



9 Education, Training, and Outreach

Climate change education, training, and outreach have continued to expand since the last *U.S. Climate Action Report* was released in 2002. Federal programs support formal educational initiatives ranging from K-12 classroom curriculum to undergraduate, graduate, and postdoctoral research, and informal education conducted in museums, parks, nature centers, zoos, and aquariums across the country. Educators can also access extensive on-line educational global change resources, such as the sample federal websites highlighted in Table 9-1 at the end of this chapter.

Efforts by state and local governments, universities, schools, and nongovernmental organizations (NGOs) are essential complements to federal programs that educate industry and the public regarding climate change. State environment and energy agencies provide teacher training workshops, often in cooperation with universities and local utility companies; local school systems institute climate change curricula and activities at the middle and high school levels; universities are joining forces with NGOs to educate staff and students about the importance of energy efficiency and are instituting new, sustainable practices on campuses across the country. From wildlife conservation groups (e.g., National Wildlife Federation, World Wildlife Fund, Izaak Walton League, and Federation of Fly Fishers), to science-based organizations (e.g., American Meteorological Society, Union of Concerned Scientists), to energy-oriented groups (e.g., Alliance to Save Energy), a variety of NGOs conduct workshops and surveys, produce brochures and kits, and write media articles to alert the public to the science underlying, impacts of, and possible solutions to climate change.

Industry is also beginning to play a role in education, training, and outreach. Several corporations have contributed to the National Park Service's efforts to communicate energy efficiency messages; various electric utilities conduct education forums to educate the public about the sources and choices of electrical power in this country and the need for energy efficiency in today's world; oil companies advertise and sponsor conferences to make people aware of alternative energy sources and the possible impacts of the choices we make.

Because of these efforts, the American public is better informed about climate change and better equipped to adjust their lifestyles to enhance the sustainability of planet Earth.

FEDERAL AGENCY EDUCATION AND OUTREACH ACTIVITIES

Several federal agencies provide state and local governments, industry, NGOs, and the public with information about national and global climate change research and risk assessments studies, U.S. mitigation activities, and policy developments. They work both independently and in partnership with other agencies, NGOs, and industry toward the common goal of increasing awareness about the potential environmental and societal challenges posed by climate change.

U.S. Agency for International Development

The U.S. Agency for International Development's (USAID's) Global Climate Change Program incorporates climate change considerations into development projects. A significant part of this program involves building the capacity of local partners to understand how climate change issues affect their ability to achieve their development goals.

Global Climate Change Program

The Global Climate Change Program provides a resource for learning more about USAID's climate change activities in more than 40 developing and transition countries. The program's Publications and Outreach section includes sector overviews, such as Clean Energy Technology, Land Use and Forestry, Adapting to Climate Variability and Change, Capacity Building, and Climate Science for Decision Making. The program also provides publications focusing on climate change and individual regions, and highlights the climate change activities undertaken in various countries where USAID maintains climate change portfolios, including training, education, and outreach efforts.

Climate Partnerships

USAID places particular emphasis on partnerships with the private sector and on working with other U.S. government agencies, local and national authorities, communities, and NGOs to create alliances that build on each other's relative strengths. Bringing together a diverse range of stakeholders helps avoid unnecessary duplication and lays the foundation for a sustained, integrated approach. Through training, tools, and other means of capacity building, USAID helps developing countries and countries with economies in transition address climate-related concerns as a part of their development goals.

Mexico Landfill Gas Model—An example of these climate partnerships is USAID's collaboration with the U.S. Environmental Protection Agency (EPA) and several Mexican government agencies to help landfill owners and operators in Mexico evaluate

the feasibility and potential benefits of collecting and using landfill gas for energy recovery. This effort resulted in the development of the Mexico Landfill Gas Model, a training workshop, and a guidance manual.

Global Partnerships

Since its inception, USAID has worked in cooperation with U.S. and international partners to improve conditions for people around the world. While these partnerships have long been key to USAID's success, this strategy has never been more important than now. USAID is committed to an approach that recognizes and incorporates the efforts of partnership and private giving, focusing on grassroots support, local ownership, sustainability, and accountability.

U.S. Department of Agriculture

As the U.S. Department of Agriculture's (USDA's) chief intramural scientific research body, the Agricultural Research Service (ARS) is responsible for research on the impacts of agricultural practices on potential climate change or disruptions and vice versa. Although ARS has no formal educational mechanism to disseminate research information to the general public, it employs a number of less formal means to communicate and make use of research advances.

All scientific research publications are submitted with an Interpretive Summary that is used for timely news releases. In addition, through collaboration with university scientists, climate change research information is provided to state and county cooperative extension agencies for release to identified producers. Also, all agency field locations publish informative brochures that describe their work and the impact of the research findings on stakeholders' interests.

Table 9-1 lists websites that provide additional information about ARS's Global Change Program and research magazine, the Global Change Program Office's activities, and the Natural Resources Conservation Service's work on managing carbon sequestration and reducing greenhouse gas emissions.

