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Maine Conservation Voters works to elect environmental leaders; with them, we work to pass laws to protect Maine's clean water, natural heritage and climate future and we hold lawmakers accountable by education the public about their votes. We use our political power to elect public officials who value conservation, regardless of their party affiliation. Through our non-partisan commitment and the strategic tools we've developed, we influence elections and successfully elect conservation champions on both sides on the aisle. Every election cycle and every legislative cycle we give people who care about the environment opportunities to get involved and make a difference. Maine Conservation Alliance leads a diverse collaborative-Maine's Environmental Priorities Coalition- advocating together for policies that ensure all Mainers are able to enjoy a clean environment and a clean energy future.

Stephen O. Andersen<sup>1</sup>, James A. Baker<sup>2</sup>, Timothy Craig<sup>3</sup>, and Sangeet Kapoor<sup>4</sup>

This paper describes the project financed by The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) to demonstrate the climate benefits of Secondary Loop Mobile Air Conditioner (SL-MAC). SL-MAC uses energy to cool the refrigerant, which then cools the water or antifreeze coolant, and finally, the coolant is used to cool the air that circulates inside passenger compartment. It has been developed to allow the safe use of mildly flammable refrigerants that have a low global warming potential (GWP) and to achieve high cooling capacity, minimizing the losses, achieving an improved overall thermodynamic efficiency in the process. The SL-MAC reduces the refrigerant charge and lifecycle refrigerant emissions, thus increasing the system reliability and reducing the routine repair cost. It further enables enhanced fuel-saving features such as regenerative cooling and prolonged idle stop (stop/start). It can be applied to MACs using hydrofluorocarbon (HFC)-134a, HFC-152a, hydrofluoroolefin (HFO)-1234yf, or any similar direct expansion refrigerant.

The presentation focuses on how engineers can find synergy in new automotive designs to protect climate, while reducing ownership cost and increasing technical and comfort performance.

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<sup>1</sup> Institute for Governance & Sustainable Development (IGSD)

<sup>2</sup> JAB Consulting

<sup>3</sup> Mahle Corporation

<sup>4</sup> Tata Motors Limited (TML)

**Title:** Update on the Zika virus outbreak (communiqué)

**Abstract:** Zika virus is a mosquito-transmitted virus, closely related to dengue and yellow fever viruses, transmitted primarily through the bite of an infected mosquito (*Aedes aegypti* and *Aedes albopictus*). Before 2007, very few cases of Zika had been documented, although they were likely to have occurred and were not reported. Because the symptoms of Zika are similar to those of many other diseases, previous cases may not have been recognized. In May 2015, the Pan American Health Organization issued an alert regarding the first confirmed Zika virus infection in Brazil. On January 22, 2016, CDC activated its Emergency Operations Center to respond to outbreaks of Zika occurring in the Americas and increased reports of birth defects and Guillain-Barré syndrome in areas affected by Zika. Since that time, cases have spread throughout the Americas with the first cases of locally-transmitted Zika reported in the U.S. in July 2016. Zika virus introduction and spread in Americas has likely been influenced by a number of contributing factors including global travel, immunologically naïve human populations, poor living conditions, inadequate public health resources, and climatic conditions conducive to mosquito growth and reproduction.

Green Chemistry: Chemical solutions to global challenges  
Amy S. Cannon, Ph.D.  
Executive Director, Beyond Benign  
[Amy\\_Cannon@beyondbenign.org](mailto:Amy_Cannon@beyondbenign.org)

Abstract:

Our society faces grand challenges of sustainability in the 21st century. The solutions to these challenges are multi-faceted, bridging many fields of study, and involving many different cultures and people. The field of chemistry is central to many of the solutions as we are grounded in a materials society. Green chemistry by definition involves the intentional design of safer products and processes that reduce or eliminate hazardous substances. It shifts chemistry from the problem, to chemistry as the solution. Through innovation in the laboratory and with changes in chemical education, scientists can be prepared to face 21st century challenges. Molecular designers (chemists) can use the tools of toxicology and environmental sciences to design safer, more sustainable products and processes. As our society tackles the global challenges we face today, chemistry will be essential in providing solutions. Green chemistry allows for these solutions to be sustainable from the molecular building blocks through the production of chemical products.

HFCs have become the fastest-growing greenhouse gas (GHG) in the world. Even with a global agreement to phase down production of HFCs and deployment of alternatives with low or zero global warming potential (GWP) in newly manufactured equipment, the large” installed base” of *existing* HFC-based refrigeration and air conditioning systems will continue to leak HFC refrigerants over the next several decades, contributing significantly to global climate change.

In the U.S., despite legal prohibitions against intentional release of refrigerant, there has been little or no economic incentive to recover HFC refrigerant from equipment (end-of-life or during servicing) and subsequently reclaim (restore to virgin-grade purity) the material for re-use. Reclaiming HFC refrigerants displaces new production of virgin HFC, thereby preventing GHG emissions that would otherwise result. The American Carbon Registry (ACR) recently approved a methodology authored by EOS Climate that enables the generation of carbon credits from recovery, reclamation and re-use of HFC refrigerants. For businesses that rely on HFC-based refrigeration and air conditioning equipment, purchase of reclaimed HFC credits provides an opportunity to complement ongoing efforts on technology transition, and demonstrate leadership in reducing HFC emissions across the refrigerant supply chain.

Reclaimed HFCs are an example of how a commodity can have a significantly lower climate impact based on how it is produced. In a resource-constrained world, a simple mechanism is needed that both rewards low-impact producers and enables participants in global markets to select for commodities based on their environmental impact. EOS Climate, in conjunction with partner organizations, has designed the Commodity Impact Factor (CIF) system to leverage global solution networks, advanced standards and verification platforms, and blockchain technology to streamline the collection, delivery, and reporting of social and environmental data at scale. Incorporation of these data into existing global commodities markets has the potential to catalyze the production of low-impact goods and radically transform global supply chains.

## International Technical Workshop on Climate Risk

**Category:** Climate Resilience

**Title:** Better Safe than Sorry — Increasing resilience in Maine’s southern coastal communities through dialogue

**Author:** Annie Cox, Wells National Estuarine Research Reserve

The Wells National Estuarine Research Reserve works with decision-maker audiences to help plan for and adapt to anticipated challenges brought on by climate change and sea-level rise through workshops and discrete projects. Projects include: *The New England Climate Adaptation Project* where four New England Communities (including Wells, Maine) were engaged in stakeholder and risk assessments, climate role play simulations and public attitudes research (necap.edu); *The Sandy Dialogues* in which municipal officials, business owners and coastal property owners from Maine travelled to Long Beach Island, New Jersey to meet with counterparts who experienced the impacts of Hurricane Sandy and the recovery process and reciprocated a visit to share lessons learned through a public workshop series (wellsreserve.org/sandy); *The Successful Adaptation Metrics and Indicators Project* that developed the *Better Safe Than Sorry Collaborative Partnership* with the ten southern Maine beach communities to share best practices for climate adaptation and preparedness and develop indicators of successful strategies for the region; and most recently *the Decreasing Vulnerability in Maine’s Beaches Business Community Using the Tourism Resilience Index* where 35+ businesses in Kennebunkport, Maine will be guided through a self-assessment to help them understand how prepared they are for a natural disaster adapted from a similar approach for the Gulf of Mexico. Lessons learned from these projects will be shared, along with common themes that emerge when engaging communities in dialogue about climate resilience.

