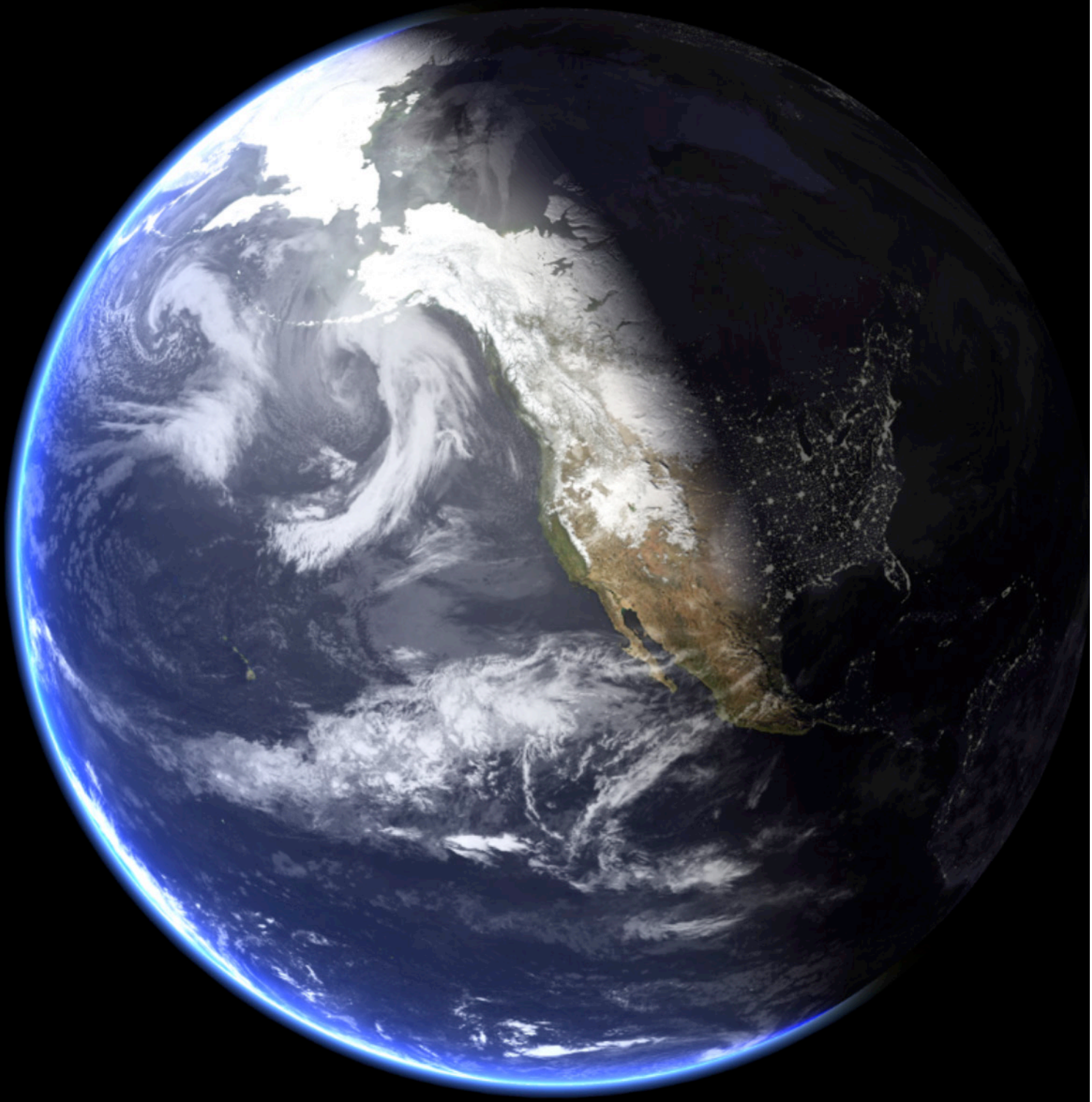
Toward a Climate & Energy Literate Society



Recommendations from the Climate and Energy Literacy Summit
December 7–9, 2012
Berkeley, California

Prepared by the National Center for Science Education
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March 2013

Cover Photo: Rendering of the North American continent hemisphere at 4:30 PM Pacific Time, February 25, 2013 from
Living Earth 3D using MODIS and other satellite imagery.

