THE GARRISON INSTITUTE

Comprehensive Report on the 2012 Climate, Mind and Behavior Initiative

Symposia
Research and Field Studies
Regional Hubs

Garrison, New York

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Foreword

Dear colleagues:

The events of the past year have undoubtedly caused all to reflect on the urgent need to create more sustainable and resilient neighborhoods, communities, and cities. From the broad devastation wrought by the severe drought that engulfed more than half the nation, to the wildfires, tornados, and super storm Sandy—a large portion of the nation's population has experienced firsthand the dangers of a warming climate. The costs have been enormous. The economic costs of Hurricane Sandy alone have been estimated to exceed $60 billion. And the human costs, though difficult to measure, are equally large as people suffer from the loss of lives and livelihoods, the dislocation of households and communities, and the disappearance of normalcy and tranquility.

More than ever we need to engage in three strategic categories of environmental work: First, we need to reduce our consumption of energy and resources through the improved design, construction and retrofitting of our buildings, neighborhoods, and cities in ways that make them more energy efficient and healthier. Second, we need to shift the power source of our civilization from fossil fuels to renewable energy. Third, we need to shift our behaviors so as to reduce waste and excess consumption.

All three strategies can benefit from an improved understanding of the social and behavioral forces that shape decisions, lifestyles, and energy use practices. However, the key to large-scale, short-term change is rooted in creating shifts in everyday practices, procedures, and norms because such changes can happen quickly and cheaply, while also laying the groundwork for other longer-term strategies. This strategic emphasis also promotes broad public engagement in ways that create much needed political support for the development of national and regional policies and large-scale investments in new technologies.

The Garrison Institute's Climate, Mind and Behavior (CMB) Initiative is helping to lead this effort by establishing networks, partnerships, and programs that use research-based insights to address the human dimensions of unsustainable practices, finding solutions in science and human systems. Among the opportunities documented by CMB's Program Director, Dr. Karen Ehrhardt-Martinez, shifts in household choices and practices could reduce total US energy consumption by an estimated 9 percent.

In this report you will find a wealth of insights from the CMB research program, our 2012 symposia, and the work of our regional hubs. In 2012, the CMB Initiative began work on two important research projects focused on 1) helping cities identify and target city-specific opportunities for reducing energy consumption and carbon emissions, and 2) creating new methodologies and evidence of behavioral opportunities for reducing energy consumption in commercial buildings. The Initiative's regional impact also grew as the number of regional hubs expanded from 3 to 5 with cities engaged in a range of innovative projects.

Finally, the CMB Initiative also successfully hosted two highly-recognized symposia in 2012: the Climate Mind and Behavior Symposium (February) and the Climate, Buildings and Behavior Symposium (May). The 2012 Symposia brought together nearly 200 thought leaders from cities, the federal government, real estate, environmental organizations, academia and elsewhere to share their work and develop new insights.

The CMB Initiative is filling a critical niche in understanding the human dimensions of climate, energy, and sustainability by connecting researchers with practitioners and helping ensure that key research findings inform real projects on the ground. This translational work is enabling city leaders and

building owners and managers to improve the sustainability outcomes of their policies and programs, and is supporting leading environmental organizations in their quest to be more effective in achieving their missions. The Initiative's collaboration with several key national organizations has been an essential element in the program's success. These include the Urban Land Institute, the Urban Sustainability Directors Network, the US Green Building Council, the Natural Resources Defense Council and Enterprise Community Partners.

I hope you enjoy reading about the accomplishments of Climate, Mind and Behavior Initiative and look forward to our continued work together.

Warmly,

Jonathan F. P. Rose
Cofounder
The Garrison Institute

About the Garrison Institute

Founded in 2003, the Garrison Institute is a 501[c]3 non-profit, non-sectarian organization exploring the intersection of contemplation and engaged action in the world.

Our mission is to apply the transformative power of contemplation to today's pressing social and environmental problems, helping build a more compassionate, resilient future. To that end, we are seeding and leading a movement for positive social and environmental change, animated by contemplative and scientific insights into the human mind and behavior.

Our program initiatives include Contemplative Teaching and Learning, Transforming Trauma, and Climate, Mind and Behavior (formerly part of the Initiative on Transformational Ecology). They create rigorous, evidence-based tools and approaches to help teachers, caregivers, human service providers, environmentalists and others on the front lines of social and environmental engagement succeed.

We conduct pilot programs to test these approaches in diverse settings from classrooms to domestic violence shelters. We refine, replicate, and adapt them to new settings and larger scales, and track results.

We nurture development of professional fields focused on innovative environmental and social change, breaking silos and opening dialog between frontline practitioners, scientists, thought-leaders, movement leaders and contemplatives.

At the same time, our contemplative retreat programs bring world-class teachers from diverse wisdom traditions to wide audiences, making accessible a broad range of ideas and practices that highlight contemplation as a force for social change.

Held in an authentic contemplative setting in a renovated monastery on the Hudson River an hour north of Manhattan, our retreats and programs pioneer ways of applying the power of contemplation in many settings and professional fields, from leadership development to human services to social action. Since we opened in 2003, the Garrison Institute has hosted hundreds of contemplative retreats and programs, attracting over 30,000 participants in diverse fields, each one an agent of positive change.

About the Climate, Mind and Behavior Initiative

The grounds of the Garrison Institute

The Garrison Institute's Climate, Mind and Behavior (CMB) Initiative seeks to increase the prevalence of environmentally sustainable lifestyles, decisions, and practices among individuals, organizations, businesses and government entities across the US. We work to achieve these objectives by collaborating with network partners to address the human dimensions of environmental problems through the application of insights and principles from the social, behavioral, and cognitive sciences. Through such efforts we seek to make climate friendly lifestyles and behaviors easier for all people to achieve in all aspects of their daily lives whether at home, work, or elsewhere.

A Focus on People. Rather than focusing exclusively on technological solutions, the Climate Mind and Behavior Initiative serves to develop effective people-centered approaches that focus on the human dimensions of sustainability issues and recognize the importance of engaging people in sustainability solutions. This approach recognizes the limitations of traditional economic models of social change and instead builds on the work of sociologists, anthropologists, psychologists, cognitive scientists and others to identify effective, durable and scalable approaches based on an informed understanding of human behavior and the social forces that shape and constrain it.

Working from the Middle Out. CMB's approach is unique. It addresses the social and behavioral dimensions of energy use, carbon emissions, and environmental sustainability by

CMB Director Karen Ehrhardt-Martinez

Dr. Ehrhardt-Martinez joined CMB as the Initiative Director in 2011. She has nearly 20 years of experience in applied and academic research with a focus on the social and behavioral dimensions of energy and climate change. In addition to directing CMB, she is a Senior Research Associated at Colorado State University. Dr. Ehrhardt-Martinez, is a cofounder of the Behavior, Energy and Climate Change (BECC) Conference and served as the BECC Conference Chair in 2009. Prior to that she led the American Council for an Energy-Efficient Economy's (ACEEE) research program on the social and behavioral aspects of energy efficiency and environmental change.

Author and editor of numerous studies and articles on behavior, energy and climate change, in 2009 Dr. Ehrhardt-Martinez was called to testify before the US House Committee on Science and Technology's Subcommittee on Energy and Environment, explaining how insights from the social and behavioral sciences can help save energy in buildings, industry and the residential and transportation sectors. She is a Fellow of the Royal Academy of Arts and Manufactures and a member of the Climate Change Task Force Steering Committee for the American Sociological Association.

2012 CMB Leadership Council

Dina Biscotti, Postdoctoral Scholar, UC Davis, Energy Efficiency Center

Uwe Brandes, Vice President, Initiatives, Urban Land Institute

Marilyn Cornelius, Doctoral Candidate, E-IPER, Stanford University

Jeffrey Domanski, Principal Expert, Sustainability Strategies, Hospitality Green

Karen Ehrhardt-Martinez, Research Director , Climate, Mind and Behavior Program, Garrison Institute

Rebecca Ford, Research Fellow, Centre for Sustainability, University of Otago, New Zealand

Ruth Greenspan-Bell, Public Policy Scholar, Woodrow Wilson International Center for Scholars

Lauren Kubiak, Energy Fellow, Energy and Transportation, Natural Resources Defense Council

Skip Laitner, Senior Fellow, American Council for an Energy-Efficient Economy (ACEEE)

John McIlwain, Senior Resident Fellow, Urban Land Institute (ULI)

Nils Moe, Mayor's Sustainability Advisor, City of Berkeley

Philip Payne, CEO, Ginkgo Residential, LLC

Roger Platt, Senior Vice President of Global Policy and Law, US Green Building Council

Jonathan Rose, Founder and President, Jonathan Rose Companies LLC

Kurt Roth, Director, Building Energy Efficiency Group, Fraunhofer CSE

Jonathan Rowson, Director , Social Brain Centre, Royal Society for the Encouragement of the Arts (RSA)

Rachel Schwom, Assistant Professor, Human Ecology, Rutgers University

Jennifer Tabanico, President and Principal Owner, Action Research

Jason Twill, Senior Project Manager, Sustainability Vulcan Inc

working in strategic partnership with thought leaders and decision makers who determine policies and practices in buildings and cities around the country. CMB uses this approach as a means of both reshaping individual behavior on the ground and facilitating high-level policy thinking. As such, CMB's strategy doesn't simply work to effect change from the top down or the bottom up, but "from the middle out."

The Learning Network. CMB serves as a hub of a growing learning network connecting science, policy, regulation, and implementation to create practicable, people-centered approaches available at various scales, from national policy to city programs to building sector practices. It's essence is assembling and sharing research across disciplines, breaking silos, finding the most useful information for people in relevant fields, and sparking new collaborations to apply it. Climate change, environment, and the social sciences are all rooted in understanding the world using systems perspectives. CMB's goal is to broaden and deepen the application of new knowledge and engage with network leaders in ways that create systemic change.

CMB Program Areas. The CMB Initiative works in partnership with a variety of nonprofit, for-profit, and government organizations in the following areas:

Research: identifying and addressing important research gaps and mapping the existing body of research to develop a comprehensive picture of this field of knowledge,

Communications: translating and communicating research insights for application in people-centered sustainability projects,

Tools and Resources: developing and providing a set of resources to build the capacity of policy makers and program officers to design and implement people-centered approaches, and

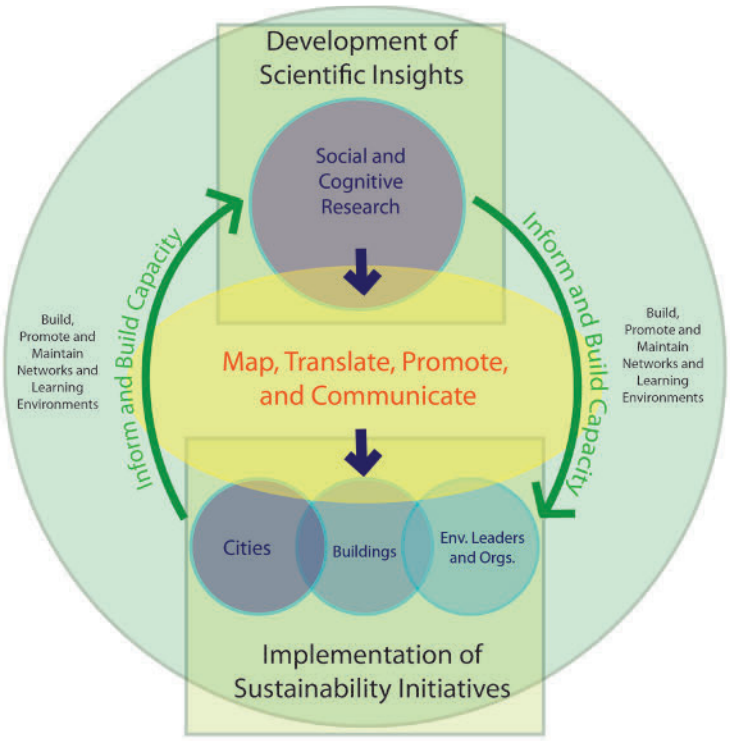
Networking: establishing and coordinating a variety of networking and convening opportunities to promote knowledge sharing, collaboration, and field development.

About the Climate, Mind and Behavior Initiative - continued

2012 in Review. In 2012, the Climate, Mind and Behavior Initiative began work on two research projects, held two high-level symposia, and expanded its network of regional hubs and hub activities. The following is a summary of the principal research efforts initiated in 2012, a consolidation of symposium insights for each of the two symposia, and highlights of the hub activities.

The diagram below illustrates the key areas of CMB's work, the linkages between them, and the ongoing process by which research informs practice and practice informs research, generating new scientific insights and finding new ways to take sustainable practices and climate and energy solutions to scale.

Climate, Mind and Behavior Initiative Activities



The Climate, Mind and Behavior (CMB) Initiative serves as a bridge between social and cognitive science research and applied initiatives focused on creating sustainable behaviors and practices. CMB's work is to map, translate, promote and communicate research insights; build, promote and maintain networks; and facilitate the sustainability work of cities, building owners and environmental leaders and organizations.

Research and Field Studies

Over the past four years, research on the human dimensions of energy consumption and carbon emissions has documented the opportunities for significant energy and carbon savings that could be achieved through shifts in household-level practices and choices. Estimates of achievable savings have ranged from 20 to 30 percent in the short- to medium-term in the residential and personal transportation sectors alone. At the national level, the savings from such interventions would reduce total US energy consumption by roughly 9% and cut carbon emissions by 7.4% (Dietz et al 2009, Laitner et al 2009). The potential is there. The conundrum: how can we realize these opportunities?

The good news is that many cities and building owners around the country recognize these opportunities. They are motivated to find ways to shift practices across the residential and commercial building sectors, in the transportation sector, and in other areas as well. But developing effective initiatives has been hamstrung by two clear obstacles: 1) A lack of city-specific information identifying the most promising savings opportunities, and 2) A lack of information about how to assess behavioral opportunities in commercial buildings.

In order to remove these obstacles, the Climate, Mind and Behavior Initiative's research arm initiated two collaborative research efforts in 2012. First, in collaboration with the Urban Sustainability Director's Network, we worked to establish a low-cost means of identifying and ranking city-specific behavioral opportunities. Second, in collaboration with members of the CMB Pacific Northwest Hub, the Urban Land Institute's Northwest District Council, Seattle's 2030 District, and the US Green Building Council, we launched a set of demonstration projects to 1) establish a methodology for carrying out a behavior audit in commercial and multi-family buildings, and 2) develop and implement an experimental design using social science principles and document the resulting energy savings.

Developing a Behavior Wedge Profile for Cities

As noted above, a growing body of research has provided clear evidence of national-level savings opportunities associated with shifting household practices and technology choices. But they have been much less successful at identifying city-specific opportunities that take unique local factors into account, such as local climatic conditions, the age and other characteristics of the local building stock, technology saturation, technology use patterns, and the lifestyles, attitudes and preferences of local populations. Cities need this information to design and implement effective programs. However developing such estimates on a city-by-city basis can be expensive if each city must design, collect, and assess their own set of primary data.

CMB's effort focused on creating a low-cost model capable of assessing city-specific opportunities for energy and carbon savings using a variety of high-quality, secondary data sources. Using secondary data sources provided the means of making the estimates affordable for cities. In 2012, we concentrated on developing a model to estimate potential energy and carbon savings in the residential sector. The work entailed identifying existing data sources, developing a prototype model for assessing residential sector energy and carbon savings, and applying it to develop a sample behavior wedge profile report for the city of Baltimore.

Overview of Achievable Savings by Housing Type and Energy End Use

The sample behavior wedge profile report specifies *achievable* savings opportunities in both single-family and multi-family buildings. It begins with an overview of all potential savings opportunities in both the short-term (<4 years) and the medium-term (<8 years) by end use and type of dwelling and is followed by a series of more detailed assessments of savings associated with specific energy end uses. As shown in the chart on page 9, estimates of Baltimore's achievable medium-term savings suggests that the city could help residents reduce residential energy consumption by roughly 12% in under 8 years. The majority of those savings opportunities are associated with single-family homes and are likely to come from four specific energy end uses: heating, cooling, plug load, and lighting. These findings reflect Baltimore's cold climate, old housing stock, and a growing reliance on air conditioning in the summer among other important factors that shape the unique patterns of Baltimore's energy demand.