# Matrix Approach to Systems Resilience Assessment

Ms. Cate Fox-Lent

Dr. Igor Linkov

The Resilience Matrix is a framework for the performance assessment of integrated complex systems. The framework consists of a 4x4 matrix where one axis contains the major sub-components of any system and the other axis list the stages of a disruptive event (Figure 1). The rows describe the four general management domains of any complex system (physical, information, cognitive, social) as described in the US Army's Network-Centric Warfare doctrine (Alberts and Hayes 2003). The columns describe the four stages of disaster management (plan/prepare, absorb/withstand, recover, adapt) as defined by the National Academy of Science in their definition of resilience (Committee on Increasing National Resilience to Hazards and Disasters 2012). Collectively, these sixteen cells provide a general description of the functionality of the system through an adverse event. Resilience is assessed by assigning a score to each cell that reports the capacity of the system to perform. For example, the Information-Recover cell is assigned a rating according to the ability of the system to collect (monitor) and share (analyze and disseminate) data that will aid in recovery. The Social-Adapt cell is assigned a rating according to the capacity of the system-users to modify behavior and sustain changes beyond the immediate incident response. The matrix of scores can be aggregated to represent a snapshot of overall system resilience, which can be monitored over time, used for comparison with similar systems, or examined more closely to illuminate gaps in system capacity (Eisenberg et al. 2014).

The science is clear: climate change is a real and present threat that is already impacting communities around the globe, and here in our great state of Maine. We are seeing more extreme weather, rising seas, collapsing fisheries, public health impacts like increase Lyme Disease, asthma, and heat stroke, and more. At the same time, the solution is clear: we need to shift our economy to one that is powered by 100 percent clean and renewable energy. There is one big barrier standing in the way of that goal - climate change has unfortunately become a polarized issue, elitist environmentalists against the general public. This is Washington's narrative, but it is not reality. Support for clean energy is widespread. How can we break the disconnect? By raising the voices of a diverse group of stakeholders - health care providers, business owners, fishermen, and more. We at Environment Maine have been focused on doing that here in Maine. Laura will talk about how.

Abstract for:

First Annual International Technical Workshop on Climate Risk, Wells, Maine, Oct.20-21, 2016

From: Ann Goodman, Ph.D.

*Adapting to Change: The Business of Climate Resilience*

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--This talk, adapted from the forthcoming book, examines emerging business reactions to, plans and preparations for climate events (e.g., fires, storms, floods, and hurricanes) and trends (e.g., droughts) from leading companies in strategic sectors: technology, telecommunications, food, banking, and insurance.

--Each profile, from which each chapter in the table of contents, above, is derived, illustrates one of five principles: **i. Responding to weather; ii. Learning from disaster; iii. Doing more with less; iv. Taking a risk—and managing it; v. Communicating change: information, collaboration**

--Informed by the 2015 COP 21 climate meetings in Paris, the book—and hence the talk--pays special attention to evolving communications strategies that encourage resilience, both inside the company—with managers, employees—and externally—supply and value chain, community, investors, others—to moderate business and human risk. The talk also looks at the private–public sector interaction in this area, how it has or hasn’t worked well, what each might best offer the other, along with emerging responses.

--The talk stresses evolving solutions to real problems that real companies are facing in real time. It is to be viewed as a snapshot in time, with the understanding that companies’ resilience plans are evolving, along with their practical and pragmatic approaches in response to our changing climate—and, critically, to their changing business goals.

--Significantly, the talk focuses on business opportunities innovative company leaders—with significant input from employees, among other stakeholders—are already exploring in response to the changing climate.

--Conference participants will benefit from learning about how real companies with real problems are facing a real-time crisis that affects all of us—and how they’re using business acumen to create solutions to a fast-changing situation predicated on uncertainty.

--The author, Ann Goodman, Ph.D., is a sustainability professional with 25 years of experience in the field as a professor, journalist, and for- and nonprofit executive. Her initial interest in sustainability was sparked by her concern about the changing climate and how business might help solve the problem. After broadening her sustainability knowledge and activities, she has returned to this initial climate concern, in part inspired by the increase in climate disasters, three of which she has lived through. The writing on her website and elsewhere, like her consulting and public speaking, reflects that recently revived concern (for details, please consult her bio).

## USE OF CARBON CREDIT PROGRAMS BY MAINE LANDOWNERS

### Changes in Program Rules and Credit Prices Could Significantly Increase Enrollment

Carbon offsets are a significant part of the cap-and-trade programs instituted in California and Quebec. Improved forest management projects make up 58% of all offset carbon credit projects in the largest market, regulated by the California Air Resources Board (ARB). Maine's 17 million acres of forests represent a significant carbon sink, with the potential to earn carbon credits worth millions for landowners, and early ARB improved forest management offset projects in Maine have been successful. To date, however, Sustainable Forestry Initiative (SFI)-certified forest lands have not enrolled in carbon credit programs, despite land managers having taken a serious look at the terms. *Keeping Maine's Forests* examines large forest landowners' and managers' decisions whether to enroll in carbon credit programs, describes its initial findings regarding the impediments to enrollment, and explores potential changes to program rules and credit prices which could yield significant increases in carbon sequestration by Maine forests.

*Keywords:* carbon credits, ARB, offset, industrial forest land, SFI, sustainably managed forests

## Thinking Outside the Box and Outside the Periodic Table

Barbara Kanegsberg and Ed Kanegsberg BFK Solutions LLC

Progress in mitigating climate change risk involves fundamental changes in the way industry and regulatory agencies interact. Currently, industry makes pronouncements about climate change, sustainability, and lessening dependence on chemicals that are currently under regulatory distress. Brave individuals within industry and at trade associations may be tasked with climate change issues. However, there is a huge gap between policy and actual manufacturing. Many in industry wait with dread for the latest pronouncements by regulatory and environmental agencies. The challenge is to decrease the current “us versus them” syndrome. Regulatory approaches that all of accepted during the phaseout of ozone depleting compounds can be modified to adjust to future requirements.