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Executive Summary: Recommendations from the Climate and Energy Literacy Summit

Understanding the causes of and responding to climate change is the major challenge of the 21st century. Most Americans do not understand the basics of climate change and energy or how they are inextricably connected, yet informed decisions, a prepared workforce, and risk reductions are not possible without a clear understanding of these topics. Research shows that in general those who have a basic understanding of the science are more concerned with addressing climate change (Leiserowitz 2010, 2011, Miller 2012). Moreover, Improving society's climate and energy literacy should be a top priority addressed through science education and through a range of other education, communication, and outreach strategies.

To counter the scientific illiteracy standing in the way of meeting these urgent 21st-century challenges, a group of fifty leaders in the climate and energy community gathered in Berkeley, California, between December 7 and 9, 2012, to participate in the Climate and Energy Literacy Summit hosted by the National Center for Science Education. The attendees included climate, energy, education, technology, and research experts, curriculum developers, philanthropists, science journalists, representatives from climate- and energy-related non-profits and professional societies, federal and state agencies, and the National Academy of Sciences.

The goal of the Summit was to identify ways "**to substantially and measurably improve climate and energy literacy to provide society and the next generation with the scientific foundation to take informed actions to minimize climate impacts and prepare for changes that are already well underway**."

Participants agreed that many components already exist to forge a national climate and energy literacy initiative, but substantial challenges remain in terms of coordination, training and funding. Following are key recommendations of the Summit:

- Create a national initiative using the *Collective Impact* approach for effective partnership by developing a common agenda, shared measures, engaging in reinforcing activities and continuous communication, and having a supporting infrastructure;
- Significantly expand through private funding the availability of existing high-quality climate and energy related education, communication, and outreach programs;
- Emphasize teaching climate change and energy topics throughout education, which is vital to establishing a strong foundation for future decisions and in fostering resilient communities;
- Build on existing resources and frameworks, including the U.S. Global Change Research Program's *Climate Literacy* and *Energy Literacy* documents (see Appendix II);
- Support the climate and energy-related aspects of the forthcoming Next Generation Science Standards (NGSS);
- Collaborate with key programs and partners, including the *100K in 10* initiative, which aims to recruit and prepare 100,000 science, technology, engineering, and mathematics teachers in ten years;
- Maximize the potential for digital learning opportunities, including online courses, educational gaming and the use of digital badges and certification;
- Identify and address the education, communications, and outreach needs of underserved and vulnerable communities relative to these topics;
- Conduct a national survey to determine whether, where, and how climate change and energy topics are taught in formal education; and
- Anticipate and effectively respond to denial and manufactured doubt about climate change.

A Path Forward

The Summit

Held at the David Brower Center in Berkeley, California, between December 7 and 9, 2012, and hosted by the National Center for Science Education, the Climate and Energy Literacy Summit brought together experts from diverse backgrounds who share a common goal: to substantially and measurably improve climate and energy literacy. The aim: to provide this and future generations with the scientific foundation necessary to take informed actions to minimize climate impacts and prepare for changes that are already well underway.

Following are many of the action items and recommendations that emerged during the Summit. Some are easily achievable with minimal commitment of resources; others will take more effort and planning; and some are long-term goals that will require years if not decades to fully achieve. Some will need to be addressed by federal, state, or local governments and school boards, some by institutions of higher learning and education publishers, some by scientific or educational associations, some by not-for-profit organizations, and some may be pursued by interested students, teachers, parents, and citizens. A coordinated national initiative can help to achieve these goals.

There is much to do, but through shared goals, common measures of success, collaboration, communication, and supporting infrastructure, current and future generations can indeed "substantially and measurably" increase our understanding of and ability to respond to climate and energy challenges.