In addition to highlighting aggregate-level savings, the report also provides two top-ten lists. The first specifies the top ten sets of behaviors for generating savings in single-family homes; the second specifies the top ten sets of behaviors for generating savings in multi-family homes. Both lists reflect the rank ordering of behaviors according to the estimated

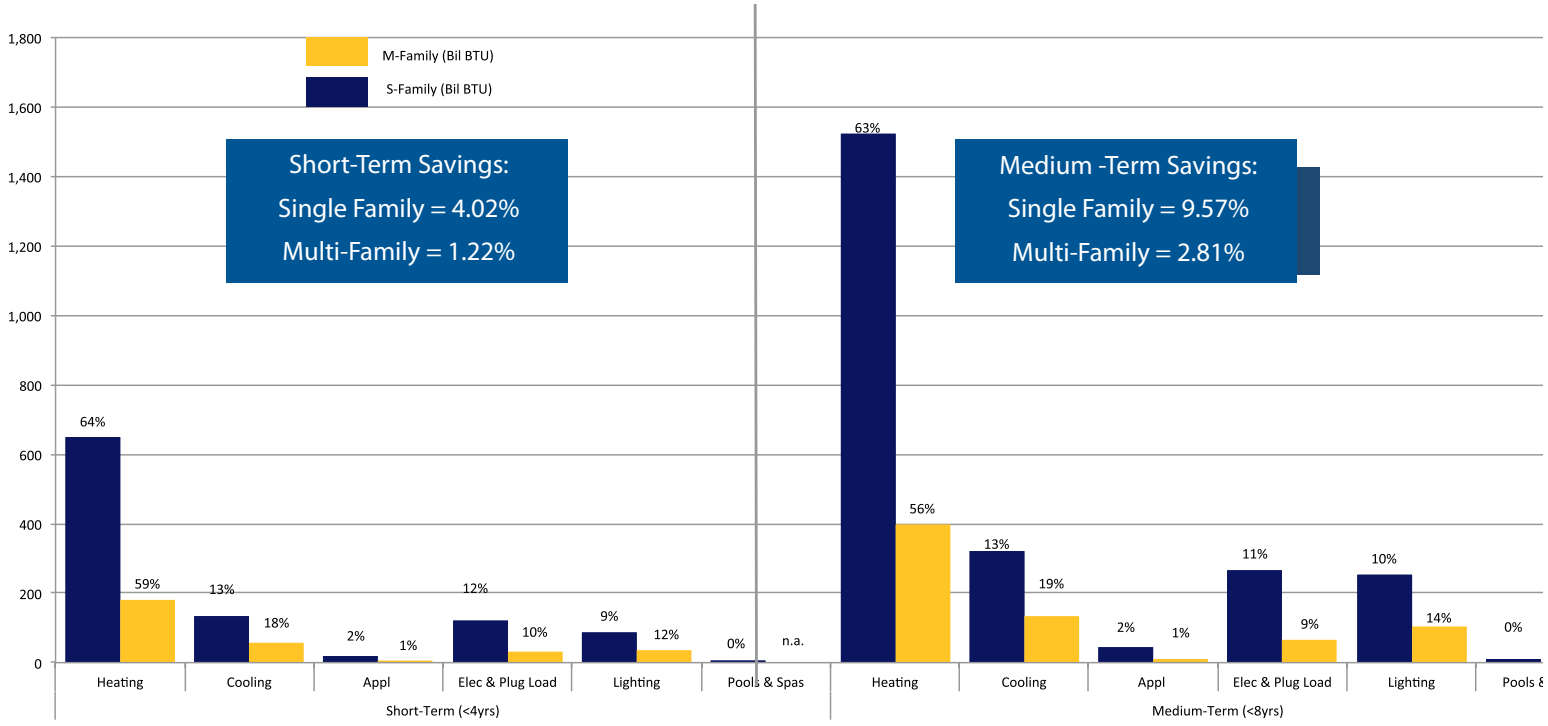
What is a Behavior Wedge Profile?

A behavior wedge profile report is a document that summarizes the scope and characteristics of city-specific opportunities for reducing energy consumption and/or carbon emissions through the application of projects that shift existing energy use patterns, practices, and decisions. The profile is based on a city-specific estimation technique that assesses the volume of potential savings opportunities and identifies the particular sets of behaviors likely to yield the most sizeable savings. While the sample behavior wedge profile report focuses on residential sector energy consumption, a fully developed profile could contain assessments for any (or all) of the following: 1) residential sector energy/carbon, 2) commercial sector energy/carbon, 3) transportation sector energy/carbon, 4) food sector energy/carbon, 5) water-related energy/carbon, 6) waste and recycling and 7) descriptive information about underlying attitudes and opinions that shape resource use practices.

The savings estimates in behavior wedge profiles rely on an estimation model that draws from several existing data sources. They also draw on methodologies used in national-level behavior wedge assessments, and on the insights of subject-matter experts. The resulting estimates represent a set of reasonably achievable savings as opposed to the full range of behavior-based savings opportunities. In order to arrive at these estimates, the model takes into account the following factors: household eligibility, the range of likely savings associated with a particular behavior, and the likely participation rate in whatever actions are required to reduce the energy footprint associated with a particular behavior. For example, when considering the achievable savings associated with air drying laundry, we start with the proportion of households that currently have clothes driers (either gas or electric), account for current use patterns and climatic conditions, assess likely household participation rates, and apply relevant savings estimates. The results provide a conservative estimate of reasonably achievable savings.

Such estimates are calculated given the particular characteristics of the local population, their living conditions and energy use practices, as indicated by existing data sources. Similar estimates are developed for a set of 23 types of behaviors and savings are calculated for both the short term (<4 years) and the medium term (<8 years). Medium-term savings were calculated by reassessing household eligibility given changes in product saturation and/or shifts in behaviors needed to achieve short-term savings. The calculation starts with assessing short-term savings opportunities (years 1-4), followed by an assessment of medium-term savings opportunities (years 5-8). These savings estimates are then added together to determine the cumulative savings opportunities in the medium term (within the first 8 years). Once the full set of estimates has been developed, they are tallied to determine the overall size of the local behavior-based savings opportunity and then rank-ordered to identify which ones represent the largest savings.

Behavior - Related Energy Savings Opportunities



achievable savings and are ordered from largest to smallest savings potential. The achievable savings for each end use is estimated using a set of algorithms that take a range of variables into account, including number of households, number of households with particular end-use technologies, current practices and other measures of eligibility. The full profile report provides a detailed assessment of the potential savings from 23 different behaviors. More detail on the methodology used to calculate estimates and other information is available in the full report.

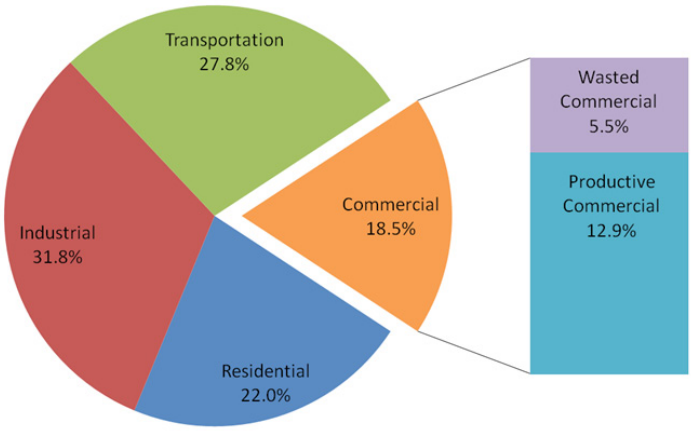
Documenting Behavioral Opportunities in Commercial and Multi-Family Residential Buildings

The United States is home to 4.8 million commercial buildings. Together, these buildings are responsible for nearly one-fifth of total US energy demand at a total annual cost of $108 billion dollars and just over 1 billion metric tons of carbon dioxide. Conservative estimates indicate that at least 30% of the energy demand from these buildings is associated with wasteful practices and inefficient energy use. Eliminating this waste could generate annual savings in excess of $30 billion dollars with a corresponding reduction in carbon dioxide emissions.

Achieving these savings will require both investing in new energy-efficient technologies and improving the policies and practices of building operators and occupants. Investing in retrofits is likely to take decades to implement (assuming a favorable policy environment). But shifting the policies and practices of operators and occupants offers significant savings in the short-term with little investment, and can add up to large utility bill savings.

Buildings are ultimately built for and occupied by people, companies and organizations. Actual building performance (including energy demand) is determined largely by the behaviors and practices of occupants and operators, as well as cultural norms and organizational procedures. Achieving energy and carbon reduction goals depends not only on improving a building's structure and systems, but also on helping the occupants operate them correctly and use energy wisely. In fact, anecdotal evidence suggests that 50 to 60% of energy demand in most buildings may be determined by operator and occupant behavior. As building technologies become increasingly efficient, the relative importance of operator and occupant behavior continues to grow. Current efforts to develop net-zero energy buildings cannot

US Energy Consumption (Delivered) by End-Use Sector, 2011



Total primary US energy consumption for 2011 equalled 97.7 quadrillion Btu. *Source:* US Energy Information Administration's Annual Energy Outlook. www.eia.gov/forecasts/aeo/er/index.cfm

be successful without taking into account the profound influence of people, practices, and policies on building performance.

Building owners, managers and operators are in an excellent position to help reshape energy use practices and minimize waste. They could help develop a culture of sustainability among building occupants by making sustainable choices available and supporting them with procedures, norms and standards that set goals, monitor progress and provide the right incentives and rewards. Such efforts can help make sustainable practices easy and expected, and help ensure that the proliferation of electronic devices in our lives doesn't overtake the energy savings achieved by upgrading the building and its systems. And they can empower building owners and managers to create sustainability plans that can be implemented quickly and at a very low-cost.

Shifting occupant behavior can be difficult, especially if the effort relies on traditional "information and education" campaigns. Such campaigns mistakenly assume that simply providing people with information about which practices are "better for the environment" will readily cause them to change their standard way of doing things and adopt something new. That kind of "education" approach often fails because it doesn't acknowledge the many barriers to change in people's lives that keep them from acting on their good intentions. Interventions work better when they recognize the need to motivate action, develop a sense of self-efficacy and make the behaviors as easy and fun as possible. Successful programs often establish a supportive organizational environment in which people know what is expected of them, have the knowledge and resources they need to succeed, have multiple reasons to participate, and can see the impact of their actions.

With this in mind, CMB recently embarked on a year-long collaboration with several local partners to design, develop and implement demonstration projects in the city of Seattle, Washington. This multi-phased project involves exploring and documenting the energy saving opportunities of interventions that work with human systems and behavioral approaches. They're focused on saving energy in two types of buildings: commercial office and multi-family residential. The project is a unique opportunity to catalyze energy and carbon reductions by:

- Identifying where behavioral approaches offer the greatest potential for increasing energy efficiency in the specified types of buildings;

- Testing and documenting the effectiveness of particular behavioral approaches, grounded in research in the fields of psychology, sociology, anthropology and behavioral economics, and;

- Using the CMB Pacific Northwest Regional Hub's network and other channels to disseminate lessons learned and identify new opportunities to bring successful behavioral approaches to scale.

The Climate, Mind and Behavior Symposium - February 2012

David Orr presenting at CMB

2012 CMB Symposium Steering Committee

Anthony Chang, Vice President, Cassidy Turley

John McIlwain, Senior Resident Fellow, Urban Land Institute (ULI)

Hilari Varnadore, Program Director, Founder, STAR Community Index

Dina Biscotti, Postdoctoral Scholar, UC Davis, Energy Efficiency Center

Dana Bourland, VP, Environment, JPB Foundation

Jerry Dion, Chief Performance Officer, Federal Energy Management Program

Rachel Gutter, Director, US Green Building Council for Green Schools (USGBC)

Peter Lehner, Director, Natural Resources Defence Council (NRDC)

Michelle McCauley, Professor of Psychology, Middlebury College

Nils Moe, Senior Aide to the Mayor, City of Berkeley, California

Jonathan Rose, Founder and President, Jonathan Rose Companies LLC

Dan Siegel, Clinical Professor of Psychiatry, UCLA School of Medicine

Marsha Walton, Senior Project Manager, NYSERDA

***Please note**: Steering Committee biographies can be found on page 34*

The third annual Climate, Mind and Behavior (CMB) Symposium took place at the Garrison Institute February 14-17, 2012, gathering over 100 leading scientists, researchers, advocates, and policy and communications experts from scientific and climate-related disciplines. Moderated by environmentalist and author Paul Hawken, the symposium marked the growth of interest in and understanding of the behavioral and social dynamics of climate change in the three short years since the CMB initiative began.

Symposium presenters highlighted the importance of shifts in behavior and social norms now underway in cities, towns, and institutions and reported on the effectiveness of on-the-ground community campaigns to change energy-use behavior. Many of the sessions probed and presented new research seeking to understand why our choices and lifestyles can often run counter to values we claim to hold about saving energy, while others appreciated in an affirmative way the power of the moral and spiritual imperative to reverse, mitigate, and prepare for accelerating climate change.

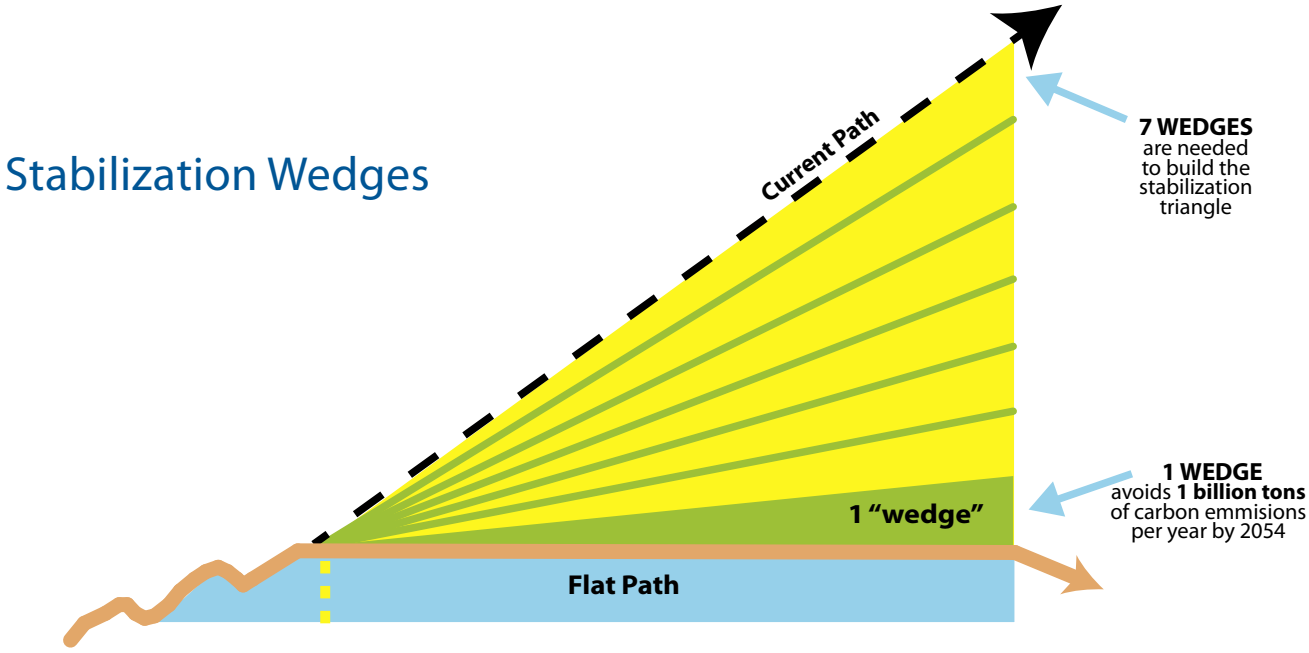
What's At Stake?

In her opening plenary remarks, Karen Ehrhardt-Martinez, Director of the Climate, Mind and Behavior Initiative, said CMB's goal is "to influence practices and decisions that reduce our impact on the environment," through a reexamination of "the conceptual models of social change that we all have, that guide our thinking around these issues and an examination and evaluation of the best means of leveraging the kinds of change we're after."

Policy, technology, economic incentive and investments are all indispensable to effective climate and energy interventions, but they aren't enough by themselves. Individual and organizational decisions, attitudes, intentions, and social norms, are among those socially-defined factors that are equally indispensable, because they may serve as unconventional levers for deep societal change.

The Power of Our Choices

Leveraging individual, organizational and network-level change is a key piece of the climate solutions puzzle. The



stakes of adding innovative solutions that help people and organizations develop low-impact practices and procedures are high. Such interventions will necessarily build on and enhance our traditional reliance on technological innovation, government regulation and economic incentives. The benefits of addressing the human dimensions of climate problems are increasingly well recognized and they are sizeable. Among other recent studies on the topic, a 2010 study by the Garrison Institute and the Natural Resources Defense Council[1] found that such savings could account for a billion metric tons of carbon per year—or roughly 1/8th of the total amount of carbon mitigation required to stabilize US emissions by 2060.[2] As illustrated above, no single approach is large enough to successfully stabilize US emissions. Instead researchers have been working to identify a set of "wedges" each capable of contributing a billion metric tons of carbon savings. The "behavioral wedge" provides a slice of the climate solution that can be accomplished quickly and with minimal investments.

Among the ongoing research on this topic, Beth Savan, Sustainability Director at the University of Toronto, described how her research measured the impact of household behaviors and their significance, noting that the size of the potential savings grows when looked at in combination with technology choices. "Our hypothesis in brief is that repeated conservation behaviors yield savings of 10 to 15%. That's what we found for discretionary energy use. [But] one-time adoption behaviors [i.e. adopting new energy-saving technologies] can increase savings by even more."

But at least in some key sectors, there is also evidence that shifts in everyday choices and practices alone can have much larger impacts. For example, Ehrhardt-Martinez pointed out that in comparisons of similar and (in some cases) identical buildings, occupant behavior has been responsible for 200 to 300% variations in building energy use (buildings currently account for 42% of US GHG emissions). Among the notable studies that have documented the dramatic effects of behavior are a study of military housing and a comparison of energy use across 4 high schools. In the high school study, a LEED certified building was found to use more energy (per square foot) than an older, non-LEED certified building with strong behavioral programs. Other studies have found that household decisions and practices could save 20—30% of household energy consumption nationwide. In fact, said Ehrhardt-Martinez, 20—30% is likely to be a conservative estimate of the energy savings that are available through behavioral programs.

The impacts of behavioral change impacts can also cut across our entire energy landscape and the economy as a whole. Economist Skip Laitner, visiting fellow at the American Council for an

1 The Garrison Institute collaborated with the Natural Resources Defense Council in 2010 on a "behavioral wedge" showing how Americans could reduce US carbon pollution by 15 percent—or one billion tons of global warming pollution —over ten years, through collective personal choices that require little to no cost, including in the sectors of home energy use, transportation, food consumption and waste. The "behavioral wedge" fact sheet is posted on http://www.nrdc.org/energy/billiontons.asp.