Attempting to regulate on a molecule by molecule basis is not likely to serve us well in the future. Lists of compounds that are forbidden or discouraged continue to grow; this approach is counterproductive. Engaging industry at a fundamental, sustainable level involves understanding by the regulatory community of the physical and chemical attributes of known substances. Based on 30 years of experience and on our recent and ongoing research in developing safer chemical blends for industry. We outline suggestions for a paradigm shift. This shift involves considering or reconsidering the approach to looking at chemistry and process options. Alternative options must be considered for a number of reasons. We must protect the environment and the worker. We must also consider the impact of manufacturing processes on public safety and on personnel safety. We must consider the impact of new technologies such as additive manufacturing.

Tuesday, May 31, 2016

## **ABSTRACT**

### **Use of Downscaling Methods to Adjust Intensity-Duration-Frequency (IDF) Curves**

Author: Mark Klingenstein, P.E. (Leidos, Inc.)

The design of drainage infrastructure by the civil engineering community relies upon the ability to utilize historical precipitation data to characterize future frequencies of various size precipitation events. Unfortunately, current climate change science suggests that one likely effect of an increase in average global temperature is an increase in intense precipitation frequency in significant portions of the United States. General Circulation Models (GCMs) function at fairly coarse spatial and temporal scales, while the design of stormwater infrastructure often relies upon an understanding of intense precipitation at very fine spatial and temporal scales. Recent literature and several computerized “tools” for characterizing climate change impact are reviewed, focusing on the various approaches to utilizing dynamical, statistical and combined downscaling methodologies to allow revision of current intensity-duration-frequency characterizations. Identified limitations of current approaches are discussed, and possible future directions of inquiry are suggested.

1<sup>st</sup> Annual International Technical Workshop for Climate Risk, October 20-21, 2016

Topic: Climate Change

Format: Oral Preferred

Leveraging Science to Effectively Communicate Climate Change Impacts and Risks

Michael Kolian<sup>1</sup>,

US Environmental Protection Agency

### Abstract

This presentation will discuss a few key EPA programs that help to inform science-based decision-making for existing and future climate-related policies and programs.

EPA's Office of Atmospheric Programs implements several climate-relevant programs to help inform decisions for climate action. For example, EPA compiles a set of key indicators related to the causes and effects of climate change into a published report entitled: *Climate Change Indicators in the United States* and online resource<sup>2</sup>. EPA partners with over 40 data contributors from various government agencies, academic institutions, and other organizations to gather these data and analyses. Another EPA project called Climate Impacts and Risks Analysis (CIRA), explores the question: What are the benefits to the United States of reducing global greenhouse gas emissions? The CIRA project estimates the physical and monetary benefits to the U.S. of global action on climate change. In addition to presenting climate change observations and projected impacts in the United States, and globally for context, these reports highlight the far-reaching significance of these changes and their possible consequences for people, the environment, and society.

In addition, EPA has two key programs that provide data on greenhouse gas emissions in the United States: the Inventory of U.S. Greenhouse Gas Emissions and Sinks and the Greenhouse Gas Reporting Program (GHGRP). EPA's inventory of U.S. Greenhouse Gas Emissions and Sinks provides annual estimates of greenhouse gas emissions and removals associated with human activities, for each year since 1990. While the GHGRP collects annual emissions data from industrial sources that directly emit large amounts of greenhouse gases. The program also collects data from entities known as "suppliers" that supply certain fossil fuels and industrial gases that will emit greenhouse gases in the atmosphere if burned or released. EPA implements other national and international programs that aim to reduce greenhouse gas emissions through efficiency measures and best practices.

### Keywords

Indicators, Impacts, Risks, climate action, science-based decisions, and policies

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<sup>2</sup> [www.epa.gov/climatechange/science/indicators/index.html](http://www.epa.gov/climatechange/science/indicators/index.html)

## **"Designing into the Anthropocene..."**

*An exploration of strategies in restoration, mitigation and adaptation to counter the effects of our presence...*

### **Abstract**

We are entering a new and world-changing epoch. The Anthropocene, a new geologic era characterized by humans as a force in shaping nature, has begun.

A vast majority of ecosystems on the planet now reflect the presence of people. With our overwhelming impact on the planet we have unwittingly made ourselves its caretakers. If we as a species are to survive, and hopefully thrive, in the future, we will need to take full responsibility for our actions and their consequences.

Like it or not, we have crossed the Rubicon; we cannot return. We will either 'design' our course forward with intention and greater precaution, or we will default and gamble our future on the unintended consequences of our actions.

The challenge we face is nothing less than existential. What we must change is our relationship to the source of our wealth – natural capital.

This demands not only a change in thinking but also a change in being. Now that is a design problem!

From the testing performed at the Massachusetts Toxics Use Reduction Institute's (TURI) Cleaning Laboratory, a wealth of data has been accumulated on the performances of industrial cleaning products. In order to use this information effectively, a database system was created so that access to this resource can be performed easily and quickly. This database seeks to allow users to search for an alternative-cleaning product based on safety and effectiveness.

But the process does not and should not end there. Process specific testing is the cornerstone to identifying effective alternatives. It links the theory of lab testing with the reality of field work. Therefore, success is achieved through lab testing, piloting and on-site evaluations. Case studies will demonstrate how the process has been effectively used at the

TURI Cleaning Lab (Marshall).

# The Impact of Climate Change on Extreme Precipitation and Flooding in the United States and How Businesses Can Prepare Now

**Andreas Muehlbauer**, Shangyao Nong, Yasir Kaheil, Hosam Ali

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## Abstract

Extreme events have the greatest potential to produce natural catastrophes that affect businesses, jobs and economies on a regional or global scale. Although no individual extreme event can be attributed solely to climate change, given the high degree of natural variability, potential changes in risks associated with extreme precipitation and floods need to be assessed to ensure businesses can take actions now to improve their resilience and increase their preparedness.

Such actions have to be based on the best available observational data and science, and presented in an understandable manner that provides practical and cost-effective solutions to reduce potential business interruptions and property loss caused by extreme precipitation and flooding. To meet this need, four of the world's leading experts in atmospheric sciences were brought together with scientists at FM Global to evaluate the current state of knowledge and develop recommendations to address the implications of climate change on extreme precipitation and flooding in the United States.

This contribution provides an overview of how climate change affects extreme precipitation and flooding in the United States together with specific recommendations how business leaders can prepare now to minimize the risk of property loss and business interruption.

# 1<sup>st</sup> Annual International Technical Workshop on Climate Risk

October 20-21, 2016

Wells, Maine

## Building Resilience into Production While Reducing Energy Requirements

Steve Norris, Plasma Technology Inc. (PTI) and Jim Unmack, Unmack Corp.