Literacy Matters

An informed citizen participating in the democratic process should know that human activities are warming the planet, that the resulting climatic changes have serious consequences, and that steps can be taken to minimize negative impacts. But most Americans are not informed. Studies indicate that most American teenagers and adults never learned basic climate science in school, but that most would like to know more (Leiserowitz 2010, Miller 2012). Although most people fail when quizzed on climate and energy basics, Leiserowitz (2011), found that graded on a curve, 97% of those alarmed about climate change receive a passing grade, compared with 56% of those who are dismissive of current climate science findings and 19% of those who are disengaged.

While scientific literacy is a long-term investment, broadly benefitting society, its returns can be quickly realized, with understanding leading to informed action and more open discussion. According to U.S. Census data (2011), 76 million Americans are students, with 40 million in primary, 16 million in secondary, and 20 million in post-secondary schools. With proper investment from public and private sectors, schools could become living laboratories for climate and energy studies and most students in the nation could attain basic climate and energy literacy in less than a decade.

Challenges to Climate and Energy Education

Although the United States leads the world in climate and energy research, there are many challenges to climate and energy education in this country. Both climate change and the impact of fossil fuels on climate and the environment have been largely neglected in current science education standards and curricula; professional development for educators is uneven or non-existent; quality instructional resources for the classroom are hard to find; and there has been a concerted effort to foster doubt and denial of climate change science, inside of classrooms and throughout society. Some states have faced repeated attempts to pass legislation mandating the teaching of the "strengths and weaknesses" of climate change. Some of these efforts have succeeded. Due to a highly polarized and politicized societal climate, some teachers are hesitant to teach climate change, or, out of a sense of fairness and balance, teach incorrectly that there is scientific controversy as to whether it is happening and human activities are the cause. Moreover, the quality of science education in the United States is uneven at best, with wealthy school districts generally excelling while inner city and rural schools often struggle to meet even basic science standards.

First Steps: The Next Generation Science Standards

There is hope for addressing the neglect of climate science education with the appearance of the Next Generation Science Standards (NGSS), set for release in late 2013. Based on the National Research Council's Framework for K–12 Science Education released in 2011, the NGSS were developed by a consortium including 26 states, which have pledged to seriously consider implementing them. Other states may adopt them as well. If these new standards are widely deployed at the state level with appropriate curricular materials and support for teachers, they will shape the development of science curriculum for years to come, influencing the content of textbooks and other instructional resources as well as the professional development of educators. Crucially, they will help prepare young people to understand and respond to the climate and energy challenges of the 21st century.

In the states where the NGSS will be implemented, students graduating from high school would understand the basic science underlying climate and energy, and appreciate the engineering, technological and societal response options that are available to mitigating climate change. Since students are a part of families and communities, NGSS and related curriculum and professional development for educators could have a ripple effect of improving climate and energy literacy beyond the classroom and into communities. The Next Generation Science Standards complement the principles and concepts contained in both the *Climate Literacy* and *Energy Literacy* documents, which are available through the U.S. Global Change Research Program. Online resources such as the Climate Literacy and Energy Awareness Network (CLEAN) will help educators find appropriate resources and pedagogical guidance. (See Additional Resources, Page 14.) While NGSS alone will not solve the climate and energy knowledge gap, it is potentially an important catalyst to build on.

Action Items

Build Partnerships

A national climate and energy literacy initiative will build on the foundation of existing partnerships, such as the Climate Literacy Network, founded in 2008, and a variety of education, communications, and outreach programs formed in recent years. There was no substantial federal funding for climate and energy education in the United States until 2009 when Congress authorized funds for the development of climate change education resources.

Grants issued by the National Science Foundation, NOAA, and NASA led to the development of a wide array of websites, curricula, museum programs, and professional development programs for educators, many of them represented at the Summit. Privately funded efforts, such as the Alliance for Climate Education (ACE), have also made important contributions, but funding from public and private foundations has in some cases diminished and certainly is not remotely at the level required to address the problem. In particular, foundations and philanthropic organizations must step up to support these vital efforts.

In addition to financial constraints, challenges to building partnerships toward shared goals include differences in mission (educational or advocacy), scope (local, regional, or national), audience (students, professionals, or general public) and discipline (climatology, oceanography, biology, economic policy, social justice, community resilience/risk reduction). The largely volunteer-driven Climate Literacy Network has helped in information sharing, but the time has come for a more coordinated effort to maximize collaboration, preserve our best efforts, build on our individual and collective strengths, and encourage the development of resources and services for unmet needs.