U.S. Department of Energy

The U.S. Department of Energy (DOE) supports numerous education and outreach initiatives focused on increasing energy efficiency and reducing greenhouse gas emissions. Some of these initiatives are outlined below and in Table 9-1.

Energy Efficiency Initiatives

Energy Savers—This program and public awareness campaign educates consumers, homeowners, and businesses on smart energy use and how to cut energy bills.

Energy Hog—This national public service advertising campaign helps children and their parents learn about energy-efficient behavior.

Building Technologies Program—This program offers a wide range of information on reducing energy consumption in homes and other buildings, which account for roughly 40 percent of energy use.

Building Toolbox—This comprehensive guide to designing, constructing, or renovating more efficient, affordable buildings includes software tools to help researchers, designers, architects, engineers, builders, code officials, and others evaluate and rank potential energy efficiency technologies and renewable energy strategies.

Home Energy Saver—Part of the joint DOE/EPA ENERGY STAR program, this initiative is designed to help consumers identify the best ways to save energy in their homes and find the resources to realize those savings.

Carbon Dioxide Information Analysis Center

This center, which includes the World Data Center for Atmospheric Trace Gases, is DOE's primary center for global change data and information analysis.

National Institute for Global Environmental Change

This DOE-funded institute conducts research on global climate change in six U.S. regions—the Great Plains, Midwest, Northeast, South Central, Southeast, and West; integrates and synthesizes information to help decision makers and communities better respond to regional-scale or ecosystem-scale

effects of climate change; and educates the public on climate change and energy-related environmental risks.

Office of Fossil Energy, National Energy Technology Lab, Keystone Center

DOE's Office of Fossil Energy and the National Energy Technology Lab are working with the Keystone Center of Keystone, Colorado, to conduct outreach, risk communication, stakeholder efforts, and focus groups to better understand community concerns related to carbon sequestration. The Keystone Center hosts a teacher training institute focusing on a climate change curriculum developed under a grant from DOE. Its staff attend regional and national meetings to present overviews of the curriculum to teachers across the country.

Global Change Education Program

DOE's Global Change Education Program continues to support three coordinated components aimed at providing both research and educational support to post-doctoral scientists, graduate students, faculty, and undergraduates at minority colleges and universities, through the Summer Undergraduate Research Experience (SURE), Graduate Research Environmental Fellowships (GREF), and the Significant Opportunities in Atmospheric Research and Science (SOARS) program.

U.S. Department of the Interior

National Park Service

As the steward of the world's foremost system of national parks, the National Park Service (NPS) is responsible for preserving and protecting the significant resources within the parks for the enjoyment of future generations. Recognizing its role as the model for national park systems around the world, NPS has increased its support of education on climate change and environmental stewardship through several innovative programs.

Sustainability Initiative—Through a combination of interpretive talks, signage, brochures, fact sheets, and other informational materials and programs, NPS is educating visitors about its efforts to ensure the sustainability of the national park system.

Greening of the National Park Service—NPS conserves energy and incorporates renewable energy resources into the park system to save money, to protect the parks' natural resources, and to educate the public about creating environmentally friendly facilities. Park visitors learn about NPS's "greening" activities through fact sheets, brochures, and on-site signage.

Climate Friendly Parks—NPS and EPA have joined forces to conduct the Climate Friendly Parks program. NPS is "leading by example" in mitigating climate change and air quality impacts in the parks by implementing action plans to reduce greenhouse gas emissions in the parks and providing a model to visitors on how to reduce energy consumption and emissions in their communities. The action plans are based on greenhouse gas emission inventories that quantify their baseline activities in several areas, including facility management, fleet management, visitor transportation, and waste management. The parks commit to educating park visitors and the community on the importance of reducing emissions and saving energy, and how these actions may help reduce harmful impacts on the parks. NPS communicates success stories from its parks' mitigation work through its creative labeling of energy-efficient projects in the parks, interpretive programs in the parks and in the communities, educational programs in schools, and wayside exhibits.

U.S. Geological Survey

As the Nation's largest water, Earth, and biological science and civilian mapping agency, the U.S. Geological Survey (USGS) collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. The agency's diversity of scientific expertise enables it to carry out large-scale, multidisciplinary investigations and provide impartial scientific information to resource managers, planners, and other customers.

The USGS and Science Education—USGS provides scientific information to educate the public about natural resources,

natural hazards, geospatial data, and quality-of-life issues. Educational resources include lesson plans and maps to assist teachers in communicating the concepts of global change.

Earth Surface Dynamics Program—USGS global change research activities strive to achieve a whole-system understanding of the interrelationships among Earth surface processes, ecological systems, and human activities. USGS work in the Earth Surface Dynamics Program focuses on understanding the likely consequences of climate change, especially by studying how climate has changed in the past.

U.S. Department of Transportation

Transportation is the fastest-growing U.S. source of greenhouse gases. Additionally, climate change may affect U.S. transportation systems through more frequent weather disruptions, changes in infrastructure life, rising sea levels, and other impacts. The U.S. Department of Transportation (DOT) has developed programs to address these issues.