### Abstract

Through a concerted effort to reduce, reuse, and recycle, PTI has reduced its energy budget while increasing production. Standardizing processes and equipment across 22 work stations in two facilities allows jobs to be shifted with minimal loss in production time and resilience in meeting production schedules. Added benefits include improvement towards meeting quality objectives. Employees have enjoyed a cleaner, brighter work environment. Lighting upgrades to more efficient fluorescent tubes, occupancy-triggered controls, and better placement produced energy savings that recovered the cost of changes in less than a year. Heat management is critical to the thermal spray process. Adding buffering tanks allowed banking cooling capacity with overall net reduction in energy requirement. Harvesting heat from process cooling water moved the heat to where it was needed and reduced the refrigeration required for the process cooling water. Attacking energy losses in the compressed air system meant chasing down leaks and installing variable speed controls so the compressor could be modulated to meet demand. Waterless urinals were paid for in less than two years by the reduction in water use. Segregation of previously landfilled metal waste allowed recycling of valuable metals including nickel, tungsten and stainless, turning a cost into a revenue stream that has paid for the improvements in energy efficiency.

## **Death by Degrees: The health crisis of climate change in Maine**

Physicians for Social Responsibility Maine Chapter (PSR Maine) released a ground breaking report in 2000 about the looming public health threat of climate change in Maine. PSR Maine updated and rereleased this report in 2015 and created a subsequent public presentation. Its focus on vector borne disease, heat impacts, allergies and asthma, and extreme weather hazards underscore the most likely health risks for human health Maine. Notwithstanding, the report also importantly features how working together makes a difference in mitigating climate change and highlights work being done in Maine. The presentation has been given in public libraries and other venues in mid-coast and southern Maine as well as at the University of Maine annual Water + Sustainability Conference in the spring of 2016.

**Category: Climate resilience**

**Title: Principles for Sound, Equitable, and Ambitious Climate Adaptation**

**Author: Erika Spanger-Siegfried, Senior Climate Analyst, Union of Concerned Scientists**

**Abstract:** Many consequences of climate change have been irrevocably set into motion. And unless societies take steps now to increase their resilience through aggressive action on both climate mitigation and adaptation, damages and dangers will mount as the climate continues to change. Planners, politicians, communities, and countries around the world thus face a pressing challenge: to protect people from the harm caused by an increasingly volatile climate.

How can decision makers act swiftly, but with care? How can communities put their limited resources to best use today in light of an uncertain future? Climate adaptation—smart planning and actions to reduce the impacts of global warming—is now needed on an unprecedented scale.

In June of this year, UCS released a set of 15 principles to help guide decision makers in building climate resilience in the United States, structured around three basic themes: science, equity, and what we call ambitious common sense. We designed these principles for decision makers and practitioners from the local to the federal level, and to be durable and flexible enough to be used in a wide variety of contexts. Providing practical examples of each, this presentation will explore these principles in the context of an overarching conceptual framework.

## *Quantifying Climate Risk to Powerplant Cooling and Generating Capacity*

Dr. Terry Thompson, Senior Fellow, LMI

Adapting to climate change and managing climate risk involves complex decisions in the energy sector. This case study supports such decisions via location-specific climate statistics derived from ensembles of climate models and time-evolving risk metrics derived from these statistics. We translate changes in climate variables (temperature, precipitation, etc.) into risk of decreases in cooling capability at thermo-electric power plants due to higher water temperature and decreased water availability. Such decreases in cooling capacity will limit generating capacity unless adaptation planning compensates for these effects.

### **NASA's Supply Chain and Climate Risk Management: *Exploratory Efforts***

The National Aeronautics and Space Administration (NASA) engages in enterprise risk management to safeguard its assets, as well as taxpayer funds. These efforts include climate change adaptation planning as part its annual Strategic Sustainability Performance Plan (SSPP) requirements and to ensure resilience and success in meeting mission goals. After conducting facilitated climate change adaptation workshops at several of its Field Centers, the Agency has helped its workforce and surrounding communities work together to understand and plan for the potential impacts of a changing climate.

More recently, moving beyond the Agency's managed infrastructure, natural resource assets, and its workforce and communities, NASA has begun looking farther beyond the Agency fence-line to determine risks faced through supply partners in the private sector. This exploratory study outlines initial findings and a potential path forward for expanding an analysis of how climate change can impact NASA's supply chain. This includes a framework for focusing on top suppliers, determining their engagement in climate change adaptation planning and risk management at the organizational level, and mapping their facilities along with projected climate risks geospatially within a geographic information system (GIS) environment. This initial work also covers a case study of facilities in Southern California.

## Environmental Justice and Climate Change - Policy in Action

The U.S. Environmental Protection Agency's (EPA) efforts to address environmental justice (EJ) centers around the fair treatment of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Pertinent to this policy is EPA's focus on addressing climate change and its effect in EJ communities.

The effects of climate change are not shared equally. Minority, low income and tribal communities are subject to a disproportionate share of negative environmental factors and may bear a disproportionate burden of climate-related effects due to those same environmental factors. They may also have limited resources to mitigate and adapt to the changes in climate. EPA has taken numerous efforts to address climate change vulnerabilities in EJ and tribal communities. This presentation will focus on EPA's work to address climate change in New England EJ and tribal communities as it relates to our policy and regional activities.

*Climate Change Across the Curriculum*

Bethany Woodworth, Ph.D.

Associate Lecturer and Coordinator, Interdisciplinary Minor in Climate Change Studies

Department of Environmental Studies

University of New England

Universities have a foundational responsibility to educate their student about important societal issues across all disciplines within the context of liberal education. Today's college students will be living out their lives at the same time that the IPCC's predictions are coming to pass, with pervasive effects on the students' personal, community, and professional lives. Thus, effective and comprehensive education about climate change is a serious responsibility. Despite this, climate change education in the United States is poorly developed. I argue that climate change curricula should not be a specialized subject of study for a few, but be fully integrated including all disciplines and programs. This paper will review the state of climate change education in post-secondary institutions, identifying and evaluating several curricular models. I describe the University of New England's new Interdisciplinary Minor in Climate Change Studies as one potential model, along with structural, funding, and support needed to ensure that climate change studies are integrated across the curriculum.

**Beth Ahearn** has been with MCV since 2012 as the lobbyist/political director and has been dedicated to environmental protection for a long while. She graduated from Brown in 1982 with a degree in environmental studies, the first year the degree was offered. After graduating, she "tried on" several outdoor/conservation vocations in various states before coming to Maine, where she had earlier fallen in love with sailing and the islands of Penobscot Bay. She attended law school in Portland to become a more skilled environmental advocate, graduating in 1988. Beth lives in Freeport with her husband and dog and has 2 adult children. She enjoys "messing about in boats" as well as biking, tennis and gardening.