There are many components to climate and energy literacy, and different institutions can make complementary contributions to respond to the challenge. Communication, collaboration, and cooperation can avoid duplication, enable partners to contribute their strengths, and produce synergies previously unidentified. The Collective Impact framework, which has proven successful at bringing together diverse partners around a shared agenda, will help to forge strong and lasting partnerships, providing there are sufficient resources to begin the process. A Climate and Energy Literacy Campaign could serve as the focal point for such a collaborative effort.

<u>Recommendations</u>:

- **Deploy Collective Impact Framework**. A proven model for successful partnership collaboration among diverse organizations, this approach involves developing a common agenda and shared measures, engaging in mutually reinforcing activities and continuous communication that is supported by a robust financial and administrative backbone.
- **Secure Resources.** Identify the human, intellectual, and financial resources required to achieve success of the initiative over short-term to long-term time scales.

- **Build on Existing Efforts.** In addition to the organizations and projects represented at the summit (see Participant List in Appendix 1), there are others doing exemplary work to improve climate and energy literacy; together they provide the building blocks of a major national scientific literacy initiative.

Infuse Climate and Energy Into Formal Education

Now, if students are taught climate- and energy-related topics at all, it is usually in middle and high school environmental and Earth science courses. Unfortunately, Earth science teachers represent only a fraction of all high school science teachers.

At present, we do not know where, how, or even whether climate and energy are being taught in the U.S. Informal surveys provide a glimpse at the problem, but a scientifically designed, accurate, and reliable national survey of teachers to establish a baseline of whether, where and how these topics are taught is a priority. Data from the National Science Teachers Association[1] suggest that of the 150,000–180,000 science teachers in middle and high school in the United States, fewer than 16,000 teach Earth science and most lack solid background in the topic. Human-caused climate change was not included in the 1996 National Science Education Standards, and state standards are patchy at best in terms of coverage of climate and related energy science.

Ideally, climate and energy literacy should be taught throughout the grade levels in developmentally appropriate ways, and not only in science but in mathematics, social studies and other relevant courses. At the high school level, some climate and energy concepts can be folded into biology class, the most widely taken high school science course.

Alas, few teachers K12 or even undergraduate teachers currently have the content or pedagogic background to effectively teach these topics at any grade level, and thus professional development for current teachers and the recruitment and training of new teachers in these areas is a priority. Ideally, all STEM teachers should be climate and energy literate, and the *100K in 10* initiative, which aims to train 100,000 new STEM teachers in 10 years, offers an opportunity to further infuse climate and energy into science education, but increasing the number of Earth and space science teachers who will deliver curriculum related to climate change dynamics covered in NGSS should also be a priority.

Based on the depth of content knowledge and pedagogical skill that are assumed in NGSS, teachers will need well-tested lesson plans, visualizations, videos, and other curricular materials that can easily be integrated into already developed courses. Some of these resources have already been identified through the CLEAN project. In addition, ideally all teachers should be prepared to withstand pressure caused by denial of climate change, which can take the form of apathetic or contrary students, annoyed parents, administrators, or other faculty. While denial can distract from literacy

[1] http://www.nsta.org/about/olpa/faq.aspx

efforts, discouraging teachers from presenting the science, there are many people in the community, including parents, who wholeheartedly support climate and energy literacy. These supporters can be encouraged to become "ambassadors" in their communities, advocating for increased literacy and the requisite resources to achieve success.

The higher education community also has a vital contribution to make in improving educator content knowledge, increasing the number (and quality) of science teacher graduates, and in increasing climate and energy literacy of its own graduates. Furthermore, when it comes to requirements for college admissions, administrators will need to consider how best to address the changing science education landscape, which has traditionally emphasized credits in biology, chemistry, and physics over those from Earth and environmental sciences. Universities, community colleges, and technical schools can also work to establish closer relationships with K–12 classroom teachers to improve mastery of what will be new subject matter to many of those teachers. Many colleges and universities are signatories of the *American College and University Presidents' Climate Commitment*, which require schools to develop climate action plans and offer "courses and other educational experiences to all students" relating to climate change and sustainability. These and related efforts can be leveraged toward the shared vision of increased climate and energy literacy.