2 Pacala and Socolow. 2004. "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies" *Science*. Vol. 305 no. 5686 pp. 968-972

A plenary session of the CMB symposium

Energy-Efficient Economy, reviewed evidence that energy use in the US is now only 14% efficient, meaning that 86% of our energy is simply going to waste. That's a staggering amount of waste, and Laitner presented new research showing that decisions to adopt existing energy-efficiency technologies have the potential to reduce it by 40—60%, while also creating 2 million jobs.

Achieving this enormous potential has a strong human dimension. Deploying efficiency measures at scale would require not only massive investments, but also large-scale shifts in human choices, behaviors and culture. "Complete economic recovery and robust development of our long-term global prosperity will not be possible without hefty increases in productive investment," Laitner said. "Greater levels of resource and energy efficiency, water and new materials, [are] all enabled by a shift in our behaviors, our social institutions and our culture."

Shifting the practices and decisions of people and organizations in the US not only benefits US carbon emissions but can reverberate globally. Rutgers University Professor of Human Ecology Rachel Shwom described the multiplier effects of making choices that cut consumption in a developed country such as the United States, and the larger, international repercussions. Which has global impacts. For example, lower demand for new furniture here can reduce deforestation in tropical forests, which are the source of much of today's furniture and sequester massive amounts of carbon. "If we can think about emissions globally," she said, "we can start to identify a much broader view on what the [key emissions-saving] behaviors are."

What's Holding Us Back?

Given the vast potential climate, energy and economic benefits of behavioral change, why aren't we pursuing such initiatives more aggressively? The public is certainly aware of the growing weight of information about climate change, and yet large portions of the population continue to reject even growing scientific consensus on climate change and its causes. Moreover, people also commonly fall prey to a variety of myths and misconceptions, biased and outmoded thinking and specious framing when it comes to their understanding of energy consumption, conservation, efficiency and their impact on climate emissions. Why?

An Indiscriminate Reliance on Information

Rick Diamond, staff scientist at the Lawrence Berkeley National Laboratory, conducted research on the energy use behavior of consumers and user interactions in the built environment, which prompted him to further investigate certain myths about energy and saving energy that could serve as a hurdle to effective interventions. "I think myth debunking really helps us see our blind spots and our assumptions," he said.

One "myth" he questions is that information motivates behavioral change. Giving people feedback through metering and hybrid car dashboards is the subject of much behavioral research. It can certainly encourage more enthusiastic use of equipment. But is the information itself really all we need to change, or should we be paying more attention to how that information is conveyed?

The 2012 Climate, Mind and Behavior Symposium - continued

This question is at the heart of John Petersen's research (Oberlin College). His presentation described a variety of "feedback mechanisms," that tell households how much energy they're consuming. While it's important to have that information (most of us don't) he noted that some feedback mechanisms succeed in motivating energy-saving behavior, while others don't. For example gently glowing "orbs" in dorm hallways that changed color as energy use increases, succeeded in reducing consumption. So did an on-screen cartoon squirrel that appeared sad when energy use went up. But if the squirrel appeared angry, it provoked defensive behavior, and energy use didn't drop. In other words, the same information about consumption presented in even slightly different ways can lead to very different behavior.

Yale Law School professor Dan Kahan, a member of the interdisciplinary Cultural Cognition Project, argues that resistance to acting on climate threats and support of climate-related policies has little to do with information or the lack of it. While it's true that greater scientific literacy is needed to combat climate denial, knowing more about climate science doesn't change people's predisposed attitudes towards climate change. Instead, it tends to drive them further toward previously held views that may be culturally determined.

This is due to the prevalence of "motivated reasoning," whereby a prior end or goal we have in mind can direct our mental operations, in effect motivating cognition with an agenda as opposed to pursuing objective truth. People tend to tune into information and arguments tailored to confirming, not challenging their prior attitudes. Motivated reasoning is not a new concept, though it may be more noticeable in the digital age. But a growing body of research now indicates that it strongly influences how we react to scientific evidence on societal risk and what and whom we believe about climate change.

We're all motivated far more than we realize to accept the facts that fit into our cultural belief systems and reject those that don't. As a result, efforts to flood people with the latest evidence and information about climate change may be ineffective at changing beliefs. This isn't only true of less educated, less informed people. On the contrary, Kahan's research finds that the more numerate and scientifically literate people are, the more new information will tend to polarize them and make them more entrenched in their prior belief systems, regardless of whether they're climate skeptics or climate activists. "One way to think about it is that everybody is motivated to try to form the types of perceptions that fit the ones that predominate in their group,"

John Petersen presenting at CMB

he said. "If you are really good at science and you are good with numbers, you are even better with that."

As a result, changing perceptions and behavior regarding climate change may require a counter intuitive approach. "The way to fix the problem is not to turn the volume up on the evidence," Kahan says. "The way to deal with the problem is to change that meaning, to remove what makes it threatening to other people. It's about framing it in a way that doesn't antagonize or come across as an assault on one side." He argues climate communicators should present information which is endorsed by a diverse set of experts, in a way that affirms rather than threatens prior beliefs and values.

The Myth of Growth as a Solution

Boston College sociologist Juliet Schor has studied how mainstream economics tends to eclipse climate change through its emphasis on concerns over economic growth. "We all know we are in unsustainable territory in terms of ecological footprints and carbon footprints," she said. "We have gone into ecological overshoot. The standard economic answer to that is, 'Don't worry about it; growth will solve the problem.'" That idea is expressed by the Kuznets curve: "It is basically the idea that a poorer [industrialized] country degrades the environment (China is a typical example) but, as you get richer you clean up your environment," she said. "Environment is a luxury good. You buy more of it, trading off between growth and environment."

That's an optimistic scenario, but it turns out to be a fallacy in terms of climate impacts. In fact, the more that economies grow, the more resources they consume, and the more greenhouse gas (GHG) they emit. American society is far

along the growth curve, and becoming ever more wasteful. Schor studied American clothing consumption patterns, since clothing historically concentrated resources and labor and was a measure of wealth as well as a sign of status. But between 1997 and 2007 she found that "we have what I call a fast-fashion model, people acquiring and discarding at a rapid, accelerating rate…enormously unsustainable." Before the 2008 financial collapse, she noted, resale shops sold used clothing at $1 per pound. It was so worthless that it was hard to even give away." We have an economic system that is putting a zero-price on commodities that are labor- and natural resource-intensive. That is a system totally out of whack."

Behavioral economist John Gowdy says that our economic system has become a dangerously imbalanced monoculture. "There used to be competition between societies, there used to be different ways of doing things," he said. "Now we have created this one-world system, one organism with one goal. In evolutionary terms this is a really dangerous situation with one ecosystem on the whole planet, one way of doing things, namely the market economy. There are no checks and balances, there is no competition."

Although some markets have started to realize the economic costs of a damaged planet, in many cases, the ravages of human enterprise aren't apparent, he said. For example in Maoxin County in China, bees have gone extinct because of environmental damage, so humans now pollinate the apple trees. Even though salaried workers now replace a formerly free ecosystem service, apple producers still find the new arrangement more efficient for production—a signal that our economic system's overwhelming focus on short-term output is ultimately irrational, ignores externalities, threatens natural systems and needs reorienting.

Unsustainable Lifestyles

It wasn't always this way. Through the mid-20th century, US productivity increases were channeled into a higher standard of living, which included shorter working hours and more leisure time. Since the 1970s, rising worker productivity has been increasingly channeled into more material output and a higher standard of consumption. That means more energy and resources get consumed, which in turn means workers need to work longer hours to squeeze out more productivity gains and earn more money to enable more consumption. All this has environmental consequences.

Schor presented research showing that household emissions go up as working hours increase. The flip side of joblessness in a down labor market is that the majority with jobs must work longer hours with stagnant wages to maintain or increase productivity. This not only tends to keep millions unemployed, it also tends to increase GHG emissions. Exhausted from long hours and long commutes, stressed workers are less likely to take public transport, plant a vegetable garden, prepare homemade meals, monitor their energy use, retrofit their homes or do other things that can lower carbon footprints, but require some time and thought.

They are also unhappier. Studies show how we spend our time strongly influences well-being, and that longer hours of work are associated with less happiness. Spending more time with family and friends, eating wholesome food, exercising and being in contact with the outdoors are proven sources of well-being. It's not only healthier; it's more sustainable, because it affords workers the time they don't otherwise have to adopt lower-carbon lifestyles.

But how many of us can afford to cut back on work hours or the carbon emissions associated with working too much? Even researchers and advocates working on climate change issues professionally often fly too much and get tracked into carbon-intensive lifestyles.

As Marilyn Cornelius, doctoral candidate at Stanford University, asked the symposium participants, many of whom traveled long distances to get to the Garrison Institute, "I wouldn't miss this for the world….but how do we decouple the amazing inspiration and connectedness [of this symposium] from air travel?" She suggested video conferencing as a low-cost, high-impact alternative, and identified other examples of the way carbon-intensive choices pervade our lives. These include the meat and dairy products that are a predominate component in American

George Marshall presenting at CMB

diets, the prevalence of chain stores that don't sell energy-efficient products, and other default conditions for which we need alternatives.

What Might Move Us Forward?

If our patterns of thought and consumption, and the way our jobs and lives are organized, militate against clear perception, better choices and effective actions concerning climate change, what could change them? What actions might help to reshuffle the deck and enable a significant shift in our choices towards sustainability? Symposium participants presented new thinking and research on how we might improve the ways we measure consumption, poll public opinion, frame climate communications and align climate goals with our values, beliefs and sense of community. Here are some of the things they identified that could help:

Use Better Metrics

Better metrics may support better choices and more sustainable consumption patterns. For example, Rick Larrick of Duke University's Center for Energy, Development and Global Environment (EDGE) argues that measuring gasoline use in miles per gallon is backwards. The consumption metric should be on top, and the distance on bottom—gallons per mile. Elizabeth Malone, staff scientist at the Joint Global Change Research Institute, says that researchers need a more holistic unit of analysis than how individuals use energy. Individual energy behavior should be viewed in the context of their lives in their cities and towns. "We should be talking about how institutional social, and technological structures influence what those individuals do," she said.

Ask Better Questions

In researching attitudes and opinions on climate change, the structure and context of questions matters.

Rebecca Ford, a postdoctoral fellow at New Zealand's University of Otago Centre for Sustainability, conducted an in-depth, three-year study of attitudes towards energy saving among 2,500 New Zealanders, and got some nuanced results. They were not monolithic; she found most of them fell into three very different groups. The largest consisted of older people who already tend to conserve. The next largest were young families who aspired to a more affluent lifestyle. "We found that their practices reflected the values with priorities more on comfort and convenience for their families," said Ford. "They were interested in making energy efficient investments, but it wasn't their priority right now." The smallest group, "basic users," were younger couples and singles who thought technological improvements could solve the energy problem. Stanford University's Jon Krosnick studies American public opinion about climate change and presented evidence that climate denial in the American public is misunderstood and often exaggerated, based on flawed or misleading polling. His research showed a large and growing majority of Americans in virtually every state believe climate change is real and anthropogenic and requires action. He finds that politicians consistently misconstrue public attitudes on climate and have wrongly ignored it.

The problem, he says, is that we aren't asking the right questions. "Public opinion has the potential to move legislators," he said. "But methods that political scientists are using to document the public will are going at a snail's pace." Gallup and Pew polls show half of Americans are climate skeptics, but Krosnick's own polling, which asks much more detailed questions, found an overwhelming majority (83%) believe climate change is real, including 66% of Republicans, and a majority of those polled in every single US state.

And even though presidential candidates in the last two elections avoided discussing climate change during the campaign, there is evidence that such an approach may be a political mistake. Krosnick found that taking green positions helped political candidates with voters, while "not green" positions hurt them. Krosnick's findings highlight the need for a serious review of opinion polling methods and findings to develop a coherent and consistent understanding of climate perspectives across the population and the implications for policy makers, politicians and policy.

Create Better Policies and an Improved Economic Climate

Gernot Wagner, economist for the Environmental Defense Fund and author of the book *But Will the Planet Notice?*, believes that large-scale policy change is the only sort of intervention that can have an impact large enough to mitigate global climate change.

That makes him something of a skeptic about voluntary forms of reducing or offsetting emissions. For example, he believes the $15 carbon credits airlines sell to customers that purport to offset the emissions of the flight are gimmicks whose main effect is to make people feel better about flying. They won't change how airlines use fuel. "The only way to have that kind of impact is to look at large policy changes, reorienting market forces in a way that doesn't just make us feel good, but actually makes the planet notice in a way that we all know has to happen in order to create a livable planet." While there is no question that the establishment of

national-level policies is needed to reduce carbon emissions to sustainable levels, Wagner's work discounts the potentially meaningful carbon savings associated with the behavior wedge (discussed above) and the benefits of engaging the population in ways that can create popular support for large-scale climate policies.

Juliet Schor argues that reducing working hours from today's "business as usual" upward trajectory could have effects that the planet would notice. Her research projects that cutting working hours by 10% could cut carbon footprints by 15%. It could reinvigorate social capital and expand the number of self-provisioners and small businesses along with overall rates of employment. There's precedent in the way Germany and the Netherlands instituted shorter work weeks and job sharing to weather Europe's unemployment crisis post-2008. In the US, it would mean a return to our long tradition of using productivity growth for lifestyle gains rather than higher output and consumption, and it could help create the conditions for a more vibrant, sustainable economy.

Some advocates are working to combine the two goals, passing climate legislation and reforming employment policy, for example by using carbon taxes to offset revenue-neutral payroll tax cuts to create jobs. But separately or together, such goals are very tall orders given our current politics and economics. Nevertheless, there are some hopeful signs of change. For example, John Gowdy points out that there are some exceptions to the predominant focus on per capita GDP growth as society's goal, including efforts to index economies according to measures of well-being or "Gross National Happiness." But they're still exceptional. "If we had a different goal and a different self- organizing principle then I think things would fall in line, but it is a difficult nut to crack."

Passing climate legislation, shortening the work week or reorienting our "business as usual" economic goals are large-scale policy and market interventions, rather than strategies focused on voluntary behaviors. They would no doubt force large-scale behavioral shifts if they came about, but they have proved elusive so far. What could help shift the debate in ways that could make major policy change more likely?

Hone Our Communications Strategies

Researchers and communications professionals have long recognized the difficulties of climate messaging. Among the biggest challenges is the expressed desire of environmentalists and climate scientists to communicate the direness of the climate threat. Despite climate realities, however, research indicates that the more the message focuses on the direness of the climate threat, the more off-putting and ineffective it becomes. Alternatively, messages that show some understanding of their audiences and that are able to appeal to their real situations, attitudes, values and beliefs may stand a better chance of getting through.

"Some people may care a lot about saving the future for future generations, but for most people, if we are going to ask them to sacrifice their own devices and their own well-being, then we need to bring it a little closer to home than this nebulous, save-the-future kind of thing," says Arizona State University doctoral student Samantha Neufeld. "Talking about their own future may be a good way to do that."

Values and identities are also important in crafting effective communications. Climate change behavior expert George Marshall, founder and Director of the UK-based Climate Outreach and Information Network, gave a talk entitled "Hearth and Hiraeth" (the latter being a peculiarly Welsh word loosely translated as "a longing for the old landscape"). With major constituencies in Wales absent from the climate discussion, his group worked with the Welsh government to find a way to communicate the importance of sustainable behavior to the whole population. Instead of testing ad concepts, the effort led with extensive research on and testing of the audience itself. "We are not just testing the narratives," he said. "We are starting in the focus groups asking people about their values their identities what makes them proud, what upsets them, how they feel about life, and so on. We are recording every single word of that and we are going to build the narrative with the language in the words that they use."

Scott Brophy, philosophy professor at Hobart and William Smith Colleges, offered a different take: "It is not just a matter of making the way you say it more palatable to the values that they already have," he said. "I think that is an unfortunate move that some folks are making. Values are lenses through which we view the world, through which we view facts. If you look at the lenses instead of through them, you are engaging people in reasoning, not just sugar-coating messages."

Prominent public relations expert James Hoggan has a perspective on climate communications that bridges objective facts and subjective values or "lenses." He spoke of life in the trenches trying to encourage a science-based media debate and confronting the lies of climate deniers. "I started watching these climate scientists wander on to a TV set and be beaten up by a climate change denier," he said. "And so I thought, 'This is very odd,' because you know, what is happening is these climate scientists seem to be helping to deliver the message that there is this debate—by debating." He believed

The 2012 Climate, Mind and Behavior Symposium - continued

that the misinformation was hampering accurate reporting on climate change, so he worked to get the facts across by founding the influential online outlet desmogblog.com and co-writing such books as *Climate Cover-Up: The Crusade to Deny Global Warming*.

Hard-nosed, confrontational truth-telling may be vital to countering the lies and obfuscations that abound in the climate "debate." But at the same time, Hoggan gained some insights into the limits of the polemical climate warrior approach in interviews on climate change he conducted with His Holiness the Dalai Lama and with Thich Nhat Hanh, who said to him, "Speak the truth, but not to punish." "I don't know what kind of effect that has on you," said Hoggan, "but I know that the kind of anger I feel from day to day about these people that we have to write about on our blog." The idea of telling the truth about, but not needing to punish their actions "really meant a lot to me, so now I am trying to shift and just let the facts speak for themselves."

But even the best-designed climate communications that successfully balance objective facts and audience sensitivity may not be enough to motivate people. Cara Pike directs the Social Capital Project at The Resource Innovation Group, which works with non-profits to communicate effectively about climate change via a new Climate Access Network. It's difficult work. Determining what climate messages get through and whether people understand them is hard enough. But seeing those who claim to understand declining to act on the understanding is even harder, she says. What else could help inspire them to take action?