**Dr. Stephen O. Andersen** is Director of Research at Institute for Governance & Sustainable Development (IGSD). While a graduate student at University of California, Berkeley he participated in the 1974 assessment of impacts of super-sonic transport (SST) on stratospheric ozone and climate. After earning his PhD in natural resource economics, Stephen worked for dozen years as a professor and for environmental and energy non-governmental organizations (NGOs). In 1986 he joined the United States Environmental Protection Agency (EPA) where he worked for 23 years in positions of increasing authority including Director of Strategic Climate Projects, Deputy Director of the Stratospheric Protection Division and EPA Liaison to the Department of Defense (DoD) on climate and ozone protection. He created EPA's first voluntary partnerships in food packaging, motor vehicle air conditioning, electronics, aerospace, and fire protection and more and he created and managed the EPA Stratospheric Ozone and Climate Protection Awards. He is co-author of three book and dozens of articles including the scientific papers spearheaded by Guus Velders making the case for accelerated phaseout of ozone depleting and hydrofluorocarbon (HFC) greenhouse gases. For the United Nations Montreal Protocol on Substances that Deplete the Ozone Layer, he founded and co-chaired the Technology and Economic Assessment Panel (TEAP) from 1988 through 2012 and also served in senior positions at the Intergovernmental Panel on Climate Change (IPCC) where he was editor and author of reports that helped the IPCC earn the 2007 Nobel Peace Prize. Stephen received prestigious awards from the United Nations (UN), the US EPA and DoD, Brazil, Iraq, Japan, Thailand, Russian Federation/Union of Soviet Social Republics (USSR), and Vietnam—including the UN Global 500 Award that has also been earned by Jimmy Carter, Wangari Maathai, and Jane Goodall. In 2009 Dr. Andersen earned the Service to America Career Achievement Medal.

**Dr. Charles Benjamin (Ben) Beard** earned a B.S. in 1980 at Auburn University, a M.S. in 1983 at the Louisiana State University School of Medicine, and a Ph.D. in 1987 at the University of Florida. He was a post-doctoral fellow and associate research scientist at the Yale University School of Medicine from 1987 to 1991. In 1991, he joined CDC's Division of Parasitic Diseases, where he served as Chief of the Vector Genetics Section from 1999 to 2003. In 2003 he moved to CDC's Division of Vector-borne Diseases in Fort Collins, CO to become Chief of the Bacterial Diseases Branch. In this capacity, he coordinates CDC's programs on Lyme borreliosis, tick-borne relapsing fever, *Bartonella*, plague, and tularemia. During his 25-year tenure at CDC, Ben has worked in the prevention of vector-borne diseases, both in the domestic global arenas. In addition to his work as Chief of the Bacterial Diseases Branch, in 2011 Dr. Beard was appointed as the Associate Director for Climate Change in CDC's National Center for Emerging and Zoonotic Infectious Diseases, where he coordinates CDC's efforts to mitigate the potential impact of climate variability and disruption on infectious diseases in humans. He has published 126 scientific papers, books, and book chapters collectively, and has served on a variety of committees and panels both inside and outside of CDC, including working groups or advisory panels for the World Health Organization, the Bill & Melinda Gates Foundation, and the American Meteorological Society. He is an Associate Editor for Emerging Infectious Diseases and past president of the Society for Vector Ecology and is currently serving as Deputy Incident Manager for CDC's Zika virus outbreak response.

**Amy Cannon** holds the world's first Ph.D. in Green Chemistry from the University of Massachusetts where her research involved the environmentally benign synthesis of photoactive materials. She received her M.S. in chemistry from the University of Massachusetts Boston and her undergraduate degree in Chemistry from Saint Anselm College in Manchester, NH. Amy worked as an Assistant Professor of Green Chemistry and Director of Outreach and Community Education at the Center for Green Chemistry at the University of Massachusetts Lowell until September of 2007 when she left to co-found Beyond Benign. Amy has industrial experience working as an analytical chemist for the Gillette Company and as a scientist for Rohm and Haas Electronic Materials. She was awarded the Kenneth G. Hancock Memorial Award in Green Chemistry in 2004 for her work on titanium dioxide semiconductors and their application in dye-sensitized solar cells. Her interests are in green chemistry education and research around safer green chemistry alternative technologies. Amy serves on the Editorial board of the new journal *Green Chemistry: Letters and Reviews*.

**Jeff Cohen** is Co-Founder and Senior VP of EOS Climate. Based in San Francisco, EOS is leveraging carbon markets and innovative financial mechanisms to promote production of commodities that minimize impacts on climate and to develop projects that directly reduce emissions of powerful greenhouse gases. EOS has partnerships with Fortune 500 companies across multiple industrial, commercial, and consumer sectors and has received numerous recognitions including five consecutive years as best project developer from Environmental Finance, Innovator Awards from both the American Carbon Registry and Sustainable Brands, and the Governor's Environmental and Economic Leadership Award.

**Annie Cox** is the Coastal Training Program Coordinator at the Wells National Estuarine Research Reserve. Annie's focus on climate change impacts include facilitating regional municipal discussions on local and regional climate adaptation solutions and working one on one with beach businesses to assess their resilience to maintaining operations before, during and after a natural disaster. At the Reserve, Annie helps develop and organize workshops and trainings for professionals working with and making decisions that affect our natural resources. Topics range from Social Media for Emergency Response to Planning for Coastal Resilience Using Green Infrastructure.

Annie holds a masters in Ecological Design from the Conway School. She became interested in land use planning issues during her Peace Corps service teaching sustainable agriculture and aquaculture in rural Zambia, where she served for two years. Annie's undergraduate degree is in Biology from the University of Maine at Farmington.

**Laura Dorle** is Environment Maine's Campaign Director. Laura moved from Minnesota to Maine in 2014 to join the Environment Maine team as a campaign organizer on our Global Warming Solutions Campaign. In that role, she was instrumental in organizing sportsmen (and women) in the lakes region to take action to fight climate change, work that influenced Senator Susan Collins to become a supporter of federal climate mitigation. She started as Environment Maine's Campaign Director in January of 2016. She graduated from the University of Minnesota, Twin Cities with a degree in Environmental Sciences, Policy, and Management. She started her organizing career during college where she organized for environmental change—first as a student at the University of California, Davis working on a successful effort to ban plastic bags in the City of Davis, and then working with Real Food Challenge to successfully convince the University of Minnesota to purchase food that supports a sustainable and just food system.

**Cate Fox-Lent** is a Research Civil Engineer with the Environmental Lab of the Army Corps of Engineers. Cate and her colleagues in the Risk and Decision Science Team develop risk and stakeholder informed decision models for dredged sediment management, adaptive management of ecosystem restoration, military installation sustainability and other civil works and military missions. This work has supported a natural transition to development of approaches to coastal community resilience assessment and investment prioritization. Cate is also a member of the USACE headquarters resilience team that is developing a roadmap for agency-wide resilience implementation.