Recommendations:

- **National Climate and Energy Survey**. Develop and deploy a survey for educators throughout formal education regarding their knowledge and teaching of climate and energy science principles, which will establish an essential baseline of literacy that can be revisited in future years.
- **Evaluate and Disseminate Resources**. Building on the review criteria and digital catalog of the Climate Literacy and Energy Awareness Network (CLEAN), continue to evaluate extant resources relating to climate and energy education, and to engage in communications and outreach in order to reduce duplication, preserve excellence, and determine gaps in climate and energy education resources that need to be filled.
- **Fill Gaps in Materials and Training.** Develop appropriate learning resources and professional development that reflect current science where gaps have been identified.
- **Ambassador Program.** Establish grassroots programs to encourage students, parents, educators, business, and community leaders, and other concerned citizens, including those most vulnerable to climate change impacts, to be strong advocates for the proper implementation of the NGSS and climate and energy literacy in their communities.
- **Defend against Denial and Doubt**. Provide educators with ideologically neutral materials to assist them in coping with climate science denial, including scientific rebuttals and guidance on best practices for countering denial and manufactured doubt.
- **Engage Higher Education.** Offer courses and other educational experiences about climate and sustainability to all college students, as per the *American College and University Presidents' Climate Commitment*; encourage universities, community colleges, and technical schools to

become integral partners with schools and communities to infuse climate and energy literacy and informed action into society.

- **Teacher Preparation.** Devise incentives for post-secondary institutions to train more STEM teachers competent in climate and energy sciences, as a component of the *100K in 10* initiative and/or other related programs that will help to foster workforce develop and entrepreneurship in the coming years and decades.
- **Revamp College Entrance Requirements**. Most colleges require two to four years of laboratory science in high school for college entrance, but some do not recognize Earth science and/or environmental science as laboratory courses. College-bound students are thus discouraged from taking these courses, which are the ones most likely to cover climate and energy science. In addition, colleges, universities, and the College Board should anticipate and be supportive of how NGSS and new learning strategies are changing the science education landscape.

Maximize Informal Education Opportunities

Informal education venues such as museums, zoos, science centers, aquaria, and other "free choice" learning environments are another opportunity to increase climate and energy literacy, and they complement the efforts of the formal education system. Citizens of all ages can be reached through informal education venues and websites. Other messengers of science literacy include weather forecasters, insurance adjusters, the military, public health officials, and leaders of youth organizations.

Those involved with informal literacy efforts can recruit and train enthusiastic science literacy advocates to engage communities through talks, meetings, citizen science, and other hands-on activities.

Just as teachers need training and tools, so do informal science educators, so they can engage community members through talks, meetings, citizen science projects, and other hands-on activities.

Media outlets can amplify and reinforce the learning that takes place in both formal and informal venues by publicizing their efforts and highlighting additional information for those who want to learn more. Media can also increase literacy by increasing coverage of climate and energy issues. Scientists can help in this effort by sharing their knowledge and research, although many need training in how to most effectively communicate with the media and with the public. Science communicators and the science research community can benefit from understanding of where climate and energy topics are taught in the curriculum and why.

<u>Recommendations:</u>

- **Unpack Key Concepts.** The Next Generation Science Standards and the climate and energy literacy frameworks contain important concepts that members of the informal education community will find useful for increasing climate and energy literacy.

- **Engage Trusted Messengers**. Trusted messengers and influential leaders within a community can help convey the relevance and importance of climate and energy literacy.
- **Provide Tools and Training**. Ambassadors for climate and energy literacy must customize how key climate and energy concepts are conveyed to different audiences, and provide appropriate regional and cultural context for the information.
- **Link Education, Communications, and Outreach**. Literacy-building efforts can be improved by appreciating the different but potentially complementary roles of education, communications, and outreach, each with their strengths and constraints.