Align Climate Goals with Core Values, Ethics, Beliefs

Many symposium presenters spoke of the need to appeal to something larger than self-interest or economic interests, and align climate goals with people's larger values, ethics and beliefs. Louke van Wensveen, a Dutch ethicist who has also worked as a sustainability manager, said society must cultivate "virtue capital." She spoke of society as a giant teepee held up by three poles representing trust, courage, and care. "If we neglect the cultivation of our virtues—and that is what we are doing in our society; it's not on the agenda—we risk not only becoming unhappy ourselves, because virtue is a reward, but we're also weakening the other poles. And if this lasts long enough, our civilization collapses."

Bob Doppelt presenting at CMB

Dina Biscotti, a sociology lecturer at the University of California-Davis, summarized theories from sociology and behavioral economics that debunk the old assertion that people are merely selfish by nature. "Part of what we want to do is move beyond this focus on the rational, self-interested individual, that utility-maximizing mythical person who does means-based calculation," she said. It's that cold, calculating notion of human behavior derived from neo-classical economics, that has led utilities to offer rebates that emphasize how much money people will save when they conserve energy. That's a mistaken approach, she said. "That narrow focus sometimes doesn't get to more socially realistic explanations of why people do what they do." As a result, we fail to consider the range of opportunities for more effectively engaging people in ways that could make a difference.

Bob Doppelt, executive director of the Research Innovations Group, drew on ethics, psychology, Buddhism, and social science research to create a broader typology for understanding the various kinds of experiences, beliefs, and commitments that would motivate action on climate change. They all involve a focus beyond self-interest—what he calls a "shift from 'me' to 'we'" (a phrase borrowed from psychiatrist Dr. Dan Siegel, a frequent presenter at CMB symposia). "The boundaries that we create to distinguish ourselves from other people—humans from the so-called natural environment, our organization from other organizations, the economy from social systems—those aren't real, those are illusions," Doppelt said, echoing the essential teachings of many world religions and wisdom traditions. "If you're not constantly aware of the interconnections, the complex web of social and ecological systems that created you and that sustain you, you're likely to do more harm than good."

We have long neglected the deep connection between concern for the environment and spirituality, but that is starting to change, said Mary Evelyn Tucker, a scholar in divinity and environmental studies at Yale and founder of the Yale Forum on Religion and Ecology. As long ago as the mid-1990s, she said, staffers at National Climate Research Center in Boulder, Colorado, were looking for a better way to

Jon Krosnick presenting at CMB

reach the public about climate change. "They were in therapy, and in despair," she said, "because their message was not reaching the American public at large and they were trying to figure out not just messaging, but: how [to] bring in larger communities." They were also ignoring religion and spirituality as a resource for inspiration and interconnectedness.

All religions deal in some way with stewardship of the planet. Stewardship is a theme of the Book of Genesis; Islam preaches "trusteeship." "Are we dominators? Are we in control? Well, all of the theologians now are dealing with a reinterpretation of stewardship," Tucker said. "That reinterpretation of text, of tradition, of ritual, of community, of practice, of virtue ... brings us out of this morass of individualism and separation and dualism that we have analyzed and analyzed."

The media and the public still harbor common misconceptions about religion, believing that it is all monolithic and monotheistic when, actually, world religions are not rigid but often diverse and flexible – Christianity included. Religion, spirituality and a reawakened sense of interconnection and wonder about the natural world can reinvigorate our response to climate change. While scientific approaches to climate problems are essential, insights from the humanities and religion can connect us to "dynamizing human energies" that fuel the movement for ecological renewal. In this respect she says human beings are the crucial "renewable energy source" we need to tap.

In fact, this is already beginning to happen, as faith-based communities are increasingly taking an active role in addressing climate change. For example, Dina Biscotti described the work of Interfaith Power and Light (IPL), a 10,000 plus member organization with member congregations in 29 states, building sustainability values and practices into the work of religious organizations. "Religious groups have been at the forefront of most social change movements. Social justice movements, civil rights and peace come particularly to mind," said Fred Taylor, a professor of environmental studies at Antioch University New England. "It seems natural that religious groups would have an important role to play in relation to climate change." He described how a group of churches initiated a "Carbon Fast" during Lent in Brattleboro, Vermont, which expanded quickly to other churches in the state. "Each day you get a different assignment, so to speak, some activity that helps reduce your carbon footprint and we did this in the context of Lent, which is often a time of renunciation and spiritual discipline," Taylor said. "Instead of giving up chocolate, or coffee, or something like that, we suggested giving up carbon." Daily emails focused on the very small home actions that add up —drying clothes outside, using different lighting, cutting car trips, etc. "The significance of a small action pointed to our first major discovery," Taylor said, "that small actions can have powerful effects on people's awareness."

Rev. Fletcher Harper directs the interfaith environmental coalition GreenFaith, which helps houses of worship take environmental action. "We are focused on leadership because we believe that religious institutions ought not only help follow or help support what environmental groups are already doing," he said. "[We] ought to find our own distinct voice as leaders in this regard, speaking to people's deepest values, deepest beliefs, deepest concerns and deepest experiences." The GreenFaith staff gives 100 presentations a year, writes curricula, works with teenagers on a consumption awareness program called "Let There Be Stuff," helps houses of worship

embark on recycling and energy saving programs, helps them incorporate environmental themes into their worship, leads retreats, and even takes congregations on environmental justice tours. "Understandably, most people don't go visit pollution on purpose," Harper said. "When they do and they go up to the chain link fence and see what's in the ground on the other side, and the impact that has on the health of the community, then they turn around and see a school or a public housing project a hundred yards away, they get it. They get that this is not just some sort of abstract political issue, this is really about avoiding avoidable suffering."

Focus on Community

One of the deepest dimensions of human motivation, which cuts across religious, spiritual and secular values, is the importance of community. It can often inspire people to look beyond their own selfish interests and devote themselves to protecting or improving a larger community with which they identify.

"We have conducted a lot of research over the last ten years backing up Aldo Leopold's assertion that we protect things that we feel are a part of us," says Oberlin University Associate Director of Psychology Cindy Frantz. "We know this with human-to-human relationships; the data is incredibly clear that the closer you feel to someone, the more willing you are to help them or sacrifice for them, etc. It is true for the natural world as well."

It therefore stands to reason that efforts to cut GHG emissions work best when people can see the benefits in their own cities or towns. "It was very important that the project was seen to be satisfying local needs," Connal Bolger of Scotland's Sustainability Learning Centre said of his work on government-funded projects to reduce household carbon emissions. "This point was set again and again and again; it was emphasized with swear words and then repeated to me." It was also important that the people who were asking for changes were known in the community, so the project was "not perceived as a missionary endeavor, imposed upon them by central authority, politicians, or planners," he said.

Being known in the community may have also been a key factor in the success of a peer-based energy savings program in 24 academic buildings on the Vanderbilt University campus, where employees shown feedback on their energy consumption cut it back by at least 7 percent (those groups who received only energy-saving facts saved little or no energy). State employees in Wisconsin changed their attitudes during a points-earning energy-saving effort called Cool Choices, described by its executive director, Kathy Kuntz. The program established a new norm for their community of work colleagues. "Now people think the norm here is that we care about this stuff, which is that cultural shift and transformation we are striving for in these places," she said.

Similarly, Make an Impact, a workplace-based program of the Center for Climate and Energy Solutions (formerly known as the Pew Center on Global Climate Change), works with employees at companies such as Alcoa and the Bank of America to shift the employee culture towards sustainability. It provides information and support to help employees calculate their carbon footprints and save energy at work and at home. "People can't just go out and buy a new Energy Star-rated refrigerator," said the Center's vice president of community outreach Katie Mandes. "So we want to say, pull your refrigerator out and vacuum the coils. Did you know you could do that and that will increase the efficiency of your refrigerator?" A sense of a shared goals or norms with colleagues at work with whom they identify and who are hearing the same thing may encourage more employees to try.

At the University of Toronto a program to set laboratory fume hoods at a proper height and save energy by lowering them when not in use, used a structure of friendly competition to get students to comply. It worked as long as the competition was active, but didn't have a lasting impact on behavior after it ended. "It failed to change habits, it failed to change the environment enough to re-program the people who use it," said doctoral student Zannah Matson. She suggested the problem might have been that the competitive element was insufficient motivation in itself. Friendly competition often works as a motivator, but in this case, pitting students against each other failed to establish a durable new norm for the group.

Marsha Walton of the New York State Energy Research and Development Authority described a different study of college students' behavior that did succeed in creating a new group norm. In campus computer labs, computers were turned off at the start of the day and signs were posted asking students to turn them off when finished. That shift in established procedures communicated the idea that it was normative to turn computers off after using them and resulted in 48 percent of students turning computers off. The impact of the intervention was weaker when no signage was provided or when the computers were turned on prior to the arrival of students.

Link Communities and Scale Up Change

Appealing to community, establishing new group norms for sustainable behavior, and meeting community needs are common features of many successful behavioral interventions. Such interventions often derive their power

from interconnectedness and community, but that doesn't mean they only work at the neighborhood level. Symposium presenters offered examples of how neighborhood or city-wide initiatives could become the nucleus of change on a much larger scale.

Oberlin environmental studies and politics professor David Orr is also the executive director of the Oberlin Project, which seeks to implement his vision of "full-spectrum sustainability" on the ground. A joint venture by the town and College, it works to create "a thriving, sustainable and environmentally friendly community" in Oberlin as a model for other communities. Its ambitious goals include powering a 13-block area by the sun, achieving carbon neutrality in the town and college; establishing a greenbelt around the city, and to teach sustainability to students and citizens alike. "It is neighborhood by neighborhood, campus by campus, city by city, region by region, that we begin to build that," said Orr. There's a logic of replicability to his project that starts at the neighborhood scale, and expands to larger scales, linking communities together fast enough to mitigate and adapt to climate change. "Can we do this in ten years?" he asks. "Can we create our equivalent of a Tea Party movement?"

"Urban sustainability officials across North America are now beginning to link their efforts into a common movement rather than being siloed or competing with one another," said Sadhu Johnston, deputy city manager in Vancouver, the former top sustainability official in Chicago and an Oberlin graduate. "We have a series of networks now that are being led across the country, and those folks are getting together and talking and sharing lessons, and actually working to bring our politicians along to collaborate in pushing for regional action," he said. "We realized a couple of years ago that if 50 million people are represented in our cities, and if we could pick a few things and focus on them together, we could actually drive some significant national change, or potentially, some international change."

A community of a different sort that cuts across regional and cultural differences is the US military, which is poised to take a leading role in promoting sustainable energy practices The US Navy has funded a pilot behavioral and cultural change campaign at Mayport Naval Station in Florida and the US Marine Corps' Camp Lejeune in North Carolina. "Efficient technology in the hands of inefficient operators is worthless," said Micah Loudermilk of the Department of Defense's National Defense University. "We are after hard data because the military exists on hard data."

He hopes the research will help promote pro-climate shifts in energy use behavior among military personnel, and once they return to civilian life, in the larger society. "Nothing against Birkenstock-wearing, tree-hugging hippies," Loudermilk says, "but everyone expects *them* to say that you should cut energy consumption. No one expects a clean-cut member of the military to say it and when they do it has enormous credibility and it becomes a very important and powerful message." The Department of Defense is poised to take a leading role in energy and climate issues… If they succeed, they are likely to contribute greatly to the larger transformation of our energy culture.

John A "Skip" Laitner presenting during the 2012 CMB symposium

Climate, Mind and Behavior Symposium Participants

Pat Aloise-Young, Associate Professor of Psychology, Colorado State University

Sarah Bahan, Analyst, Rocky Mountain Institute

Robert Beinstein, Director of State and Municipal Programs, CH2M Hill

Nicole Biggart, Director, Energy Efficiency Center, University of California Davis

Dina Biscotti, Postdoctoral Scholar
Energy Efficiency Center, University of California Davis

Susan Bodnar, Psychologist and Adjunct Faculty, Columbia University

Conall Bolger, Researcher, Sustainability Learning Center

Dana Bourland, Vice President of Green Initiatives, Enterprise Community Partners

Stuart Brodsky, Assistant Professor, New York University's Schack Institute of Real Estate

Scott Brophy, Professor and Chair, Philosophy Department, Hobart and William Smith Colleges

Alenka Brown, Senior Research Fellow, National Defense University

William Browning, Founder, Terrapin Bright Green LLC

Amanda Carrico, Postdoctoral Research Fellow, Vanderbilt Institute for Energy and Environment

Steve Cochran, Vice President of Climate and Air, Environmental Defense Fund

Roger Cohn, Editor, Yale Environment 360

Nancy Cole, Director of Outreach, Climate and Energy Program, Union of Concerned Scientists

Dwight Collins, President, Collins Family Foundation
Core Faculty, Presidio Graduate School

Marilyn Cornelius, Doctoral Student, Stanford University

Rick Diamond, Senior Advisor, University of California, CIEE

Bob Doppelt, Executive Director, The Resource Innovation Group

Michael Dorsey, Assistant Professor, Dartmouth College

Karen Ehrhardt-Martinez, Director, Garrison Institute's Climate, Mind and Behavior Initiative

Matthew Eisenson, Policy Aide to the Executive Director, Natural Resources Defense Council

Melissa Everett, Executive Director, Sustainable Hudson Valley

Anders Ferguson, Chief Strategist and Partner, Veris Wealth Partners

Rebecca Ford, Postdoctoral Fellow, University of Otago, NZ

Paul Gallay, President, Riverkeeper

Jean Gardner, Associate Professor of Social-Ecological History and Design, Parsons, The New School

Will Goodman, Special Assistant to the President, Jonathan Rose Companies

John Gowdy, Professor, Rensselaer Polytechnic Institute

Ruth Greenspan Bell, Senior Fellow, World Resources Institute

Joel Gurin, Chief of Consumer and Governmental Affairs Bureau, Federal Communications Commission

Rachel Gutter, Director, US Green Building Council Center for Green Schools

Fletcher Harper, Executive Director, GreenFaith

Amy Hartzler, Studio Director, Free Range Studios

Paul Hawken, Director, One Sun LLC

Denis Hayes, President and CEO, Bullitt Foundation

Julie Hayes, Project Manager, Milepost Consulting

Rebecca Henn, Assistant Professor of Architecture, Pennsylvania State University

Jennifer Hirsch, Urban Anthropology Director

James Hoggan, President, James Hoggan and Associates

Sadhu Johnston, Deputy City Manager, City of Vancouver

Chris Jones, Research Associate, UC Berkeley

Dan Kahan, Professor, Yale University

Beth Karlin, Doctoral Student, UC Irvine

Stacey Kennealy, Sustainability Director, GreenFaith

Cary Krosinsky, Senior Vice President, Trucost

Jon Krosnick, Professor of Communication, Political Science, and Psychology, Stanford University

Kathy Kuntz, Executive Director, Cool Choices

John A. "Skip" Laitner, Director of Economic and Social Analysis, American Council for and Energy Efficient Economy

Marc Lapin, Associate in Science Instruction, Middlebury College Program in Environmental Studies

Rick Larrick, Professor, Duke University

Dan Lashoff, Director, Climate and Clean Air Program, Natural Resources Defense Council

Peter Lehner, Executive Director, Natural Resources Defense Council

Diane Louard-Michel, Director, Corporation for Supportive Housing

Micah Loudermilk, Senior Research Associate, National Defense University

Bruce Lowry, Director, Policy and Communications, Skoll Global Threats Fund

Elizabeth Malone, Staff Scientist, Joint Global Change Research Institute

Peter Mandelstam, President, NRG Bluewater Wind

Katie Mandes, Vice President of Community Outreach, Center for Climate and Energy Solutions

George Marshall, Director, Climate Outreach and Information Network

Sabine Marx, Managing Director, Columbia University, CRED

Zannah Matson, Research Assistant, Cities Center, University of Toronto

Michelle McCauley, Professor of Psychology, Middlebury College

Cindy McPherson Frantz, Associate Professor of Psychology, Oberlin College

Peter Miscovich, Managing Director, Corporate Solutions

Michelle Moore, Federal Environmental Executive, Council on Environmental Quality

Samantha Neufeld, Doctoral Student, Arizona State University

Richard Oram, Chairman, The Oram Foundation, Inc.