**Dr. Ann Goodman** is author of the forthcoming book *Adapting to Change: Adapting to Change: The Business of Climate Resilience* to be published by Business Expert Press (BEP) in August 2016. Dr. Goodman co-developed and taught a course, partly based on the book, at CUNY's Zicklin School of Business at CUNY in autumn 2015. She has 25 years of international experience in the intersecting fields of business, sustainability, climate, risk assessment, strategic resilience planning-- as an executive, entrepreneur, communicator, educator and consultant.

Dr. Goodman advises the National Institute of Standards and Technology (NIST) as a member of its Community Resiliency Panel, serving on the economics and society committee. Recently she has also worked with: NCAnet, the communications and outreach affinity network of the National Climate Assessment and Development Advisory Committee (NCADAC); the ARC3-2 (Assessment Report on Climate Change and Cities) Communications Working Group of the UCCRN (Urban Climate Change Research Network); the Inter-Agency Forum on Climate Change Impacts and Adaptation; GARI (Global Adaptation and Resilience Investment Working Group); impact investment firms and social impact start-ups and for- and nonprofit organizations, including the Higher Ground Foundation and Climate Adaptation Works.

She speaks widely on sustainability and business to international audiences in Europe, Asia, the Americas--recently on sustainability, social media, disaster, supply chain, energy efficiency, climate resilience in LA, NYC, Washington DC, China, Hong Kong; France and Thailand.

After attending the COP21 Paris meetings, she spoke at the Fontainebleau campus of the acclaimed international INSEAD business school about potential business outcomes of the international climate agreement in December, 2015. She also spoke on business and climate change at the Natural Hazards Workshop and the National Center on Atmospheric Research, both in Boulder, Colorado in summer of 2015. In fall, 2014, she was invited to speak on the topic at the annual Berkin-Friedman Forum at Baruch College, CUNY, NYC, where she again convened a public session on the Post-Paris Business Climate in February, 2016. In June, 2016, she presented a paper on climate/energy education and workforce development at the annual NCSE (National Council on Science and the Environment) conference in Washington, DC. Other presentations are scheduled for September 2016 in coordination with Climate Week in NYC; at US government agencies in Autumn 2016; and at other conferences throughout 2016 and 2017.

Dr. Goodman co-founded the Women's Network for a Sustainable Future (WNSF) and was its Executive Director for a decade. Under her leadership, WNSF was the premier sustainability organization for US businesswomen, expanding from NYC to Washington, D. C., Atlanta, California, and the Pacific Northwest. She forged an ongoing sustainability alliance with businesswomen in China (through the premier organization CAWE/China Association of Women Entrepreneurs), created the annual NYC Businesswomen's Sustainability Leadership Summit, and a West Coast clean technologies counterpart.

A former full-time journalist, she reported extensively on sustainability/business for major international media, including Fortune, Business Week and Public Radio's nationally broadcast Marketplace; was an editor-in-chief at United Newspapers; first business journalist elected to the Board of the Society of Environmental Journalists (SEJ).

More recently, she contributed a column to Greenbiz.com (see, among others: White House interviews; China and climate adaptation reporting; and an exclusive series on business climate resilience at her landing page: [greenbiz.com/bio/ann-goodman](http://greenbiz.com/bio/ann-goodman), with others also available on her own site, [anngoodman.com](http://anngoodman.com)). Her 2012 story on sustainability and risk reporting trends was the year's 2nd-most read piece on the premier business sustainability news site that year.

Recent honors include: University of Chicago Public Service Award; fellowships from Leader to Leader Institute, Clean Tech Incubator at NYU-Polytechnic Institute, Kauffman Foundation (2), and Building Engagement Capacity Workshop for 3<sup>rd</sup> National Climate Assessment.

In broad community service, local to global, she was appointed to the Planning Committee, National Summit, US President's Council on Sustainable Development, 1998-99.

Dr. Goodman is a member of the American Society of Adaptation Professionals (ASAP), the Association of Climate Change Officers (ACCO) and the Authors Guild.

Recently she has served on Sustainability Accounting Standards Board (SASB) working groups (finance; technology & communications); the (US-based) French Embassy's Franco-American Civil Society Organization selection committee; Green Economy Think Tank (GETT) NYC Leadership Committee; US Senator Kirsten Gillibrand's (New York State) Small Business Working Group; and the University of Chicago Women's Steering Committee.

B.A., M.A., Ph.D. from the University of Chicago; awarded French Government Doctoral Research Fellowship; served on University of Paris economics faculty (Dauphine); taught at New York University and Bard College.

Earned Global Reporting Initiative (GRI) professional certificate and updated G3/G3.1, GRI-14, and CDP (formerly Carbon Disclosure Project) certificates.

Near-native fluency in French; proficiency in Spanish; working knowledge of German; studied Mandarin and Bengali.

**Sherry F. Huber** is Executive Director, Maine Timber Resources and Environmental Education (TREE) Foundation and the former Executive Director of the Maine Waste Management Agency. She served in the Maine House of Representatives for six years and is a Corporator of Maine Health. She chaired the board of Mainewatch Institute and is a former trustee of the College of the Atlantic. She is a former director of The Nature Conservancy, the Land Trust Alliance and NatureServe and currently serves on the Council of Advisors of the last two. She is a former President and current member of the Forest Society of Maine and a member of the University of Maine School of Law Board of Visitors, the Leadership Council of the Yale School of Forestry and Environmental Studies and Maine Conservation Voters. She is a founder of Keeping Maine's Forests and serves on the Steering Committee. She is an Advisory Trustee of the Maine Audubon Society and a Trustee Emerita of Waynflete School. She is an Honorary Director of the Friends of Casco Bay. Sherry is a graduate of Smith College.

**Barbara Kanegsberg**, President of BFK Solutions, LLC, is a recognized expert in critical/industrial cleaning and contamination control. She develops critical cleaning processes, conducts validations, and resolves product-related regulatory issues. Barbara is a member of the ASTM medical device Cleanliness Testing Task Force and a US Expert to the ISO/TC 209 WG 12. She has a master degree in biological chemistry, and is co-author of the two-volume CRC Handbook for Critical Cleaning.

**Dr. Ed Kanegsberg**, Vice President of BFK Solutions, is a chemical physicist and engineer who troubleshoots and solves manufacturing production problems in medical device development and in other high-value products. He is a recognized consultant in industrial cleaning process design and process performance with decades of experience helping companies transition from prototype to production. Ed has a Ph.D. in physics and is co-author of the CRC Handbook for Critical Cleaning.