Helping the Vulnerable: Religious Groups, and Social and Environmental Justice Organizations

The Forum on Religion and Ecology at Yale has compiled climate change statements[2] from all major world religions that stress the responsibility of humans to be good stewards of the planet and help the most vulnerable. Many secular groups that focus on social justice and environmental issues also emphasize the moral dimensions associated with the consequences of climate change. Many students and individuals involved with social justice and religious organizations seek to address equity and access issues, as well as pollution and health problems that disproportionately affect disenfranchised members of society.

We believe that addressing these issues should be grounded in accurate scientific knowledge. Climate and energy literacy is essential for the success of these social justice and equity organizations, and thus should be included in their message.

Religious leaders and members of social and environmental justice organizations can be important trusted messengers to their communities, especially those that are poorly served or underserved by the formal and informal education providers. Enlisting the guidance and support of religious institutions and as organizations, such as Green for All, Roots of Success, and Movement Generation, in the campaign for improved climate and energy literacy will bolster and broaden the overall initiative and help to ensure that materials and strategies are customized to meet the needs of underserved communities and individuals.

Recommendations:

- **Convene Working Group**. Convene a national-level working group composed of religious, social justice, and environmental justice organizations to discuss common concerns, including the disproportionate effect of climate change on specific groups, energy equity, and access to appropriate energy resources.
- **Learn What is Needed.** Assess what is really needed and desired by communities and those that serve them.

[2] http://fore.research.yale.edu/climate-change/statements-from-world-religions/

- **Building Resiliency, Reducing Risk**. Examine how climate and energy education can contribute to helping vulnerable communities build resiliency and improve sustainability, reduce climate and energy risks, and provide work-force training in energy conservation and climate mitigation fields.
- **Customizing Curriculum**. Continue to identify existing climate and energy curricula through existing programs such as CLEAN and create new curricula that are culturally competent and address the needs of underserved and vulnerable communities.

New Tools: Social Networking and Information Technology

In the Internet Age, virtually everyone online has their own "personal learning network" of people, websites, and resources used to exchange information. These can take the form of online social media (Facebook, Twitter, YouTube, etc.), digital versions of traditional media sources such as the New York Times, informal news sources such as blogs and podcasts, and Meetup.com-type community groups. For broad dissemination and uptake of climate and energy literacy, these networks, as well as online and computer games, virtual reality realms, and crowdsourcing, can be tapped for climate and energy literacy-related projects.

New developments that could help improve climate and energy literacy are online courses, educational gaming, and digital badges. Online courses for the public range from large scale Massive Open Online Courses (MOOCs) that can be accessed by tens of thousands of participants, to much smaller online communities for educators and learners. Educational gaming is a fast developing field that is a hybrid of video gaming and interactive educational simulations, while digital badges are a way of rewarding online learning. Similar to merit badges, they are used to replace certificates or diplomas as evidence of completion of certain courses or skills. Digital badges could focus on career pathways requiring people to complete skills or quests to address climate and energy issues.

<u>Recommendations:</u>

- **Develop and Deploy Scalable Online Courses.** Recruit skilled post-secondary instructors to develop online courses that include educational gaming, focusing on climate and energy literacy for educators, high school or postsecondary students, the military, and/or the general public.
- **Promote Digital Badges.** Offer digital badges that can replace or supplement certificates of completion for online courses, encouraging learners to complete the courses.
- **Engage Gaming Community**. Survey professional game developers to determine their openness to 1) including themes reflecting climate/energy science principles within their current games, and/or 2) developing new games that would have these themes as components.
- **Tap Personal Learning Networks**. Climate/energy science principles can be broadly defused through many online channels, such as Twitter, Pinterest, Facebook, and online study groups.

Taking the Next Steps

Our common agenda is clear: to substantially and measurably increase climate and energy literacy in the United States. To do this will require integrating these topics throughout K–16 science courses, using science literacy frameworks, NGSS, and synergistic initiatives. The *Collective Impact* framework offers a proven model for successful partnership collaboration among diverse organizations through development of a common agenda and shared measures, engaging in mutually reinforcing activities and continuous communication, and being supported by a robust financial and administrative backbone. The community shares a sense of urgency as well as a vision that achieving substantially increased climate and energy literacy is possible and imperative.