David Orr, Director, Environmental Studies Program, Oberlin College

Fred Osborn III, President, The EASTER Foundation

Joshua Owens, Program Officer, Enterprise Green Communities

John Parkinson, Executive Director, New York District Council, Urban Land Institute

Lynne Peeples, Media, Huffington Post

Robert Perkowitz, Founder and Chairman, ecoAmerica

John Petersen, Associate Professor of Environmental Studies, Oberlin College

Cara Pike, Director, The Social Capital Project

Climate, Mind and Behavior
Symposium Participants - continued

Jonathan Rose, President, Jonathan Rose Companies

Carol Saunders, Research Faculty, Antioch University New England

Beth Savan, Senior Lecturer and Research Associate Cities Center, University of Toronto

Scott Schang, Vice President, Climate and Sustainability, Environmental Law Institute

Oliver Schaper, Senior Associate and Design Director, Gensler and Co-Founder, School of Jellyfish, Beacon, NY

Juliet Schor, Professor of Sociology, Boston College

Linda Schuck, Senior Advisor, University of California, CIEE

Lauren Shenfield, Principal and Senior Advisor, Philanthropy Advisors, LLC

Debika Shome, Deputy Director, Harmony Institute

Rachael Shwom, Assistant Professor, Rutgers University

Anthony Sorgi, Student, New Jersey Institute of Technology

Jennifer Tabanico, Co-owner and President, Action Research

Fred Taylor, Teacher and Environmental Activist, Antioch University New England

Mary Evelyn Tucker, Director, Forum on Religion and Ecology, Yale University

Louke Van Wensveen, Indepent Ethicist

Gernot Wagner, Economist, Environmental Defense Fund

Marsha Walton, Senior Project Manager, New York State Energy Research & Development Authority

Tim Warman, Vice President , National Wildlife Federation

Marc Weiss, Film/TV Producer, Independent

Adam Wolfensohn, Managing Director, Wolfenson & Co

Nancy Youman, Director, Open Society Initiative on Climate Change

John Petersen and Cindy Frantz at the CMB symposium

The Climate, Buildings, and Behavior Symposium - May 2012

The fourth annual Climate, Buildings and Behavior (CBB) symposium took place at the Institute May 23-25, 2012. It convened over 80 for-profit and not-for-profit real estate professionals, government representatives, social scientists and building industry experts from across the US. The CBB symposium focused on the human dimension of resource optimization, conservation, and environmental sustainability, but with special attention to the practices and policies of residential and commercial buildings. Discussions focused on the application of social science insights and enabling technologies in ways that engage and empower building operators and occupants and eliminate the wasteful use of resources in the building sector, which currently accounts for 42% of US GHG emissions.

Researchers shared their evidence-based insights about the effectiveness of different approaches to conservation and energy efficiency including information on residential and commercial feedback, programmable thermostats, energy benchmarking, the use of social norms and social networks, gamification and effective variety of other strategies. Real-estate professionals discussed first-hand experiences, successes, challenges and insights. All the participants used the information to develop and refine their own personal action plans for leading change in their organizations. Here's a summary of some of the experiences and insights that emerged from the event.

Buildings and People

Is it buildings themselves that consume energy, or the people inside them? Building operations, technology and retrofits may be important factors in building energy performance, but they aren't the only ones. The built environment doesn't simply constrain human beings. There's a complex give and take between buildings and the people in them, and a crucial human element to how any building works.

Occupant behavior has an enormous impact on building energy use, and building energy performance may depend even more on understanding human behavior than on knowledge of building materials or systems. So said several CBB presenters, who pressed their colleagues to think beyond the building envelope. Instead of focusing exclusively or even primarily on how it's insulated, heated

A breakout session of the CBB symposium

2012 CBB Symposium Steering Committee

Lonny Blumenthal, Associate, United States Green Building Council (USGBC)

Dana Bourland, VP, Environment, JPB Foundation

Uwe Brandes, Vice President, Initiatives, Urban Land Institute

Stuart Brodsky, Associate Professor, Schack Institute of Real Estate, New York University

Anthony Chang, Vice President, Cassidy Turley

Patty Connolly, Director, Global Sustainability, RREEF

Rick Diamond, Staff Scientist, Deputy of Research Operations, Building Technology, Urban Systems Department at Lawrence Berkeley National Laboratory

Rachel Gutter, Director, United States Green Building Council Center for Green Schools

John McIlwain, Senior Resident Fellow, Urban Land Institute (ULI)

Josh Owens, Green Communities Program Officer, Enterprise Community Partners

John Parkinson, Principal, Envision

***Please Note**: Steering committee biographies can be found on page 34*

or cooled, managers should also focus on the human beings living inside.

"Heating and air, HVAC—our first assumption is that it's systems and lighting [that use energy]," said John Silkey of Milepost Consulting. "But it is men, women and children [who are] the three biggest consumers of energy in the building." He advocated the elevation of the building engineer to a higher station, because they are so important to efficient operations. "You forget that these guys and girls are really working behind the scenes," he said. "If you ever go to your building manager or your building operator's office, it is not a corner office with windows. It is generally in the basement or it is in the elevator penthouse—and let me tell you, the elevator penthouse is not a penthouse."

Milepost's building operator training program regularly achieves 15-20% building-wide energy savings through low-cost, no-cost efforts. It emphasizes building community and teams and empowering people to be creative in tackling inefficiencies. Milepost is participating in Seattle 2030 District, an ambitious effort to halve the city's emissions by 2030, which they hope to help achieve by establishing cross-company connectivity to allow professionals to share ideas.

Judith Heerwagen and Kevin Kampschroer described their work for the US General Services Administration (GSA), which managed to cut consumption 30% in 500,000 buildings by installing green retrofits from 1985—2005 (a period when the commercial building sector as a whole showed no net change in energy use). But they noted the retrofits also caused dissatisfaction among occupants. "If we are looking at air quality, temperature, and speech privacy, satisfaction is extremely low," Heerwagen said.

James Finlay presenting at CBB

Uncomfortable workers do one of three things: They alter their behavior (putting on sweaters, blocking light with umbrellas, piling up books to block air ducts). They may try to just cope with their emotions. Or they may demand to change the environment. "It is generally considered better to change the environment," said Heerwagen. "There's a lower adaptive cost to doing that."

To work well, a building's systems should accommodate occupants, as well as the occupants making appropriate use of the building's systems. "It's not just about the buildings," said Linda Mandolini, CEO of Eden Housing. "It's about the people who live and work in them." So it's critically important for building managers to engage the people inside the buildings and involve them in green initiatives, said Dana Bourland, former vice president at the affordable housing group Enterprise Community Partners. Building affordable housing units to green standards started as a hopeful idea and has taken off, she said, the way seatbelts in cars became ubiquitous. Now operations and maintenance of these green buildings and the behavior of their occupants have become just as important to their performance as how they were built. "It's always been in the criteria since 2004, when we launched our program. There is a requirement that you engage the residents living in the building and you also train the operations and maintenance staff."

In fact, the greenest building—even a LEED Platinum building—won't work well unless the people inside it are working with it. Lauren Riggs and Lonny Blumenthal of the US Green Building Council (USGBC) are taking this into account in a LEED pilot program they created called "Occupant Engagement." It's building a framework within LEED Rating Systems that will encourage sustainable behavior and resource conservation among occupants in LEED certified projects. It rewards project teams for finding ways to empower occupants to become aware of and responsible for their own energy and water consumption, waste disposal habits, and other actions that affect the overall performance of the building.

Whose Job Is It?

Green buildings need green building investors. Why aren't there more of them? Investors focus mainly on what James Finlay of Wells Fargo identified as "the seven tribes of real estate:" owners of single-family houses, mom-and-pop-style commercial buildings, "medium commercial" buildings, large commercial buildings, multi-family apartment buildings, special-purpose buildings like gas stations and hotels, and "MUSH" buildings—municiplities, universities, schools, and hospitals. Whether they are built or retrofit to green standards is not a particularly important criterion for investors.

Cathy Higgins presenting at CBB

"I have got to tell you, financing is not the problem; it is defining the risk," Finlay said. Although not enough study has been done on the value of energy-efficient upgrades, right now convention wisdom holds they're worth 50 cents on the dollar. Many investors need a stronger indication of green building performance to justify more investment. "The risk analysis of energy efficiency, at least for me in the way I am looking at it, it is really about compelling motivation," says Finlay.

At least some investors are motivated by the economics of energy efficiency. Patricia Connolly and Nick Stolatis described their work with the Greenprint Center for Building Performance. Greenprint is a worldwide alliance of real estate owners, investors, financial institutions and other industry stakeholders working to reduce the carbon footrprint and increase the energy efficiency of the built environment globally, which it notes represents a third of global carbon emissions. Greenprint aims to do this "while demonstrating the correlation with increased property values."

But many people still believe that green operations aren't cost-effective, even though operating efficiency and sustainability usually go hand in hand, said Jaxon Love of Shorenstein Properties. "So that is a real mental barrier that we are working on overcoming with this concept of bringing greenways provisions into the leases with tenants," he said. Owners of large apartment buildings can learn to work through barriers with their tenants and learn how to change behavior. Shorenstein ran tours called Flip the Switch that discussed energy saving choices with tenants (he noted that one of the hardest to convince them about was the value turning off their computers).

Studies show that occupant behavior can vary building energy use by as much as 200-300%. Behavioral change programs are often low-cost or no-cost to implement (some, like turning off computers, actually save money), high-impact and offer a high rate of return. That ought to be a compelling incentive for tenants to adopt them and ought to help make green programs attractive propositions for owners and investors. Gina Ciganik of the Minneapolis affordable housing group Aeon says the potential financial return did attract her organization. "Green and sustainability: those words started to get pretty meaningless, so we talked about it within the organization to CFOs and other people who were number crunchers," she said. "We really talked about it in terms of conservation, high-performance building, sound business principles. And that seemed to resonate with more people."

But Cathy Higgins of the New Building Institute believes that optimizing building energy use requires more than just a healthy return on investment. It requires a very human quality: leadership. Someone has to coordinate and lead the combined efforts of owners, tenants, designers, and operators. "Money matters, but individuals influence," she said. "It doesn't matter how cheap something is, or if it's free, or if it's got a great ROI. If there's no champion for it, it's not going to happen. ... If we can connect the right information to these right people that have parts of the responsibility, parts of the impact on the buildings then we can be able to influence them in ways that are meaningful to them."

Jennifer Reed of Eden Housing, which builds and maintains affordable housing communities in Northern California, agrees that sustainability and green building performance is everyone's job and requires everyone's participation. "We talk about it all the time at all of our meetings and in all of our newsletters," she said. "Buy-in from the staff, buy-in from the residents, really getting all staff at all levels engaged. It's not

just me and the green steering committee, it's the maintenance staff, the managers, the resident services staff. It's our senior leadership. Everyone needs to be engaged."

Managing the Unmanageable

"We all know that unlike in previous eras, energy is no longer visible to us today," said Karen Ehrhardt-Martinez, Director of the Garrison Institute's Climate, Mind and Behavior Initiative. "It is not like it used to be when in order to heat our home we were either chopping wood or shovelling coal," she said. "It just invisibly enters our house. We don't see it." A prerequisite for engaging people in energy savings is to make energy use visible and tangible. That's the value of installing meters and other devices that provide feedback on energy use. If we know how much energy we're using and how certain behaviors affect consumption—and few of us do—we can set goals to reduce it and chart progress. "It allows us to manage what is otherwise an unmanageable resource," Ehrhardt-Martinez said.

Until recently, households had almost no access to energy consumption information, which was a barriers to meaningful energy management. But smart metering and other emerging feedback technologies and programs are creating new opportunities for making energy consumption visible and energy use behavior meaningful, allowing for new energy-saving practices to emerge.

Meters and Thermostats

Smart grids and advanced meters enable utilities to learn about their customers' habits and allow them to provide customer feedback that can help lower energy use. But to be useful, Ehrhardt-Martinez said feedback data should be communicated to customers in a way that's easy for them to see and understand.

She conducted a study with colleagues Skip Laitner and Kat A. Donnelly that reviewed 57 feedback initiatives around the world, more than half of them in the United States. They found feedback enabled average household electricity savings of between 4% (when utility bills included detailed data on customers' use) and 12% (when people used real-time meters that even showed how much energy specific appliances were using).

That's a range of actual savings, but the potential savings from metering and feedback could be much higher. Think Eco, which makes the Modlet, a plug-level device tracking electrical use, partnered with the utility Con Edison to testing 200 of the devices on window air conditioners in one building. They found it reduced energy consumption between 15% and 34 %. New York has 6 million air conditioners, Think Eco's Heidi Perry points out. "Con Ed expects that there is going to be about a 20% increase in that number in the next few years," she said. "If all these air conditioners are running at once it represents 2,500 megawatts, which is something like 20-25% of their peak summer load." Imagine saving a third of that with tracking devices.

Metering technology works best when it's paired with motivating human qualities like leadership, community and communications. That was the experience of Smart Energy Now, a Duke Energy program that installed advanced meters in 63 office buildings across downtown Charlotte, North Carolina, in which some 20,000 people worked. The program trained staff leaders and instituted an "Energy Champions" program that rewarded savings and also flagged waste in a humorous way. For example, plastic crabs were handed out to workers who failed to turn off lights (crabs are attracted to light). "You don't just install it and forget about it," said Elena Alschuler, an MIT Masters student who conducted a study of the program (she went on to work for the US Department of Energy as a building technology specialist). "You really have to have ongoing engagement, and who it's coming from is really important...." The successful programs are partnering with local government. They're partnering with local civic and professional groups and truly trying to work top-down through the organizations so it really matters who the message comes from."

Like smart meters, programmable thermostats can save energy, but they also need to interface well with human users, and those users need to be motivated. Research has found that thermostats with buttons that are too small and require complicated interactions with computers can be confusing and discouraging for people, so it's assumed that simpler, more usable models would get better results.

But that assumption is in some doubt. Olga Sachs and Kurt Roth, two researchers from Fraunhofer's Center for Sustainable Energy Systems, presented new results from their ongoing study of programmable thermostats. Their initial findings contradict earlier research about usability. People in their study were no more likely to use default settings for energy saving when using easier-to-use models than when using the more complicated ones. "Not unless they are motivated and triggered... [So] what do we do next?" Sachs asked. "I would suggest we work on the missing components, like motivation triggers. Or we work on the technology that is going to replace the motivation triggers and make it easier. So we have a lot of work cut out for us."

Anisa Baldwin Metzger presenting at CBB

Competition and Gamification

If not energy-saving devices themselves, what can motivate or trigger energy-saving behavior? Friendly competition with peers and games have been found to work for some users. Robert Cialdini's groundbreaking study in Arizona showed people are more likely to reduce their energy consumption when shown evidence that their neighbors are doing it. That study inspired the software company Opower, which works with utilities to promote energy efficiency by providing personalized energy-use data to customers each month. Their service compares households' current consumption levels to their own past usage and to their neighbors'. Participating households have saved on average 1.5-3% on electricity usage.

Opower's Arkadi Gerney described how utilities and energy providers across the US are rapidly adopting Opower's customer feedback platform. Since it works directly with utilities using an "opt-out" structure (i.e. customers don't need to opt into the program, they participate by default unless they opt out), Opower has been able to reach a huge number of households, resulting in total electricity savings of over 1 terawatt-hour of energy, worth over $100 million.

"Gamification," the application of game-mechanics and dynamics to non-game applications, can be a fun and effective way to encourage lower energy use. The interactive sustainable lifestyle company Practically Green uses gamification to get more people to commit to energy saving measures and create tighter community through friendly competition. Its founder Susan Hunt Stevens finds that what's compelling to people about the game is really the other people playing.

"Community is a really important element to anything that we do," Stevens said. She believes few people are really focused on winning the game; most are more motivated by socializing. Also, rewards can send dissonant messages. "The rewards programs that you set up reflect a lot on your culture and there have been some programs that have encouraged people who take green actions to go get Friskies and Coca-Cola and consume different things… The rewards can actually incite [more consumption]." Overall, though, games incorporating social cues are an approach that works. Practically Green has logged 1.2 million pledges of more sustainable behavior and their employee engagement platform engages over 80 percent of employees in participating companies.

Andy Frank of the software company C3 finds that reward programs do motivate. C3 creates energy management software for utilities that enable states to set and reach energy use reduction goals. People who sign up for it learn much more than their utility bills can tell them. They get online analysis drawing on statistics from the US Census, appraisal reports, and other sources that help set a baseline of energy habits in their demographic. The software tracks their energy use and rewards clients who save energy with a point system. "By far the top two things that people told us were important to them and why they joined our website was, number one, saving money, and number two, helping the environment. However," he said, "the only statistically significant correlations that we find for sign-up are how many reward points they were getting. Take what people tell you with a grain of salt."

The 2012 Climate, Buildings and Behavior Symposium - continued

Angela Hurlock presenting at CBB

What's Working

Symposium participants had many inspiring success stories to tell. In schools, residences, commercial buildings and communities across the US, innovative energy-saving programs are applying new tools and technologies together with insights from behavioral science about people-centered strategies, leadership, norms and community. And they're achieving impressive results.

For example, Jeni Cross of Colorado State University and Anisa Baldwin Metzger of the Center for Green Schools and the US Green Building Council described energy efficiency school initiatives in Colorado, New Orleans, Boston, and Sacramento. They are saving energy, resources and money while creating school environments that are healthy for students and conducive for learning.

Eden Housing's Jennifer Reed presented examples of resident leaders making their programs succeed, like the "Green Ninjas" who engage staff and community residents on green education initiatives, and another resident engagement program in Petaluma, California led by kids from the local Boys and Girls Club. It quickly saved over $13,000 across three affordable housing sites.

Angela Hurlock told us about Claretian Associates, a religious non-profit working to build and renovate affordable housing in a tough South Chicago neighborhood. Formerly a steel workers' neighborhood, today it's racially diverse with some reputation for gang activity and crime. Even though sustainability wasn't the mission they started with, they found it meshed naturally with their social goals. As they built new houses or renovated old, they weatherized siding, added solar panels, and made other improvements. "We didn't come to green by way of being so strategic and saying, 'We're going to be the greenest affordable housing developers in Chicago,'" said Hurlock. "We came to it because it just made sense with what we were doing."

Greg Searle, an international consultant on sustainable lifestyles, also cited examples of sustainability integrated with other helath and lifestyle goals. BioRegional's One Planet Communities increase residents' quality of life while achieving zero-carbon and zero-waste. The energy and resource savings are real, but not front and center—what's salient is the lifestyle benefit. Searle's Eco Concierge pilot project also works to make sustainable practices an inconspicuous norm. "Sustainability shouldn't even be in the marketing," he says. "We're selling a lifestyle; one that's healthier and happier."

