine mammals," said Dr. Frank Stone, the Navy's marine mammal program manager.

The whale tagging effort successfully deployed nine satellite tags on three different species, including three Blaineville's beaked whales, a Cuvier's beaked whale and five sperm whales. "The mere presence of beaked whales on a Navy range is counter-intuitive to the perception of their reactions to sonar," said David Moretti, principal investigator for the Naval Undersea Warfare Center's (NUWC) Marine Mammal Monitoring Program. "Given that this is an active Navy range where sonar is used, you wouldn't anticipate this species to be present in this particular location if you believed the popular press."

BMMRO Director Diane Claridge explained: "Beaked whales are moving in and

out of here, and one of the things I'm interested in is whether or not that movement is related to the activities taking place, such as the Submarine Commanders Course (SCC)." Although the team is still reviewing the data for this project, beaked whale monitoring during previous SCC events has shown a decline in their acoustic detections during active sonar exercises. Beaked whale detections increased following the end of the multi-day exercise, thus leading to a hypothesis that animals moved off the range during exercises. However, this remains to be tested, and the extent and distance of any movements remain unknown.

8 Denver International Airport Reduces Carbon Footprint

Denver International Airport (DIA) – Last year DIA opened a 2-megawatt solar farm close to the Jeppesen Terminal, which generates approximately one-half the power needed to run DIA's "people-mover" train system between the terminal and 3 concourses. The innovative airport continues to reduce its carbon footprint and to promote environmental sustainability by planning to construct a new photovoltaic system to power its fuel-storage and fuel-distribution facility.

The \$7 million, 1.6-megawatt solar project, located on 9 acres north of the airport's airfield, is expected to provide 100 percent of the fuel farm's electricity consumption. "We expect this project to reduce energy costs for our airline and cargo business partners over the 20-year term of the agreement," said Aviation Manager Kim Day. "DIA has a widespread reputation as a 'green' airport, and this project is another example of our commitment to environmental responsibility."

Day added her appreciation for the efforts of the Aircraft Service International Group, as well as for the 20 airline members of the DIA fuel committee, which includes chair Bob Sturtz, United Airlines' managing director of strategic sourcing/fuels. The new system is scheduled for completion by the end of 2009.

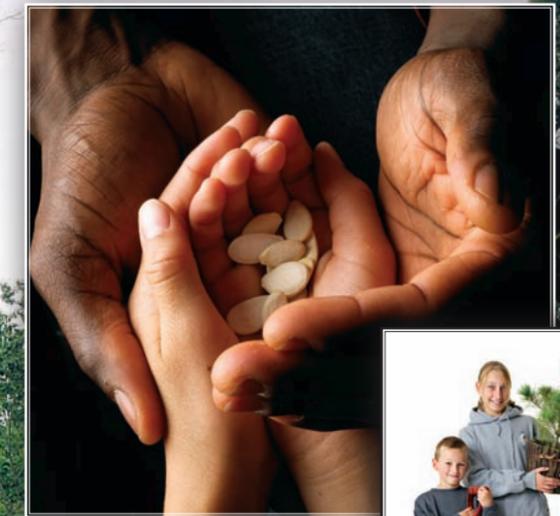
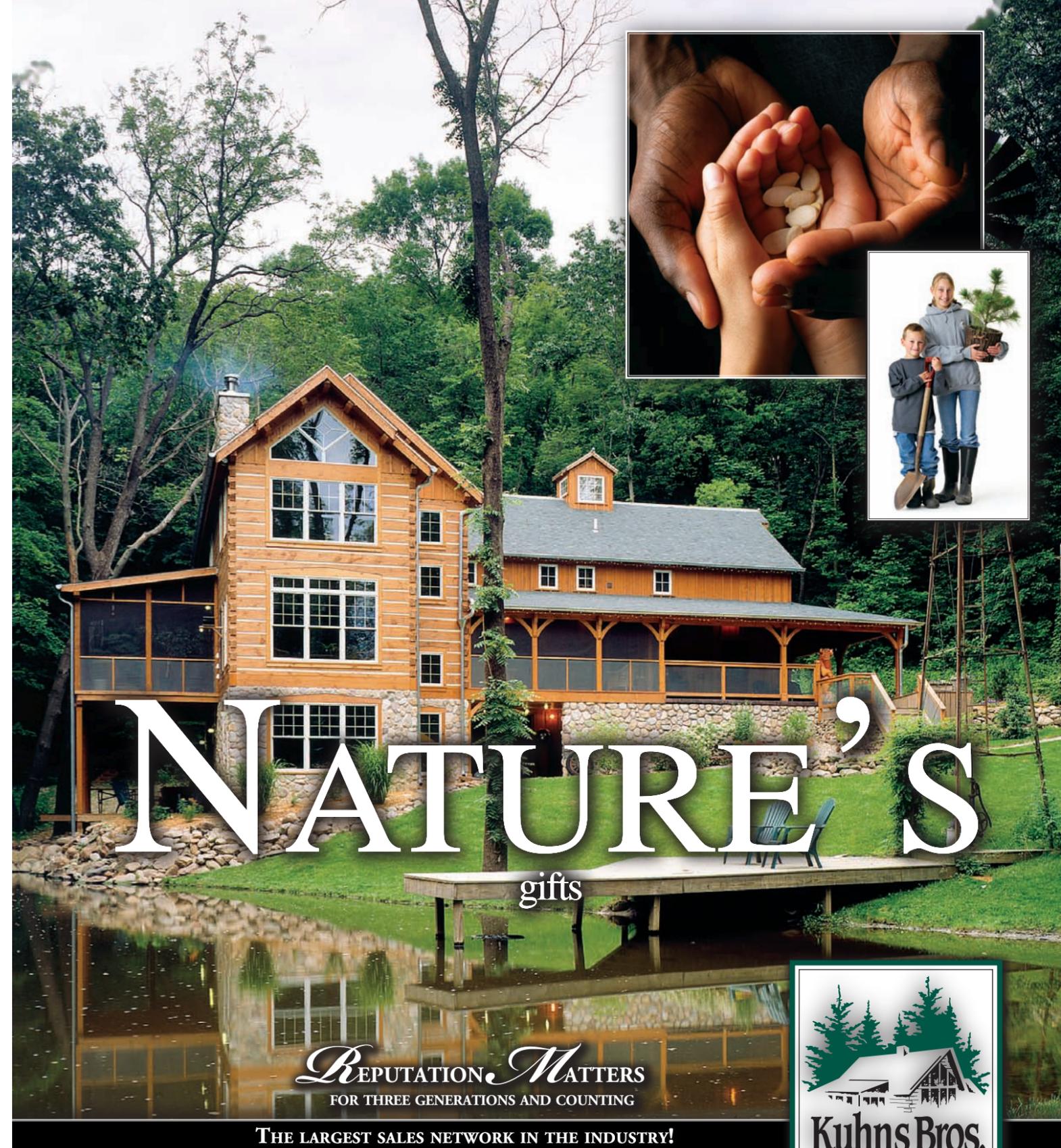
9 China Greentech Initiative Delivers 2009 Report