Finally, the action items summarized in the Table below will require adequate scientific, intellectual, and financial assets from public and private sources to provide the leadership and infrastructure for the success of the initiative. Like climate itself, climate literacy can create change both quickly and over the long term.

Over the next 10 years, a national initiative to significantly and measurably increase the climate and energy literacy will help to prepare the 56 million students currently in K–12 education, the 20 million more in post-secondary schools, and the millions of other professionals, including the military, farmers, coastal residents, and many others who make climate and energy related decisions in their jobs. And ultimately it will serve the broad public, who want and deserve to know more about these vital topics in order to make informed choices, reduce risk, and build resilient, sustainable communities.

Table of Actions. An initial ranking and timeline of steps to achieve the shared vision of "substantially and measurably increasing climate and energy literacy." Determining what organizations will tackle which actions and how the effort will be coordinated is an important next step. Modest efforts are "low-hanging fruit" that require a minimal investment of time and capital; substantial efforts will need significant planning to develop, implement, and measure; and large efforts will require considerable investment of human, intellectual, and financial capital to achieve over years and decades.

Modest	Substantial	Large	Time Frame		
Efforts Required			**2013**	**2014**	**Beyond**
Building Partnerships					
Deploy Collective Impact Framework					
Secure Resources					
Building on Existing Efforts					
Formal Education					
National Climate and Energy Survey					
Evaluate and Disseminate Resources					
Fill Gaps in Materials and Training					
Ambassador Program					
Defend against Denial and Doubt					
Engage Higher Education					
Teacher Preparation					
Address College Entrance Requirements					
Informal Education					
Unpack Key Concepts					
Engage Trusted Messengers					
Provide Tools and Training					
Link Education, Communications, and Outreach					
Helping the Vulnerable					
Convene Working Group					
Learn What is Needed					
Building Resiliency, Reducing Risk					
Customizing Curriculum					
New Tools: Social Networking and Information Technology					
Develop and Deploy Online Courses					
Digital Badges					
Engage Gaming Community					
Tap Personal Learning Networks					

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U.S. Census Bureau (2011). Statistical Abstract of the United States. Retrieved from: http://www.census.gov/compendia/statab/2011/tables/11s0216.pdf

Additional Information

- *100K in 10* initiative: http://www.100kin10.org
- Alliance for Climate Education: http://www.acespace.org
- American College and University Presidents' Climate Commitment: http://www.presidentsclimatecommitment.org
- Collective Impact: http://www.ssireview.org/articles/entry/collective_impact
- Climate Literacy & Energy Awareness Network: http://cleanet.org
- Climate.gov: http://climate.gov
- National Center for Science Education: http://ncse.com
- National Research Council Framework for K12 Science Education: http://www7.nationalacademies.org/bose/Standards_Framework_homepage.html
- Next Generation Science Standards: http://www.nextgenscience.org
- U.S. Global Change Research Program- Climate and Energy Literacy Frameworks: http://www.globalchange.gov/resources/educators

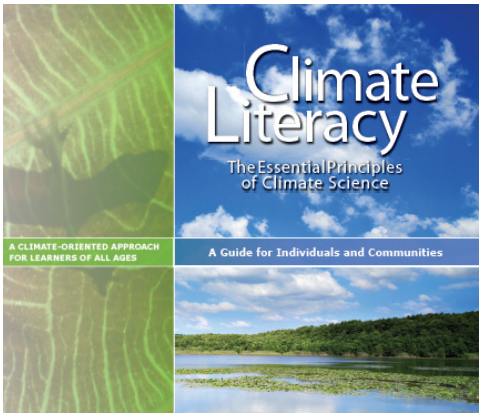
Appendix I: Climate & Energy Summit Participants List