Some alumni of our previous symposia described how they used lessons learned and action plans drafted while on retreat at the Garrison Institute to help them lead positive change when they returned to their organizations. Laura Tavormina of the West Side Federation for Supportive Housing in New York told us how she applied what she learned at the Institute to working with her staff 350 people. "Set a goal, create a team across staff lines, make green a part of every meeting. It is just part of everything you do."

Climate, Buildings and Behavior Symposium Participants

Elena Alschuler, Program Specialist, Department of Energy - Office of Energy Efficiency and Renewable Energy

Alan Arthur, President & CEO, Aeon

Jeffrey Barg, Urban Planning and Policy Manager, Pennsylvania Horticultural Society

Ingo Bensch, Lead Researcher, Energy Behavior, Energy Center of Winsconsin

Nicole Biggart, Professor and Chevron Chair in Energy Efficiency, University of California Davis Graduate School of Management

Steve Bluestone, Partner, Bluestone Organization

Lonny Blumenthal, Associate, USGBC

Dana Bourland, VP, Green Initiatives, Enterprise Community Partners

Jeff Brodsky, President, Related Management Company

Stuart Brodsky, Sustainability Pioneer, Stuart Brodsky Consulting. See Steering Committee biography on page 35

Hooper Brooks, Director of International Programmes, The Prince's Foundation for the Built Environment

Alex Burris, Vice President of Operations & Technology, Ginkgo Residential

Lane Burt, Director, Technical Policy, USGBC

Theddi Wright Chappell, National Practice Leader, Cushman & Wakefield

Gina Ciganik, Vice President, Aeon

Ric Cochrane, Project Manager, Preservation Green Lab, National Trust for Historic Preservation

Ed Connelly, President, New Ecology, Inc.

Patty Connolly, Director, Global Sustainability, RREEF Real Estate

Jeni Cross, Sociologist, Colorado State University

Dena Davis, Director, West Side Federation for Senior and Supportive Housing, Inc.

Karen Ehrhardt-Martinez, Director, Climate, Mind and Behavior Initiative, Garrison Institute

James Finlay, VP Commercial Real Estate Appraisal Manager, Wells Fargo Bank

Andy Frank, Senior Director of Business Development, C3

Paul Freitag, Director of Development, Jonathan Rose Companies

Arkadi Gerney, Senior Director for Policy, Partnerships and Public Affairs, OPower

Steven Gladman, President, The Affordable Housing Trust for Columbus and Franklin County

Chien Glasgow, Co-Founder and Director of Design, Fulcrum Development

Will Goodman, Special Assistant to the President, Jonathan Rose Companies

Christina Grace, Project Director, Living City Block

Col. John Graham, Associate Dean for Research and Drector of the Network Science Center, United States Military Academy

Amos Harris, Spinnaker, Saint Louis

Judith Heerwagen, Sustainability Program Expert, US General Services Administration

Yianice Hernandez, Sr. Program Director of Green Communities, Enterprise Community Partners

Cathy Higgins, Program Director, New Buildings Institute

Climate, Buildings and Behavior Symposium Participants - continued

Ying Hua, Assistant Professor; Co-Director of IWSP, Cornell University, Department of Design and Environmental Analysis

Mark Huppert, Techincal Director, National Trust for Historic Preservation

Angela Hurlock, Executive Director, Claretian Associates

Max Joel, NYSERDA Energy $mart Communities Coordinator, Solar One

Bomee Jung, Sr. Program Director, Enterprise Community Partners

Kevin Kampschroer, Director, General Services Administration

Constantine Kontokosta, Director, Center for the Sustainable Built Environment; Deputy Director, NYU CUSP; Clinical Associate Professor of Real Estate, NYU

Lauren Kubiak, MAP Energy Fellow, NRDC

Dena Lang, Research Associate, Pennsylvania State University

Jennifer A. Layke, Director, Johnson Controls, Inc.

Grey Lee, Executive Director, US Green Building Council - Massachusetts Chapter

Jaxon Love, Graduate Student: University of Oregon, Shorenstein Properties

Ravi Malhotra, President, iCast

Linda Mandolini, Executive Director, Eden Housing

John McIlwain, Senior Resident Fellow, ULI/J. Ronald Terwilliger, Chair for Housing, ULI

Clayton, J. McPhail, Acquisitions Analyst, Jonathan Rose Companies

John Meeks, Founder, Apple Blossom Energy, Inc.

Anisa Baldwin Metzger, Manager, School District Sustainability, USGBC Center for Green Schools

Brandon Mitchell, Sustainability Coordinator for New, Communities, Government of the District of Columbia

Kim Morque, Principal, Spinnaker Real Estate Partners

Andrew Padian, VP for Energy Initiatives, Community Preservation Corporation

JoAnne Page, President and CEO, Fortune Society

Chrissa Pagitsas, Program Manager, Fannie Mae

Anne Papageorge, VP for Facilities and Real Estate Services, U Penn

John Parkinson, Principal, Envision

Eloise Paul, Associate Director CUMC Leasing and Acquisitions Columbia University

Heidi Perry, Director of Sustainability, Think Eco Inc.

Darren Molnar-Port, Green Building Administrator, State of NJ

Jennifer Reed, Director, Resident Services, Eden Housing, Inc.

Lauren Riggs, Manager, LEED Performance, USGBC

Jonathan Rose, President, Jonathan Rose Companies

Kurt Roth, Director, Building Energy Efficiency, Fraunhofer Center for Sustainable Energy Systems

Olga Sachs, Member of Technical Staff, Fraunhofer Center for Sustainable Energy Systems

Brian Schwagerl, NYC Global Real Estate Executive, CRE, The Sustainable Speaker

Greg Searle, Executive Director, Bioregional North America

Lisbeth Shepherd, Founder and Executive Director, Green City Force

Nicole Katherine Sherwood, Asset Manager, Investments & Executive Director, Jonathan Rose Companies

Adam Siegel, Vice President of Sustainability and Retail Operations, Retail Industry Leaders Association

John Silkey, Senior Project Manager , Milepost Consulting

Susan Hunt Stevens, Founder & CEO, Practically Green

Nick Stolatis, Director, Strategic Initiatives, TIAA-CREF Global Real Estate

Nathan Taft, Director of Acquisitions, Jonathan Rose Companies

Laura Tavormina, Deputy Director, CFO, West Side Federation for Senior and Supportive Housing, Inc. (WSFSSH)

Johanna Walczyk, Program Analyst, Supportive Housing Network of New York

Marsha Walton, Senior Project Manager, NYSERDA

Shelley Weintraub, Vice President, Real Estate, Greyston Foundation

Stockton Williams, Principal, HR&A Advisors

Lauren Yarmuth, Co-Founder & Principal, YR&G

Gina Ciganik at the CBB symposium

The 2012 Symposia Steering Committee Member Biographies

Dina Biscotti is a Postdoctoral Scholar at the University of California, Davis Energy Efficiency Center. She completed her Ph.D. in Sociology at UC Davis in 2010 and her research specialization is in economic and organizational sociology. In collaboration with EEC Director Nicole Biggart, Dina is leading a research project to study the diffusion of energy efficiency technologies through social institutions like churches, schools, and community-based organizations. With the UC Davis California Lighting Technology Center and the UC Davis Western Cooling Efficiency Center, she is working on several interrelated research projects to identify structural barriers to the adoption of energy efficiency technologies and practices, along with strategies for overcoming those barriers.

Lonny Blumenthal, LEED AP O+M is an Associate in the LEED Department at the US Green Building Council. As a core team member of the Building Performance Partnership at USGBC, he focuses on developing a framework for the dynamic and sustained collection of data on human experience within the built environment. Additionally, as the co-author of the "Occupant Engagement" LEED pilot credit, he strives to enable occupants in existing buildings to exhibit efficient behavior in order to improve overall building performance. Lonny also assists in the development of the LEED 2012 rating system, supporting documents and tools. Prior to joining USGBC, he focused on reducing the environmental footprint of businesses and their supply chains while working at a sustainability-focused management consulting firm. Lonny received his B.A. in Earth and Environmental Science from Wesleyan University.

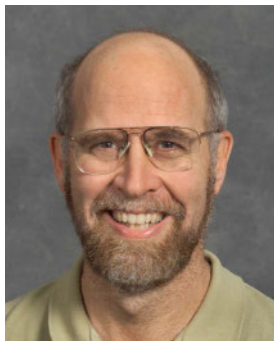
Dana Bourland is Vice President of Environment at The JPB Foundation. In this role Dana will lead the creation and development of a national environment program with an initial focus on energy efficiency and environmental health. The mission of JPB is to enhance the quality of life in the United States through transformational initiatives that promote the health of our communities by creating opportunities for those in poverty, promoting pioneering medical research, and enriching and sustaining our environment. Formerly Dana was Vice President of Green Initiatives for Enterprise Community Partners where she led environmental strategy for the national organization. Dana developed and oversaw all aspects of Enterprise's award-winning Green Communities program including the creation of Enterprise's multifamily retrofit program and served as managing director of the Green Communities Offset Fund.

Uwe S. Brandes is Vice President, Initiatives at the Urban Land Institute (ULI) in Washington, D.C. where he leads ULI's Climate Change, Land Use and Energy (CLUE) and The City in 2050 initiatives. Prior to ULI, Uwe was Vice President at the Anacostia Waterfront Corporation in Washington D.C and Associate Director of the D.C. Office of Planning where he managed the award winning Anacostia Waterfront Initiative, an unprecedented inter-governmental partnership between the District of Columbia, the US General Services Administration, the US Navy and the National Park Service to redevelop the shores of the Anacostia River in the nation's capital. Uwe is a Fulbright Scholar and has earned degrees in Engineering Science and Architecture from Dartmouth College and Harvard University respectively.

Stuart Brodsky is a leading figure in the real estate industry's evolution to sustainability. Currently an Assistant Professor at New York University's Schack Institute of Real Estate and an independent consultant, Stuart has previously held positions at GE Capital Real Estate and the US Environmental Protection Agency. Stuart launched and led the US EPA Energy Star Program's commercial property market initiative (1999-2008). Program milestones during Stuart's EPA tenure include: establishing partnerships with influence over nearly 7 billion square feet of commercial property nationwide, designing BOMA International's Building Energy Efficiency Program, and developing the Energy Efficiency Financial Value Calculator.As a Senior Sustainability Leader of GE Capital Real Estate's $80 billion global real estate portfolio (2008-2011), Stuart teamed with headquarter executives and portfolio directors on four continents to identify and pursue value-adding sustainability practices. At NYU's Shack Institute, Stuart teaches sustainability courses and serves as an advisor to the Institute's Center for a Sustainable Built Environment and co-chair of the ULI NY Sustainability Council. Stuart has a Masters of Environmental Design from Yale School of Architecture and a BA in English from Hobart College.

Anthony Chang, Vice President at Cassidy Turley, is a member of the landlord leasing team of Northern Virginia. He has devoted his career to repositioning office buildings in major markets creating value through leasing, capital strategy, and operating excellence. As an Asset Manager at Broadway Partners, he oversaw a 3.3M SF portfolio of office assets in the New York, Washington, and Boston markets. Since 2008, he has transacted over $900M in dispositions and leased over 375K square feet of office space with a value in excess of $120M. His last assignment facilitated the close of a new $570M joint venture between Broadway, RXR Realty, and USAA. Prior to joining Broadway, Anthony was a General Manager with Hines responsible for the financial and operational performance of office buildings in New York City. He started his career with Tishman Speyer at Rockefeller Center with roles in construction, facilities, and property management.

Patty Connolly is Director of Global Sustainability at RREEF Real Estate, and is charged with incorporating sustainability concepts and principles into all aspects of the RREEF Real Estate investment management process. She is shaping and coordinating comprehensive world-wide sustainability and green building programming and strategies. She joined RREEF Asset Management as Regional Director overseeing a commercial portfolio that grew from 800,000 sf to 18 million sf in 18 months. She transitioned to RREEF Portfolio Management working on two separate accounts, valued at $1 billion and consisting of office, industrial, retail and multi-family assets. Prior to RREEF Real Estate, she was SVP with Shorenstein Realty Services overseeing a trophy office portfolio. She culminated a 14-year career with Jones Lang LaSalle as Regional Operations Manager in Manhattan with responsibility for a 23 million sf portfolio of commercial office buildings. During her Jones Lang LaSalle tenure, she specialized in office, retail and industrial property management and leasing. She is represented on a number of sustainability and charitable councils and boards. She earned her Bachelor of Science degree in Chemical Engineering from Tufts University and her MBA from Harvard Business School. RREEF Real Estate acquires and manages investments in commercial and residential property, and real estate securities on behalf of its institutional and private clients worldwide. Its product offering is global and comprehensive, including core, value-enhanced and high yield property investments as well as investments in publicly traded real estate securities.



Rick Diamond is a Staff Scientist and Deputy of Research Operations of the Building Technology and Urban Systems Department at Lawrence Berkeley National Laboratory. His research has focused on consumer behavior and user interactions with the built environment, including post occupancy and energy evaluations of housing, schools, and workplace environments. Diamond has co-led efforts for the US Department of Energy on developing a social science R&D roadmap for the building sector, and has recently led an effort to provide technical assistance on the greening of the US House of Representatives. He is also a Senior Advisor

Symposia Steering Committee Member Biographies - continued

at the California Institute for Energy and Environment, (CIEE), where he is working to develop support for research and development in behavior and decision making related to energy efficiency. Diamond has a B.A. in Visual and Environmental Studies from Harvard College, and an M. Arch. and Ph.D. from the University of California at Berkeley. He has been on the faculty at Harvard University's Graduate School of Design, the California College of Arts and Crafts, and as a visiting professor in the Architecture Department at UC Berkeley.

Jerry Dion leads the Federal Market Development group for the Federal Energy Management Program (FEMP, USDOE), with a focus on accelerating adoption of advanced efficient and renewable energy technologies into the Federal market, and developing institutional and behavior change resources and guidance. He leads a team in developing systematic approaches to accelerate the uptake, and eventual institutionalization, of efficient and renewable energy technologies, tools and techniques by Federal agencies in support of legislated and Executive Order goals. The team develops and provides credible information on new technologies, and promotes Federal agency collaborations on technology demonstration, validation, and specification. The team is developing innovative approaches to ensure compliance with mandates to purchase Energy Star, FEMP-designated, and Water Sense products. In addition, the team is developing evidence-based approaches to institutional / behavior change that will result in significant and permanent improvements in energy efficiency, renewable energy utilization and greenhouse gas emission reduction. Mr. Dion is serving a two year appointment as a Senior Adjunct Fellow at the Center for Technologies and National Security Policy (CTNSP) at the National Defense University. As an Adjunct Fellow he supports the CTNSP Energy and Environmental Policy Program group with collaborative initiatives with the Department of Energy and Department of Defense. Prior to joining FEMP, Mr. Dion served as the Research Supervisor for the Building Technologies Program in the Office of Energy Efficiency and Renewable Energy (EERE) of the Department of Energy. He supervised a diverse research program designed achieve the technical and economic capacity for implementing Net-Zero Energy Homes and Commercial Buildings in all segments of the US new construction market. Mr. Dion has served in a variety of capacities in Efficiency and Renewables over the past 19 years, including EERE corporate planning lead, and senior advisor in the Federal Energy Management Program and Office of Building Technologies, State and Community Programs (predecessor organization to the Building Technology Program). Mr. Dion served as the Co-Chair of the Building Technologies Research and Development Subcommittee of the National Science and Technology Council, which produced the "Federal Research and Development Agenda for Net-Zero, High Performance Green Buildings" (October 2008). Prior to joining the Department of Energy, he served the Arizona Energy Office for 10 years, leaving as Planning and Policy Program Manager. Mr. Dion holds a Master of Urban Planning degree from the State University of New York at Buffalo.

Rachel Gutter leads the Center for Green Schools at the US Green Building Council. Having been appointed by the USGBC for the position, the Center for Green Schools was established in 2010 to serve as the driver for green schools dialogue, policy development and innovation. Rachel came to USGBC in 2007 to oversee the launch of LEED for Schools, a version of USGBC's popular green building certification program that facilitates the design, construction and operations of high-performance, green schools. To accelerate market transformation, USGBC launched the National Green Schools Campaign to engage students and teachers, parents and school superintendents, elected officials and other policy makers in a national conversation about the relationship between high-performance educational facilities and high performing students. Rachel's professional experiences in the fields of green building consulting and interior architecture and her time with the Green Building Program of Montgomery County Public Schools have contributed to her in depth knowledge of green schools. However, it is her six years of teaching experience that fuels her commitment to educating a generation of sustainability natives. Rachel received her Bachelor of Arts from Tufts University. A competitive figure skater throughout her childhood, today Rachel finds balance through a daily dose of yoga. She lives in Washington, D.C.

Peter Lehner is the Executive Director of NRDC and NRDC Action Fund. He is responsible for guiding NRDC's policy positions, advocacy strategies, communications plans, development and administration, and managing NRDC's seven offices and for leading the Action Fund's political activities. Since Peter's return to NRDC in 2006, NRDC has opened new offices in Beijing and Chicago, started the Center for Market Innovation, and expanded both its policy and communications capacity. Previously, Peter served as chief of the Environmental Protection Bureau of the New York State Attorney General's office for eight years. He supervised all environmental litigation by the state, prosecuting a wide variety of polluters and developing innovative multi-state strategies targeting global warming, acid rain, and smog causing emissions. Peter previously served at NRDC as a senior attorney in charge of the water program. Before that, he created and led the environmental prosecution unit for New York City. Peter holds an AB in philosophy and mathematics from Harvard College and is a graduate of Columbia University Law School, where he continues to teach environmental law. He also has extensive experience in sustainable farming and green business.