China Greentech Initiative (CGTI) – The China Greentech Report 2009, the Initiative's first deliverable, provides a cross-sector analysis of market and environmental issues facing China. The Report includes the country's regulatory response, available technical solutions and key developmental challenges and opportunities to accelerate greentech market growth.

The information demonstrates China's enormous market potential, that its government's policy changes are a positive driver and that the country is innovating at the intersection of technology and commercial opportunity. The Report is distributed free of charge and can be downloaded after signing in at www.china-greentech.com or at www.centerforabetterlife.com under "Reports and Studies."

This actionable roadmap is the collaborative product of more than 200 experts, and it critically reviews 7 major market segments: alternative transportation, clean water, cleaner conventional energy, cleaner industry, the electric power infrastructure, green buildings and renewable energy.

The Initiative's founding partners are PricewaterhouseCoopers and the American Chamber of Commerce in Shanghai.



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About Solar

Making Solar Accessible
Emily Wilmsen



A Colorado State University mechanical engineering professor was conducting research for Anheuser-Busch in the late 1980s when an epiphany hit: Could he borrow the efficiencies of making aluminum cans on a mass scale and use them to make solar panels? In 1991 Professor W.S. Sampath began to investigate his ideas for low-cost photovoltaic solutions by focusing upon a thin-film cadmium telluride glass coating in his small Colorado State laboratory. Another 16 years would pass before he started a company, AVA Solar, to commercialize this technology.

The spinoff, now called Abound Solar, formed in 2007 with support from the National Renewable Energy Laboratory in Golden, Colo. By 2008 the new company had attracted \$104 million in venture capital – more than any other Colorado firm that year. To date, Abound has raised \$150 million from private investors and institutions, including Invus Group, DCM, Bohemian Companies, Technology Partners and GLG Partners. Abound is now ramping up production to make low-cost, thin-film photovoltaic solar panels at its new factory in Longmont, Colo., and expects to begin shipping by the end of 2009. The

company has gone from 40 jobs a year ago to 200.