Name (last, first)	Organization
Anderson, Allison	Brookings Institute
Arvizu, Shannon	The Frameworks Institute
Asher, Pranoti	American Geophysical Union
Barton, Marcia	Einstein Fellow
Berbeco, Minda	National Center for Science Education
Boudet, Hilary	Oregon State University
Boudrias, Michel	University of San Diego
Byers, Al	National Science Teachers Association
Chen, Carrie	Aquarium of the Bay
Dawley, Lisa	GoGo Labs
Elder, James	Campaign for Environmental Literacy
Ehlers, Bryan	CalRecycle
Flam, Faye	Freelance science journalist and WHYY contributor
Flora, June	Stanford University
Gaible, Edmond	Natoma Group
Grajal, Alejandro	Chicago Zoological Society
Greco, David	Nonprofit Finance Fund
Griswold, Marcus	MADE-CLEAR
Haas, Mike	Alliance for Climate Education
Hamilton, Lawrence	University of New Hampshire
Herr, Meredith	The Social Capital Project
Hoyos, Lisa	BlueGreen Alliance
Karsten, Jill	National Science Foundation
L'Amoreaux, Claudia	Natoma Group
Ledley, Tamara	TERC
McCaffrey, Mark	National Center for Science Education

McVey, Megan	United States Global Change Research Program
Molina, Mario	Alliance for Climate Education
Mourad, Teresa	Ecological Society of America
Niepold, Frank	NOAA
Pinderhughes, Raquel	Roots of Success
Pfirman, Stephanie	Columbia University
Poppleton, Kristen	Will Steger Foundation
Rooney-Varga, Juliette	University of Massachusetts, Lowell
Rosenau, Josh	National Center for Science Education
Saltzman, Jennifer	Stanford University
Schoedinger, Sarah	NOAA
Scotchmoor, Judy	University of California Museum of Paleontology
Schwille, Kathleen	National Geographic
Scott, Eugenie	National Center for Science Education
Shanley Hope, Sarah	Alliance for Climate Education
Simoneaux, Nicole	Nonprofit Finance Fund
Smithson-Stanley, Lynsy	Climate Nexus
Souweine, Daniel	Citizen Engagement Lab
Steiner, Mary Ann	Carnegie Museum of Natural History
St. John, Courtney	Columbia University
Storksdieck, Martin	National Academy of Sciences
Trottier, Lorne	National Center for Science Education: Board Member
Wertheim, Jill	National Geographic
White, Lisa	University of California Museum of Paleontology

Appendix II

What is Climate Science Literacy?



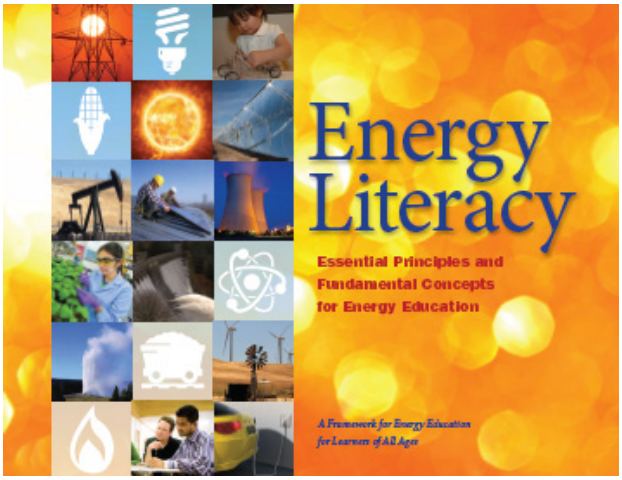
Climate Science Literacy is an understanding of your influence on climate and climate's influence on you and society

A climate-literate person:

- Understands the essential principles of Earth's climate system,
- Knows how to assess scientifically credible information about climate,
- Communicates about climate and climate change in a meaningful way, and
- Is able to make informed and responsible decisions with regard to actions that may affect climate.

United States Global Change Research Program (2009). Climate Literacy: The Essential Principles of Climate Science- A Guide for Individuals and Communities

What is Energy Literacy?



Energy literacy is an understanding of the nature and role of energy in the universe and in our lives. Energy literacy is also the ability to apply this understanding to answer questions and solve problems.

An energy-literate person:

- Can trace energy flows and think in terms of energy systems
- Knows how much energy he or she uses, for what, and where the energy comes from
- Can assess the credibility of information about energy
- Can communicate about energy and energy use in meaningful ways
- Is able to make informed energy and energy use decisions based on an understanding of impacts and consequences
- Continues to learn about energy throughout his or her life

United States Global Change Research Program (2012). Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education