Michelle McCauley is Professor of Psychology at Middlebury College where she uses cognitive, social, and developmental theory to address applied problems across multiple domains. Her early scholarly work focused on legal issues: specifically, how individual attitudes affect juror decision making, how cognitive interviews can improve eyewitness reports, and how child maltreatment is viewed internationally. Recently, she has turned her attention to the disconnect between environmental attitudes and actual behavior. In particular, she considers variables that intervene between one's environmental attitudes and action, such as; social expectations, psychological need fulfillment, and childhood life experiences. In addition to her scholarly work, she teaches courses focusing on the human dimension of environmental problems.

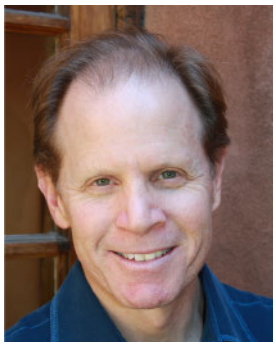
John K. McIlwain is the Senior Resident Fellow and holds the J. Ronald Terwilliger Chair for Housing at the Urban Land Institute in Washington, DC. Mr. McIlwain leads ULI's research efforts to seek and promote affordable housing solutions, including development and housing patterns designed to create sustainable future environments for the nation's urban areas. Prior to joining the ULI staff, Mr. McIlwain served as Senior Managing Director of the American Communities Fund for Fannie Mae and as president and chief executive officer of the Fannie Mae Foundation. Mr. McIlwain has also served as executive assistant to the Assistant Secretary for Housing/ Federal Housing Commissioner at the US Department of Housing and Urban Development.

Nils Moe currently serves as the Mayor's Sustainability Advisor for the City of Berkeley. In this role, he is helping to implement Berkeley's Climate Action Plan and working with the city staff and the community to reduce their GHG emissions. Nils was one of the founding team members responsible for creating Berkeley's innovative solar financing program, which has since become a national model of renewable energy financing (PACE). Nils is also very active in regional environmental policy planning. He is working on the proliferation of climate friendly policies as a member of the East Bay Green Corridor's Innovative Policy Committee and a steering committee member of the Bay Area Climate Collaborative. Nils is also helping to make the Bay Area the EV Capitol of the US in his role on the Bay Area Electric Vehicle Strategic Council and a member of the California Clean Cars Campaign Advisory Committee. Most recently Nils participated in a United Kingdom Climate and Behavior Change delegation and was selected by the Heinrich Boell Foundation as one of five US representatives to meet with environmental leaders across Europe. He is currently a member of the planning committee and co-chair for the Facilitating Behavior Change Sub-committee for the Urban Sustainability Director's Network. During the last ten years he has been working as a professor of Organizational Psychology at San Francisco State University and a faculty member of the MPA and MBA in Sustainable Management programs at the Presidio Graduate School.

Symposia Steering Committee Member Biographies - continued

John Parkinson is a Principal of Envision, a strategic consultancy which focuses clients' attention on their needs, and creates value related to sustainability, infrastructure and technology. Prior to founding Envision, John was the Executive Director of the ULI's New York District Council, where he was instrumental in creating mission-based initiative councils, including Sustainable Building, Infrastructure and Housing. The vision for the councils is to engage members and to leverage their expertise and passion within the land use industry. They are designed to create a topically focused, multi-disciplinary group of mid and senior level professionals, involved in specific facets of commercial real estate, committed to developing trusted connections and sharing best practices. ULI New York's Housing, Infrastructure and Sustainable Building Councils provide a forum for information exchange among peers on the "state of the art" within the development and investment arena. Prior to joining the staff, he was a member of ULI, where his prior work included providing technology and services to the real estate industry. Those experiences included founding and running a business that provided document and drawing imaging services, as well as an on-line property management marketplace providing the economic advantages of electronic commerce. He has twenty five years of professional leadership and management experience in organizations ranging from start-ups to Fortune 200 firms, not-for-profits and the public sector.

Jonathan F.P. Rose's business, public policy and not-for-profit work all focus on creating a more environmentally, socially and economically responsible world. In 1989, Mr. Rose founded Jonathan Rose Companies LLC, a multi-disciplinary real estate development, planning, consulting and investment firm, as a leading green urban solutions provider. The firm currently manages over $1.5 billion of work. By drawing on its human capital, financial depth and real estate expertise it creates highly integrated solutions to real estate challenges. The firm's work touches many aspects of community health; working with cities and not-for-profits to build not only housing, but also civic, cultural, educational and infrastructural open space. The firm's innovative work has won awards from a wide range of notable organizations including: the National Trust for Historic Preservation, the Natural Resources Defense Council, Global Green USA, the Urban Land Institute, the American Planning Association and the American Institute of Architects. Mr. Rose is a Trustee of several organizations including: the Urban Land Institute (and was a founding co-chair of its committee on Climate, Energy and Land Use); the Natural Resources Defense Council; and vice chair of Enterprise Community Partners. He serves on the leadership councils of the Yale University School of Forestry and Environmental Studies and the Yale School of Architecture. Mr. Rose also chairs the Trust for Public Land's National Real Estate Council and chaired the Metropolitan Transit Authority's Blue Ribbon Sustainability Commission. A thought leader in the Smart Growth, national infrastructure, green building, and affordable housing movements, Mr. Rose is a frequent speaker and writer. His work has received widespread media attention from CNN to The New York Times and was profiled in e^2, a PBS series on sustainable development. Mr. Rose also serves on the Board of the Brooklyn Academy of Music (BAM) and is a co-founder of the Garrison Institute with his wife, Diana Rose, where he leads the Climate, Mind and Behavior program. Mr. Rose graduated from Yale University in 1974 with a B.A. in Psychology and Philosophy, and received a Masters in Regional Planning from the University of Pennsylvania in 1980.



Dr. Daniel J. Siegel received his medical degree from Harvard University and completed his postgraduate medical education at UCLA with training in pediatrics and child, adolescent and adult psychiatry. He is currently a clinical professor of psychiatry at the UCLA School of Medicine where he is on the faculty of the Center for Culture, Brain, and Development and the Co-Director of the Mindful Awareness Research Center. Dr. Siegel is also the Executive Director of the Mindsight Institute, an educational organization that focuses on how the development of mindsight in individuals, families and communities can be enhanced by examining the interface of human relationships and basic biological processes. He is the co-editor of a handbook of psychiatry and the author of numerous articles, chapters and the internationally acclaimed text, *The Developing Mind: Toward a Neurobiology of Interpersonal Experience*. His latest book is *Mindsight: The New Science of Personal Transformation* which offers the general reader an in-depth exploration of the power of the mind to integrate the brain and promote well-being. Dr. Siegel's ability to make complicated concepts exciting as well as easy to understand has led him to be invited to address local, national and international organizations where he speaks to groups of educators, parents, public administrators, healthcare providers, policymakers, clergy and neuroscientists.

Hilari Varnadore is the Program Director for the STAR Community Index. Varnadore manages the development and implementation of a national, voluntary, consensus-based framework for improving the livability and sustainability of US communities. STAR is a collaborative initiative between ICLEI, the US Green Building Council and the Center for American Progress. Prior to joining ICLEI, Hilari was the Sustainability Director for Frederick County, Maryland. Hilari was responsible for advancing sustainability within government operations and decision- making processes as well as designing and implementing innovative community initiatives. She developed an internal Sustainable Action Team and planning process, established an appointed Sustainability Commission, and raised more than $2 million to support and sustain the office. Hilari has been an active member of the Urban Sustainability Directors Network and a volunteer on the Planning & Design Technical Advisory Committee within the STAR Community Index program. She is an advisory board member to the Maryland Clean Energy Center and a strong advocate for developing local government networks around sustainability in both MD and the DC Metro area. Hilari ran a MD nonprofit focused on sustainability and Chesapeake Bay protection during the 2000s. Her academic background is in community resiliency, planning and environmental policy.

Marsha Walton is a Senior Project Manager at New York State Energy Research and Development Authority (NYSERDA), in Albany NY, where she has been employed since 1992, working on energy policy, energy efficiency and exploratory research. Currently she is developing a new behavior research program that is applying behavioral and perceptual insights from the social sciences and neurosciences to energy efficiency and renewable energy decision making, and studying the framing effects of climate change communication. Marsha has a Ph.D. in Ecological Economics (Rensselaer Polytechnic Institute, NY), Master of Regional Planning (Cornell University, NY), and a BA in Anthropology (Bard College, NY).

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Regional Hubs

CMB's regional hubs provide members with year-round, regionally-focused opportunities for building local networks, establishing new collaborations, learning about social science insights, sharing information about ongoing initiatives, building new partnerships and establishing community-wide efforts to enhancing sustainable practices and policies.

Regional hubs play a vital role in strengthening the interconnectedness of intra-regional efforts and enhancing the social capital of network members. Each regional hub network is a reflection of the larger CMB network members and partners, bringing together diverse groups of professionals dedicated to addressing the human dimensions of sustainability through the application of social and behavioral insights and people-centered initiatives. Network members include city sustainability managers, urban planners, building managers, representatives of environmental organizations and other nonprofit groups, academic and non-academic researchers, and a host of other community members.

The current array of regional hubs includes three locations on the east coast (New York, Charlotte, and Boston), one in the Rocky Mountain Region (Denver) and one on the Pacific Coast (Portland/Seattle).

Demonstrating the Importance of Sustainable Practices in the Pacific Northwest

Compared to other regions of the country, concerns over climate and sustainability tend to be among the highest in the Pacific Northwest, making it the ideal location for a set of demonstration projects to address the human dimensions of energy and carbon in commercial buildings. Many of the hub members had attended CMB symposia and wanted to bring the insights to bear in a local setting using an experimental design to rigorously document the impact that such approaches could have in commercial buildings in the Pacific Northwest and to document the "how-tos" of doing this work. With generous funding from two local foundations, hub members are working with CMB Initiative staff to design, implement, and evaluate 2 or 3 demonstration projects: one in a commercial office building and the second in a multi-family residential housing building. Among the goals of the project are 1) developing and documenting a methodology for assessing the energy saving opportunities associated with human systems and behavior, 2) testing and documenting the effectiveness of particular behavioral approaches that are grounded in state-of-the-art research from the fields of psychology, sociology, anthropology and behavioral economics, and; 3) disseminating lessons and identifying opportunities to bring the behavior approaches to scale.

The Human Dimensions of Resilience in New York

In the wake of hurricane Sandy, members of the New York hub gained a new appreciation for the urgency of engaging local government, organizations, households, and businesses in efforts to address climate and sustainability issues. Moreover, concerns about the resilience of local communities gained much greater prominence as businesses and residents were challenged like never before to respond to the devastation and attempted to much greater prominence as businesses and residents were challenged like never before to respond to the devastation and attempted to find ways to regain normalcy in their lives.

During a hub meeting in early December, hub members drew from personal experiences and observations to identify a variety of critical issues that influenced community resilience, including:

- the greater response capacity and preparedness of "green building" operators,
- the environmental justice issues associated with tenants and workers in moldy buildings,
- the importance of community hearths as centers of post-crises community activity, and
- the expanded role of social media in connecting people and communicating information.

Energy-Efficiency, Climate Change, and Collaboration in Charlotte

Sustainable energy is a hot topic in Charlotte, North Carolina—the site of one of CMB's newest regional hubs. Interest and investments in sustainable energy have skyrocketed as noted in a recent news article (Charlotte Observer, Feb 2013) which reported that investments in renewable energy and efficiency grew 13-fold in North Carolina between 2007 and 2012, totaling $1.4 billion in that period. Notably, members of the Charlotte hub are among the local forces catalyzing interest in sustainable energy and efficiency and making the much needed linkages to the role of people, practices and policy.

As a result of those efforts, the Charlotte hub network was launched in April in collaboration with the Urban Land Institute at a special one-day seminar on Resilient Communities. Since then, hub members organized a special screening of the film "Carbon Nation" at which the film's director, Peter Byck, led a post-screening discussion. Among the film's core messages: "seeking and implementing solutions to climate and energy issues is not only good for the environment, but is good business." This special event was particularly effective at bringing together a diverse audience of nearly 200 participants ranging from Sierra Club members to CEOs and provided a new way to think about the multiple benefits of embracing clean energy technologies and sustainable practices.

Expansion of CMB's Regional Hubs

The east coast is now home to three out of five CMB regional hubs with the recent formation of hubs in Boston, Massachusetts (Sept 2012) and Charlotte, North Carolina (April 2012). Several other places have expressed an interest in the development of new regional hubs, and we look forward to working with several new hub partners in 2013.

Regional Hub Leadership Council Members

Boston

Edward Connelly, President, New Ecology, Inc.

Grey Lee, Executive Director, USGBC, MA

Kurt Roth, Director, Building Energy Efficiency Group, Fraunhofer CSE

Bonny Bentzin, Director of Sustainability, GreenerU, Inc.

Charlotte

Philip Payne, CEO, Ginkgo Residential, LLC

Alex Burris, Director of Operations & Technology, Ginkgo Residential, LLC

Nicole Storey, Community Energy Conservation Coordinator, City of Charlotte

Pacific Northwest

Jason Twill, Senior Project Manager, Sustainability, Vulcan Inc.

Ric Cochrane, Project Manager, National Trust for Historic Preservation

Jill Simmons, Director, Office of Sustainability and Environment, City of Seattle

Andrea Learned, Founder, Learned On

John Silkey, Project Manager, Milepost Consulting

Rocky Mountain

Chuck Perry, Principal, Perry Rose

Michael Leccese, Executive Director, ULI Colorado

Ravi Malhotra, Founder and President, iCast

Mirka della Cava, Program Officer, Energy Efficiency Climate Works

Karen Ehrhardt-Martinez, Director, Climate, Mind and Behavior Initiative, Garrison Institute

New York

John Parkinson, Principal, Envision

Stuart Brodsky, Associate Professor Schack Institute of Real Estate, New York University

Yianice Hernandez, Deputy Director, Enterprise Community Partners

Constantine Kontokosta, Director, Center for the Sustainable Built Environment, New York University

Marsha Walton, Senior Project Manager, NYSERDA

The 2012 Climate, Mind and Behavior Leadership Council

Dina Biscotti is a Postdoctoral Scholar at the University of California, Davis Energy Efficiency Center. She completed her Ph.D. in Sociology at UC Davis in 2010 and her research specialization is in economic and organizational sociology. In collaboration with EEC Director Nicole Biggart, Dina is leading a research project to study the diffusion of energy efficiency technologies through social institutions like churches, schools, and community-based organizations. With the UC Davis California Lighting Technology Center and the UC Davis Western Cooling Efficiency Center, she is working on several interrelated research projects to identify structural barriers to the adoption of energy efficiency technologies and practices, along with strategies for overcoming those barriers.

Uwe S. Brandes is Vice President, Initiatives at the Urban Land Institute (ULI) in Washington, D.C. where he leads ULI's Climate Change, Land Use and Energy (CLUE) and The City in 2050 initiatives. Prior to ULI, Uwe was Vice President at the Anacostia Waterfront Corporation in Washington D.C and Associate Director of the D.C. Office of Planning where he managed the award winning Anacostia Waterfront Initiative, an unprecedented inter-governmental partnership between the District of Columbia, the US General Services Administration, the US Navy and the National Park Service to redevelop the shores of the Anacostia River in the nation's capital. Uwe is a Fulbright Scholar and has earned degrees in Engineering Science and Architecture from Dartmouth College and Harvard University respectively.

Marilyn Cornelius is a doctoral candidate in the Emmett Interdisciplinary Program in Environment and Resources (E-IPER) at Stanford University. Marilyn integrates climate change studies, behavioral sciences, and design thinking to study residential energy conservation. Her projects include an experimental high school curriculum that reduced energy use and a study exploring global identity as a motivator for

sustainability-related attitudes and actions. Currently she is investigating barriers and alternative low-energy actions as part of a team of researchers funded by the Advanced Research Projects Agency—Energy (ARPA-E). Marilyn is a recipient of the Stanford Interdisciplinary Graduate Fellowship (SIGF). Marilyn assisted late climatologist and advisor Professor Stephen Schneider with multiple climate-related projects at Stanford before commencing her doctoral studies. Previously, as Environment Associate for the United Nations Development Program, she managed projects in 10 Pacific Island nations focusing on climate change, energy, land degradation, and biodiversity. She was Assistant National Director for the International Waters Program, a project spanning 14 Pacific Island countries and foced on conservation of freshwater and coastal resources, and waste management. Marilyn was also a research consultant for the Wildlife Conservation Society. Marilyn is from Fiji.

Jeffrey Domanski has worked for more than 15 years as a multi-disciplined environmental professional. He has extensive experience in program and project management and organizational sustainability leadership for large and globally-recognized organizations. Through his work, he has acquired both broad and deep knowledge of, and direct experience with, climate and energy challenges and how they are perceived and addressed in multiple settings. At Hospitality Green, Jeff manages delivery of services for clients seeking sustainability strategies to address corporate and facility-focused environmental resource and energy reductions, financing approaches, supply chain management, internal and external reporting, stakeholder engagement, market analysis, policy development, and other social responsibility approaches. As Cushman & Wakefield's Director of Sustainability Strategies, he guided development of the firm's global sustainability platform while improving the environmental footprint of the firm's corporate operations, and supported numerous clients in

the pursuit of their environmental and sustainability goals. He also liaised with numerous external partners on projects and industry initiatives, including the WBCSD, the US EPA, the US DOE, the USGBC, NRDC, EDF, and real estate organizations. He served as Associate Manager of Sustainability at Princeton University and has provided technical and policy analysis consulting services to numerous clients, including The World Bank, the Univ of Pennsylvania, sustainability consulting and design firms, and as senior staff scientist and project manager at AKRF, a New York-based environmental planning and consulting firm serving clients in the private and public sectors. Jeff is a LEED AP, received his BS in Chemistry from SUNY ESF at Syracuse, an M.P.A. from Princeton University. He proudly served in the US Peace Corps from 1994 to 1996.