**Mark J. Klingenstein, P.E.**, is a civil engineer whose 35 year career has focused on wastewater treatment and water pollution control. Mr. Klingenstein has considerable experience with wastewater collection systems, wet weather issues, and wastewater treatment systems (both municipal and industrial). He is also an experienced trainer, who has presented workshops on a variety of water pollution control-related topics to government clients. Mr. Klingenstein received a BSCE from Drexel University (1979) and a MECE from Stevens Institute of Technology (1989). Mr. Klingenstein is a licensed Professional Engineer, P.E., in Arizona, New Jersey and Indiana.

**Michael Kolian** is an Environmental Scientist at the United States Environmental Protection Agency (EPA), Climate Change Division, where he has worked for 16 years and specializes in climate change science and impacts. He is the lead author of EPA's *Climate Change Indicators in the United States* report and is co-chair of the U.S. Global Change Research Program's Indicator Working Group. Mike works on several assessments to inform EPA's climate-related regulatory actions and analyzes and publishes data collected by EPA's Greenhouse Gas Reporting Program and other programs. Prior to working on climate change for EPA, Mike was program manager for EPA's national air quality and trends monitoring programs and worked on numerous assessment activities related EPA's Clean Air Act regulations including the Acid Rain Program. He has a Master of Science in Public Health from Tulane University's School Public Health and Tropical Medicine.

**JohnPaul Kusz** (FIDSA, FRSA) is president of JPKusz, Ltd, USA providing consulting and business development strategies that focus on generating more sustainable outcomes. His clients include businesses, non-government organizations, and academic institutions.

He has taught as an adjunct professor at the Illinois Institute of Technology at both the Institute of Design and the Stuart School of Business, where he co-founded the Center for Sustainable Enterprise in 2001. For over twenty-five years he has written and lectured on the potential of design to not only mitigate social and environmental impacts, but create a viable future.

He has authored over 45 articles on the potential of design to mitigate environmental impacts, including contribution to one of the first policy oriented publications on the issue of design for the environment; "Green Products by Design," for the US Congress, Office of Technology Assessment.

He has developed and patented products in areas of recreation, personal health and safety, medical imaging and surgery and resource recovery systems. In 2007 he was given a Fellowship in the IDSA for his work on environmental matters related to product design. Through his work and research he explores the development of "sustainable" product, business and system models, and how stakeholders can generate social and technical innovations to move us toward a more sustainable future.

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**Dr. Jason Marshall** directs the services of the Toxics Use Reduction Institute Cleaning Lab. The lab works with companies, communities and citizens to evaluate the performance of cleaning chemistries and equipment. Recent projects include: promoting the adoption of alternatives to trichloroethylene for businesses in Massachusetts and Rhode Island; promoting safer ingredients in cleaning products resulting in recognition from EPA's Safer Detergent Stewardship Initiative at the Champion Level; participating member of the Toxics Reduction Task Force Massachusetts Executive Order No. 515 establishing an Environmental Purchasing Policy to examine specific areas of environmental procurement and provide targeted technical assistance and guidance to agencies as needed.

Related publications: In Search of the Silver Bullet: Assessment of Alternatives for Trichloroethylene in Cleaning Operations October 2015. "How Green and Does it Clean: Methodologies for Assessing Cleaning Products for Safety and Performance". Chapter in Developments in Surface Contamination and Cleaning (2014); "Road Map for Cleaning Product Selection for Pollution Prevention" Chapter in the Handbook for Critical Cleaning, Second Edition (2011); "Hands-On Assistance Improves Already Successful Pollution Prevention Services of the Toxics Use Reduction Institute's Laboratory" in *Journal of Cleaner Production*, February 2011.

Dr. Marshall has a Bachelor's of Science in Chemical Engineering, Master's of Science in Environmental Studies and a Doctorate of Science in Occupational and Environmental Hygiene from the University of Massachusetts Lowell.

**Dr. Andreas Muehlbauer** is a senior research scientist at FM Global working on natural hazards and loss prevention. Prior to working at FM Global, Dr. Muehlbauer was a research scientist at the Joint Institute for the Study of the Atmosphere and Ocean at the University of Washington and funded by the National Science Foundation, the U.S. Department of Energy, and NASA. He published numerous peer-reviewed articles on the topics of clouds, precipitation, and climate change. He has been involved in various international workshops in the field of atmospheric sciences and served as a reviewer for scientific journals, the National Science Foundation and the European Research Council. His educational background is in atmospheric physics and meteorology.

**Dr. Paul Perkins**, a member of the board of Physicians for Social Responsibility Maine Chapter (PSR Maine), is a practicing psychiatrist in Bath, Maine. He has been engaged in climate work for a number of years, working with several different initiatives. He cofounded a Greater Bath chapter of Cool Communities in 2007, which led to the Bath City Council committing to lowering the town's carbon emissions. In 2013 he cofounded a Brunswick, Maine chapter of Citizen's Climate Lobby (CCL), whose effort focused on lobbying for a revenue neutral carbon tax. Over the past two years his efforts have been working with PSR Maine on raising awareness of the health ramifications of climate change.

**Erika Spanger-Siegfried**, a senior analyst in the Climate and Energy Program at UCS, currently manages UCS's analytical work on climate impacts and preparedness, work that is intended to shed light through new research and outreach on ongoing local impacts, current efforts to cope, and the urgency of high-level action. Erika also managed the Energy-Water Initiative (EW3), a multi-year program aimed at raising awareness of the energy-water connection, particularly in the context of climate change, and motivating and informing effective low-carbon and low-water energy solutions. Ms. Spanger-Siegfried formerly managed the Northeast Climate Impacts Assessment (NECIA), a collaboration between UCS and a multi-disciplinary team of more than 50 scientists from across the region that explored future climate change in the Northeast states and the impacts on key sectors.

Prior to joining UCS in 2005, Ms. Spanger-Siegfried was an associate scientist at the Boston Center of the Stockholm Environment Institute, where for six years her work focused on understanding and building the adaptive capacity of vulnerable populations and sectors in developing countries. Earlier in her career, Ms. Spanger-Siegfried worked with the Harvard Center for Health and the Global Environment and the Massachusetts Department of Public Health's Environmental Laboratories. She has served on several relevant advisory bodies, including the Commonwealth of Massachusetts' Climate Change Adaptation Advisory Committee.

Ms. Spanger-Siegfried has a master's degree in energy and environmental analysis from Boston University and a bachelor's degree in fisheries biology from the University of Massachusetts at Amherst.