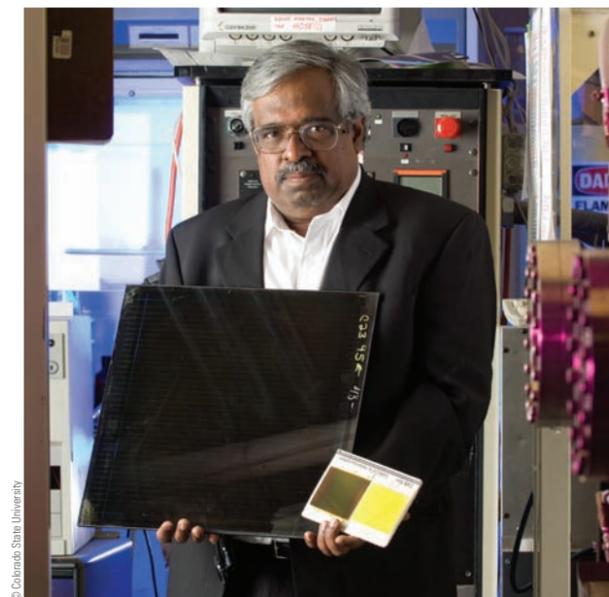
"It's a long road we're taking. In a space of 10 years, these modules may produce three times more energy that can be converted to electricity, and that will reduce the cost. I'm not saying this is going to happen next month. We're just starting out on this road," said Sampath.

"Abound Solar uses proprietary manufacturing technology to produce solar modules that cost half as much to produce as crystalline silicon, the mainstream technology for photovoltaics."

At capacity, Abound Solar is expected to churn out 200 megawatts of solar modules annually by using continuous in-line semiconductor equipment that converts sheets of glass into solar panels. Abound uses proprietary manufacturing technology to produce solar modules at half the cost of crystalline silicon, the mainstream technology for photovoltaics.

In 2008 *BusinessWeek's* online edition named Abound Solar one of the most successful start-ups in the nation and one of 25 "hot" companies. The online magazine listed Abound among an exclusive group of national organizations that had raised the most venture capital in the 2008 calendar year. And in May 2009, the company signed a long-term sales agreement with "juwi solar," a leading global solar integrator based in Germany.

Abound Solar fits with Colorado Gov. Bill Ritter's and President Barack Obama's missions to create new jobs through the "New Energy Economy." According to a White House press release, U.S. Interior Secretary Ken Salazar visited the company in August 2009 to "highlight the enormous opportunities for Americans in the emerging clean energy economy."



Thoughts on Poverty

Amzie Moore | Graduate Student, University of Chicago's School of Social Service Administration

The United States of America is, undoubtedly, one of the wealthiest industrialized nations in the world. Yet, despite its affluence, millions of Americans live in poverty. At the beginning of the 21st Century, the national poverty rate was 11.7 percent because 32.9 million people were impoverished. What's more, recent data (U.S. Census, 2008) illustrate that the number of people living at or below the poverty line has slowly and consistently increased to 13.2 percent, or 39.8 million – 1 in 7 people.

Poverty is not a new social phenomenon. It has certainly been part of America's history with continuous debates and controversies surrounding its origins. Conservative intellectuals and politicians have argued unequivocally that poverty is a result of poor people's indolence and intemperance (Katz, 1986). Liberals, on the other hand, have consistently contended that structural impediments have contributed immensely to Americans' living impoverished. For instance, liberals have argued and provided data illustrating that children, older people, handicapped Americans and people of color have consistently and historically encountered structural obstacles, which have ultimately forced them to suffer from poverty disproportionately in the U.S.

The same assumptions hold true for the aforementioned groups today, who continue to be impoverished. For example, as of 2008, the African American poverty rate was 24.5 percent, which was almost double the national rate. Moreover, scholars and politicians continue to have divergent views regarding its origins. Lawrence Mead (1994), a conservative educator, has argued that long-term poverty is a result of poor people's lifestyles and that members of poor families are impoverished because they lack a strong work ethic. To be more specific, Mead asserted, "Poverty may be due, not so much to a lack of opportunity, as to a lack of enforcement of social norms as the work ethic."

William Julius Wilson, on the other hand, has argued that inner-city blacks do not have an opportunity to work largely because American jobs disappeared from the inner city and reappeared in surrounding suburban areas or foreign countries. These notions were confirmed by Judith Russell. In *Economics, Bureaucracy, and Race: How Keynesians Misguided the War on Poverty*, she writes, "In the two decades from 1967 to 1987, New York City and Chicago alone lost more than 825,000 manufacturing jobs, and this pattern was repeated over the industrial Northeast and Midwest."

Despite on which side one falls regarding the origins of poverty, this social phenomenon is certainly having an adverse effect on society. And it affects every American citizen. Poverty has contributed to criminal activities in the inner city as well as to poor health care, inefficient educational facilities, dependency on Temporary Aid to Needy Families (TANF) and expansion in the prison population. Each of these social issues, whether directly or indirectly, has an impact on the American taxpayer. Because climate change is a major issue and industries are being created as a result thereof, now is the time for policy makers to work together to eradicate poverty by funding initiatives that would help poor people gain the human capital required to compete in the green economy. 🌱



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