Karen Ehrhardt-Martinez, Ph.D. is the Director of the Climate, Mind and Behavior Program at the Garrison Institute and a Senior Research Associate with the Department of Sociology at Colorado State University. Karen has nearly 20 years of experience in applied and academic research with a focus on the social and behavioral dimensions of energy and climate change. Karen is a cofounder of the Behavior, Energy and Climate Change (BECC) Conference and served as the BECC Conference Chair in 2009. Karen has also provided expert testimony before the US House Committee on Science and Technology's Subcommittee on Energy and Environment. During her employment with the American Council for an Energy-Efficient Economy, Karen was responsible for leading the organization's research program on the social and behavioral dimensions of energy efficiency and environmental change. Among Karen's recent accomplishments is an edited volume on the social and behavioral dimensions of energy and climate change entitled "People-Centered Initiatives for Increasing Energy Savings" and a meta-review of the impact of advanced metering initiatives and residential feedback programs. Karen is a Fellow of the Royal Academy of Arts and Manufactures and a member of the Climate Change Task Force Steering Committee for the American Sociological Association.

Rebecca Ford is a Research Fellow in the Centre for Sustainability at the University of Otago, New Zealand. Her research is primarily focused on the development of technological solutions to improve the way in which people use energy in their homes and cars. Becky is currently working on two interdisciplinary projects: Energy Cultures and GREEN

Grid. The Energy Cultures project aims to evaluate the highest impact opportunities for energy savings in New Zealand homes and cars, examine the potential for new types of technology and practices in these areas, and determine how these might be cost effectively leveraged. The GREEN Grid project focuses on electricity use in the home, and particularly on the shifts in energy demand and demand side management that is required for growth in New Zealand's renewable generation portfolio. Before moving to New Zealand, Becky completed a D.Phil in the Engineering Department at the University of Oxford in the UK. Becky worked under the supervision of Dr. Malcolm McCulloch in the Electrical Power Lab, on a research project titled "Reducing domestic energy consumption through behaviour modification". The background premise to the project was that consumers' energy demand might be influenced by real-time feedback on individual appliance electricity consumption. The outcome of the research was the development of techniques and algorithms that could be used to determine the type of appliances switching on and off within the home, by measurement of just the total current and voltage supplied to the home.

Ruth Greenspan Bell is Public Policy Scholar, Woodrow Wilson International Center for Scholars; co-leader (with Elke Weber of Columbia University) of a new program to harvest insights from behavioral social science to motivate a variety of behavior changes and speak more compellingly about the climate challenge. Previous positions include Senior Fellow/Director, US Climate Policy Objective, WRI (on leave); Director, International Institutional Development and Environmental Assistance (IIDEA), RFF (building more effective systems of environmental protection globally; results include a highly acclaimed study of the policy process switching commercial vehicles from petrol and diesel to CNG that led to Delhi air quality improvements); Senior Advisor to the Assistant Secretary of State for OES; and various domestic management positions in US EPA's Office of General Counsel. Bell publishes extensively (e.g. *Foreign Affairs*, *Issues in Science and Technology*, *Environment*, and *Harvard International Review*). A graduate of UCLA and School of Law of the University of California, Berkeley, she serves on several boards (International Senior Lawyers Project and The Mountain Institute). She is a long-standing member of the Council on Foreign Relations.

The 2012 Climate, Mind and Behavior Leadership Council - continued

Lauren E. Kubiak is an energy fellow working in the Energy Council's New York office. Applying behavioral themes of competition, social norms, and community to NRDC's social energy efficiency collaboration with Opower and Facebook, she studies and writes about how communities can best engage widespread human instincts to influence home energy use. She has authored 5 articles and reports over the past year, documenting the economic benefits of energy efficiency and renewable energy, several of which have been cited in *Bloomberg*, *Huffington Post*, *The Hill*, *Columbus Dispatch*, and other major media outlets. She received her Masters of Science and Bachelors of Science from Stanford University's Earth Systems program, where she conducted studies of how incentives and local behaviors influence community composting and recycling programs in the San Francisco Bay Area, Nantucket, the Equatorial Pacific and several states across the US.

John A. "Skip" Laitner is a Senior Fellow and former Director of Economic and Social Analysis for the American Council for an Energy-Efficient Economy (ACEEE). He previously served almost 10 years as a Senior Economist for Technology Policy for the US Environmental Protection Agency (EPA). He left the federal service in June 2006 to focus his research on developing a more robust technology and behavioral characterization of energy efficiency resources for use in energy and climate policy analyses and within economic policy models. In 1998 Skip was awarded EPA's Gold Medal for his work with a team of economists to evaluate the impact of different strategies that might assist in the implementation of smart climate policies. In 2003 the US Combined Heat and Power Association gave him an award to acknowledge his contributions to the policy development of that industry. In 2004 his paper, "How Far Energy Efficiency?" catalyzed new research into the proper the characterization of efficiency as a long-term resource. Author of nearly 300 reports, journal articles, and book chapters, Skip has 40 years of involvement in the environmental, energy and economic policy arenas. He has provided technical seminars in diverse places as Australia, Canada, China, France, Germany, Iceland, Ireland, Italy, Korea, Netherlands, South Africa, and Spain. He has a master's degree in Resource Economics from Antioch University. Among Skip's latest publications is a book he co-edited with colleague Karen Ehrhardt-Martinez, *People-Centered Initiatives for Increasing Energy Savings* (Washington, DC: American Council for an Energy-Efficient Economy. See www.aceee.org/node/9275. Also see his Desert Year Blogs More By Waste Than Ingenuity? and the $3 Trillion Thought Experiment.

John K. McIlwain is the Senior Resident Fellow and holds the J. Ronald Terwilliger Chair for Housing at the Urban Land Institute in Washington, DC. Mr. McIlwain leads ULI's research efforts to seek and promote affordable housing solutions, including development and housing patterns designed to create sustainable future environments for the nation's urban areas. Prior to joining the ULI staff, Mr. McIlwain served as Senior Managing Director of the American Communities Fund for Fannie Mae and as president and chief executive officer of the Fannie Mae Foundation. Mr. McIlwain has also served as executive assistant to the Assistant Secretary for Housing/ Federal Housing Commissioner at the US Department of Housing and Urban Development.

Nils Moe currently serves as the Mayor's Sustainability Advisor for the City of Berkeley. In this role, he is helping to implement Berkeley's Climate Action Plan and working with the city staff and the community to reduce their GHG emissions. Nils was one of the founding team members responsible for creating Berkeley's innovative solar financing program, which has since become a national model of renewable energy financing (PACE). Nils is also very active in regional environmental policy planning. He is working on the proliferation of climate friendly policies as a member of the East Bay Green Corridor's Innovative Policy Committee and a steering committee member of the Bay Area Climate Collaborative. Nils is also helping to make the Bay Area the EV Capitol of the US in his role on the Bay Area Electric Vehicle Strategic Council and a member of the California Clean Cars Campaign Advisory Committee. Most recently Nils participated in a United Kingdom Climate and Behavior Change delegation and was selected by the Heinrich Boell Foundation as one of five US representatives to meet with environmental leaders across Europe. He is currently a member of the planning

committee and co-chair for the Facilitating Behavior Change Sub-committee for the Urban Sustainability Director's Network. During the last ten years he has been working as a professor of Organizational Psychology at San Francisco State University and a faculty member of the MPA and MBA in Sustainable Management programs at the Presidio Graduate School.

Philip Payne's primary focus, for over twenty years, has been the development, acquisition, rehabilitation and management of middle market (workforce) multifamily housing. Mr. Payne is currently the CEO of Ginkgo Residential, which was formed in July 2010. Ginkgo provides property management services for multifamily properties throughout the southern United States and is actively involved in the acquisition and substantial rehabilitation of middle market multifamily properties. From 2007 to 2010, Mr. Payne served as the CEO of Babcock & Brown Residential. Prior to joining Babcock & Brown Residential, Mr. Payne was the Chairman of BNP Residential Properties Trust, a publicly traded real estate investment trust that was acquired by Babcock & Brown Ltd, a publicly traded Australian investment bank, in February 2007. In addition to his duties at Ginkgo, Mr. Payne is a member of the Board of Directors and Chairman of the Audit Committee of Ashford Hospitality Trust, a NYSE listed real estate investment trust focused on the hospitality industry. Mr. Payne is a member of the Urban Land Institute ("ULI"), ULI's Responsible Property Investing Council and is co-chairman of ULI's Climate, Land Use and Energy Committee. He is also a member of the National Multi Housing Council. Mr. Payne received a BS and a JD degree from The College of William and Mary in Virginia and is licensed to practice law in the Commonwealth of Virginia. He has written for various publications and spoken at numerous conferences on a variety of topics including real estate investment trusts, securities regulations, finance, and responsible property investing.

Roger Platt, as Senior Vice President of Global Policy and Law, is responsible for managing policy and legal aspects related to the increasingly global adoption of the LEED green building certification program. Platt's role includes managing an international portfolio of policy development relationships, including the World Green Building Council Policy Committee and the United Nations Environment Programme, among others, supporting policy initiatives in countries where LEED is becoming the dominant rating system tool for delivering high performance buildings. Platt also oversees USGBC's

proactive engagement in US Policy and legislation development among federal and state agencies, on the Hill, in state capitals, city halls and county commissions across the country, as well as through the alliances USGBC has forged with other NGOs and public-private initiatives. This includes advancing USGBC's views to these constituencies on the benefits of green schools, green affordable housing, sustainable communities, and mitigating the impact of buildings on climate change. Platt joined USGBC after 15 years as senior vice president and counsel with the Real Estate Roundtable, whichrepresents the leaders of America's top public and privately owned real estate entities on public environmental and non-profit organizations to advance responsible public policy. Before joining the Real Estate Roundtable, he was a consultant to President Clinton's then newly formed Corporation for National and Community Service. He is a graduate of Harvard University and the University of San Francisco School of Law. He is a member of the California and District of Columbia bar associations and a member of the Urban Land Institute (ULI), where he chaired the ULI sustainable Development Council form 2001-2004, and current serves as assistant chair of the ULI Responsible Property Investment Council.

Jonathan F.P. Rose's business, public policy and not-for-profit work all focus on creating a more environmentally, socially and economically responsible world. In 1989, Mr. Rose founded Jonathan Rose Companies LLC, a multi-disciplinary real estate development, planning, consulting and investment firm, as a leading green urban solutions provider. The firm currently manages over $1.5 billion of work. By drawing on its human capital, financial depth and real estate expertise it creates highly integrated solutions to real estate challenges. The firm's work touches many aspects of community health; working with cities and not-for-profits to build not only housing, but also civic, cultural, educational and infrastructural open space. The firm's innovative work has won awards from a wide range of notable organizations including: the National Trust for Historic Preservation, the Natural Resources Defense Council, Global Green USA, the Urban Land Institute, the American Planning Association and the American Institute

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of Architects. Mr. Rose is a Trustee of several organizations including: the Urban Land Institute (and was a founding co-chair of its committee on Climate, Energy and Land Use); the Natural Resources Defense Council; and vice chair of Enterprise Community Partners. He serves on the leadership councils of the Yale University School of Forestry and Environmental Studies and the Yale School of Architecture. Mr. Rose also chairs the Trust for Public Land's National Real Estate Council and chaired the Metropolitan Transit Authority's Blue Ribbon Sustainability Commission. A thought leader in the Smart Growth, national infrastructure, green building, and affordable housing movements, Mr. Rose is a frequent speaker and writer. His work has received widespread media attention from CNN to The New York Times and was profiled in e², a PBS series on sustainable development. Mr. Rose also serves on the Board of the Brooklyn Academy of Music (BAM) and is a co-founder of the Garrison Institute with his wife, Diana Rose, where he leads the Climate, Mind and Behavior program. Mr. Rose graduated from Yale University in 1974 with a B.A. in Psychology and Philosophy, and received a Masters in Regional Planning from the University of Pennsylvania in 1980.

Dr. Kurt Roth is Director of the Building Energy Efficiency Group at the Fraunhofer Center for Sustainable Energy Systems (CSE). His group collaborates with industry on applied research to develop, analyze, test, evaluate, and demonstrate energy-saving building technologies. Prior to joining Fraunhofer CSE, he was a Principal in the Mechanical Systems group of TIAX LLC, formerly Arthur D. Little's Technology & Innovation business. Dr. Roth has led several studies funded by the Department of Energy to assess the energy savings and commercialization potentials of HVAC, building controls and diagnostics, toplighting, and information (IT) technologies. In addition, he leads analyses to characterize building energy consumption, including the energy consumed by consumer electronics, IT, medical equipment, and miscellaneous electric devices. Dr. Roth has presented at numerous conferences and meetings, and authored more than sixty "Emerging Technology" articles for the ASHRAE Journal. Dr. Roth received his B.S., M.S., and Ph.D. degrees from the Massachusetts Institute of Technology (MIT), all in mechanical engineering. He is a member of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), American Solar Energy Society, American Society of Mechanical Engineers, Northeast Sustainable Energy Association, and Sigma Xi.

Jonathan Rowson is Director of the Social Brain Centre at the Royal Society of Arts in London. He holds a first class degree in Politics, Philosophy, and Economics from Oxford University, an Ed.M from Harvard University in Mind, Brain and Education, and a PhD from Bristol University. His Doctoral thesis is an inter-disciplinary and multi-method examination of the concept of wisdom, including a detailed analysis of the challenge of overcoming the psycho-social constraints that prevent people becoming 'wiser', similar to what the RSA terms 'The Social Aspiration Gap'. A chess Grandmaster, Jonathan was British Champion for three consecutive years 2004-06. Jonathan now leads the RSA's Social Brain project.

Rachael Shwom is an assistant professor in the Human Ecology department who specializes in climate and society. She earned her Ph.D. in Sociology with a specialization in Environmental Science and Policy at Michigan State University in 2008. Her dissertation research focused on how different governmental, business, and environmental organizations sought to influence US policies on appliance energy efficiency over the past three decades. She is interested in energy efficiency policy because efficiency improvements are often identified as an important and politically feasible step for reducing US greenhouse gas emissions that drive climate change. She has also researched formation of public opinions on climate change, social science's role in enabling decision-makers to act on climate change under uncertainty, and media's coverage of climate change. In the future, she will continue her research on environmental and energy advocacy organizations and the factors that influence their decisions. She is also interested in the role that production decisions, such as those made by real estate developers and automobile manufacturers, play in changing energy consumption patterns.

Jennifer Tabanico is President and principal owner of Action Research, a firm specializing in changing human behavior through the application of traditional marketing techniques blended with the latest empirical insights from the social and behavioral sciences. Jennifer is a recognized leader in the application of community-based social marketing and has developed, implemented, and consulted on behavior change programs for a wide range of public and private agencies

worldwide. Her most recent clients have included the City and County of San Diego, the Urban Sustainability Directors Network (USDN), Keep America Beautiful, the New York Energy Research and Development Authority (NYSERDA), Cal Recycle, Efficiency Nova Scotia, and the USDA Forest Service. Over the last decade, Ms. Tabanico has conducted numerous studies of environmental attitudes, hazardous waste management, pollution prevention, energy conservation and community-based crime prevention. She is an author of both academic and technical publications in these areas including articles in the *Journal of Environmental Psychology*, *BioCycle*, and *Criminology*. She also is a co-author of book chapters on developing effective behavior change programs (*Handbook on Household Hazardous Waste*) and normative social influence (*Attitudes and Attitude Change*). Jennifer's primary talent lies in bridging the gap between academic research and real-world applications by facilitating communication between diverse groups and navigating them toward a common goal.

Jason S. Twill is Senior Project Manager, Sustainability, for Vulcan Inc. in Seattle, Washington. With over 13 years of experience in the areas of construction management, architecture, urban planning and real estate development, Jason is responsible for supervising all aspects of the development process for both new construction and existing building re-use projects for Vulcan Inc. Jason also currently oversees sustainability initiatives on behalf of the firm. His work in this area includes research and oversight of company-wide resource conservation programs, creating investment strategies for alternative energy and water systems, and advocacy work for policies that support environmentally conscious design. Jason earned a masters degree in real estate finance and development from New York University. He serves on the boards of the International Living Future Institute, BioRegional North America and is a co- founder and board member of the Green Sports Alliance. Jason is also a Fellow to the Runstad Center for Real Estate Studies at the University of Washington and is an appointed member of the Green Ribbon Commission for the City of Seattle. His latest project, *The Economics of Change*, seeks to redefine the economic models that drive investment in our built environments through integration and recognition of social and environmental value streams intrinsic in green buildings and infrastructure.

The accomplishments of the Climate, Mind and Behavior Initiative wouldn't be possible without the dedicated work of CMB Program Staff, and other Garrison Institute employees and consultants. We would like to recognize the contributions of the following individuals:

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How to Get Involved

If you are interested in supporting Climate, Mind and Behavior, please contact Bridget Connors at bridget@garrisoninstitute.org. To receive monthly updates about this project, subscribe at www.garrisoninstitute.org/email. If you would like to get involved, please contact climatechange@garrisoninstitute.org. Additional information about the CMB project and symposium can be found on the Institute's website at www.garrisoninstitute.org/cmb. Videos of select presentations can be seen at www.garrisoninstitute.org/cmb-video.

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