**James L. Unmack** is an industrial hygienist with a background in bioengineering and bioenvironmental engineering. Jim has more than 30 years of experience in protecting workers' health and safety through the application of good science to the work environment. After 10 years with Cal/OSHA he founded this company to be able to provide the best solutions to the challenges faced by today's employers. With the scope and volume of regulations increasing at a dizzying pace, employers need competent help to find their way through the regulatory maze. Jim Unmack specializes in occupational safety and industrial hygiene to help employers achieve a more productive workforce through the implementation of intelligently designed programs and projects that enhance safety and quality, reduce and control losses from accidents, injury and illness, and fulfill regulatory requirements.

Mr. Unmack is a registered professional engineer in the State of California for the practice of safety engineering. He is certified by the American Board of Industrial Hygiene for the comprehensive practice of industrial hygiene and the Board of Certified Safety Professional for the comprehensive practice of safety. He is a Board Certified Environmental Engineer with the American Academy of Environmental Engineering. As a member of the Cal/OSHA permissible exposure limits advisory committee (HEAC), he has provided expertise to Cal/OSHA in an effort to establish rational worker exposure levels.

A graduate of the University of California at Berkeley in Electrical Engineering, Mr. Unmack studied bioengineering and received the degree of Master of Science in Electrical Engineering from Santa Clara University. He completed Bioenvironmental Engineering at the United States Air Force School of Aerospace Medicine and retired from the Air Force Reserve as a Lieutenant Colonel Bioenvironmental Engineer where he provided industrial hygiene services to the Space Shuttle and heavy launch vehicles efforts.

**Bethany Taylor** has had the privilege of traveling to 15 different countries on five continents over the last twenty years as she sought an education and life built outside the 4 walls of a classroom. The stories and lives of the people Bethany encountered on her journeys inspired her to pursue a career in medicine. Today, Bethany is in her last year in UNE's Pre-med program and she is passionate about bringing medical care to those most in need. Bethany is also a mother to five adopted children from Ethiopia. It was during time spent in Namibia and Ethiopia that Bethany became aware of the significant impact climate change and development is having on local village and community health in Sub-Saharan Africa. The impact of a hydropower dam construction project, on a particular tribe of people she interacted with in Namibia spurred her interest in researching this topic further.

**Dr. Terry Thompson** leads climate analytics at LMI. This effort uses large volumes of climate data to develop projections of future regional and local climate, as well as extreme events such as storms, floods, and droughts. The emphasis is on bridging the gap between this data and the decision-oriented information needed by different economic sectors (health, energy, transport, agriculture, government, etc.) to influence climate-adaptation planning, risk management, and investments. He holds a Ph.D. in Computational Biophysics from the University of Rochester Medical School.

**Erik Tucker** has assisted clients in sustainable management of chemical and environmental mission risks for over 10 years as a project manager in the Engineering Solutions Group of Leidos, Inc. Mr. Tucker began his career at Leidos consulting for and training private sector clients on the Emergency Planning and Community Right to Know Act (EPCRA) Toxic Release Inventory (TRI) program. When another position opened up within his group he shifted focus toward supporting the federal government in managing risks related to climate change.

Working with both the National Aeronautics and Space Administration (NASA) and Department of Defense (DoD) has provided a wide array of opportunities to develop this expertise. What began as an opportunity to calculate greenhouse gas (GHG) emissions for NASA and DoD has broadened into a holistic program in support of their agency-wide strategic climate risk management goals. This exciting pathway has included developing GHG accounting and trends analysis tools; facilitating climate change adaptation workshops in the DC area and beyond; managing an interagency working group project on regionalizing sea level rise projections, worldwide; reviewing renewable energy project opportunities; and representing federal agency interests in public forums.

Mr. Tucker attended Virginia Tech and earned both a BS Chemical Engineering and BA Interdisciplinary Studies. He also recently completed a MS Environmental Science and Policy at George Mason University with final research focusing on climate risks across NASA's supply chain. In his spare time Mr. Tucker enjoys biking, traveling as much as possible, and spending time with his wife and extended family in Virginia.

**Dylan Voorhees** is the Clean Energy Director at the Natural Resources Council of Maine. Since 2006, Voorhees has led NRCM's involvement in a variety of energy and climate issues, including adoption of the Regional Greenhouse Gas Initiative; wind power and solar energy policy; energy efficiency programs, laws and funding; promotion of electric vehicles; efforts to combat dirty fuels such as tar sands; and general education for the public and policymakers about the risks of climate change in Maine. Voorhees played a leading role in legislation that led to the creation of the Efficiency Maine Trust. Prior to joining NRCM, he worked on wind power issues for the Executive Office of Environmental Affairs in Massachusetts, and on sustainable land use development for the Vermont Forum on Sprawl. Voorhees holds a B.A. from Columbia University and a Master of Public Policy from Harvard University's Kennedy School of Government, where he concentrated in environmental and energy policy. He lives in Augusta with his wife and three daughters.

**Sharon Wells** is currently the Environmental Protection Agency, Region 1 (Boston) Director of the Office of Civil Rights and Urban Affairs. Her responsibilities include implementing the Region's environmental justice and civil rights programs. She began her 33 year career with EPA Region 1, as an attorney in the Office of Regional Counsel where she led the General Law Practice and served as the Regional Judicial Officer, and a Deputy Ethics Official.

Sharon is a 1980 graduate of Trinity College, Hartford, Connecticut, and a 1983 graduate of New York University School of Law. She is a native of New Jersey, and is married with three children.

**Dr. Bethany L. Woodworth** is a professor of Environmental Studies at the University of New England. She spearheaded the creation of UNE's Interdisciplinary Minor in Climate Change Studies, and coordinates the University's program to teach Environmental Awareness to all students who graduates from the College of Arts and Sciences. She teaches classes in environmental studies, climate change, pollution, and biodiversity preservation.

Bethany's career spans 30 years of working in the public and non-profit sector as a research wildlife biologist. She earned her Ph.D. in Ecology from the University of Minnesota, and went on to work for Frankfurt Zoological Society as Ecological Monitoring Advisor for the Tanzania Wildlife Conservation Monitoring project, a coalition of government and NGOs that conducted aerial surveys of wildlife and human populations throughout Tanzania. Thereafter she joined the U.S. Geological Survey as Research Wildlife Biologist in Hawaii, leading multiple projects on recovery of Hawaii's forest birds. She co-founded the Hawaii Forest Bird Interagency Database Project, which brought together years of disparate monitoring data into a central clearinghouse for comprehensive analysis. As a member of the Hawaii Forest Bird Recovery Team, she helped draft the recovery plan for 21 species of threatened and endangered forest birds. She was co-editor of the book Conservation Biology of Hawaii's Forest Birds. From 2001-2005 she led the forest bird demography subproject for the Biocomplexity of Introduced Avian Diseases in Hawaii, which brought her passion for conserving endangered species and habitats together with her interest in climate change.