Center for Climate Change and Environmental Forecasting

The center is the focal point of DOT technical expertise on transportation and climate change. Through strategic research, policy analysis, partnerships, and outreach, the center focuses on activities designed to reduce transportation-related greenhouse gases and to mitigate the effects of global climate change on the transportation network.

It All Adds Up to Cleaner Air

Developed and guided by the Federal Highway Administration, the Federal Transit Administration, and EPA, this initiative is a multilevel public education and partnership-building program to inform the public about the connections between their transportation choices, traffic congestion, and air pollution through television, radio, and print public service announcements. The program encourages people to take simple, convenient actions that can make a difference in traffic congestion and air quality when practiced on a wide scale, such as trip chaining

(combining trips), car maintenance, and alternative modes of transportation.

The campaign's messages were designed to increase public awareness of the connection between travel behavior and air quality, with a focus on reducing criteria air pollutants from motor vehicles. Improved transportation choices also produce an important ancillary benefit of reducing greenhouse gas emissions.

U.S. Environmental Protection Agency

EPA supports numerous climate change outreach and education initiatives for various audiences, helping them better understand climate change, its implications, and programs led or supported by the Agency. EPA also provides useful tools to help individuals and organizations identify measures they can take to reduce greenhouse gas emissions. Following are EPA education, training, and outreach efforts targeted to business and industry, the general public, and educators and students, and information about EPA training for select leaders, educators, and technicians, sea level rise outreach, and technical assistance to state and local governments.

Business and Industry Outreach

EPA has actively engaged business and industry on climate change-related issues, with a goal of working together to reduce greenhouse gas emissions and improve corporate operational efficiency. *ENERGY STAR*, the Green Power Partnership Program, Climate Leaders, the SmartWay Transport Partnership, the Landfill Methane Outreach Program, and the international Methane to Markets Partnership are all examples of the many hallmark public-private partnership programs that EPA leads. These partnerships and programs, among others, provide businesses and consumers with tools, technical assistance, information and cost-effective ways to save energy, foster the use of clean energy, reduce greenhouse gas emissions, and promote energy security and efficiency at home and abroad.

General Public Outreach

The Climate Change website supports EPA's mission to protect human health and

the environment by presenting accurate, accessible, understandable information on climate change and global warming to communities, individuals, businesses, public officials, governments, and other interested parties. The site features climate science, emissions data, impact assessment summaries, U.S. policy information, and suggested actions that individuals and other interested parties can take to reduce greenhouse gas emissions.

Resources for Educators and Students

Climate Change, Wildlife and Wildlands Toolkit for Teachers and Interpreters—EPA led a partnership effort with NPS and the U.S. Fish and Wildlife Service to develop a climate change educational toolkit for classroom teachers and natural resource interpreters. The kit contains fact sheets, a short video, and other presentation materials that investigate the links between climate change and changes to habitat, ecosystems, wildlife, and public lands, including national parks and wildlife refuges.

Global Warming Wheel Card Classroom Activity Kit—This tool helps teachers educate students in grades 6 through 8 about the causes and potential impacts of global warming. Centered on the hand-held wheel card that students use to estimate household carbon dioxide emissions, the kit encourages students to think about ways to reduce their personal, family, school, and community contributions to the greenhouse effect.

Students' Energy Manual—EPA worked with Harvard University to develop an online manual designed to help members of other campus communities initiate student internship programs aimed at improving energy efficiency, reducing greenhouse gas emissions, and producing economic and educational benefits as well.

Topic-Specific Brochures—EPA has produced several brochures to educate specific audiences about particular topics relevant to possible climate change impacts in the United States. Those brochures include *Climate Change and Birds*, *Climate Change and Cold-Water Fish*, *Climate Change and Public Lands*, and *Climate Change and Coral Reefs*.

EPA is currently revising all of the brochures to reflect the latest scientific research.

Training of Select Leaders, Educators, and Technicians

EPA responds to many requests to train educators to more effectively use EPA-produced kits in their classrooms, to help other government agencies educate their staff to interact with the public on climate change issues, and to teach students how they can help reduce greenhouse gas emissions. EPA also shares information with international parties on technical issues, including greenhouse gas inventory methodologies and practices, economic modeling, analysis of the co-benefits of simultaneous reductions in greenhouse gases and conventional air pollutants, technology assessments, and preparation of National Communications for the United Nations Framework Convention on Climate Change.

Sea Level Rise Outreach

EPA supports a number of projects to provide information to stakeholders who wish to take timely measures in anticipation of sea level rise. Planning scenario mapping projects inform coastal planners about sea level rise. Informational brochures about the risk of sea level rise, including maps of states with coastal land, illustrate which areas are likely to be protected against rising seas and which are likely to flood. These efforts inform dialogue within communities about how to prepare for sea level rise.

State and Local Technical Assistance

To enable state and local governments to quantify and reduce greenhouse gas emissions, EPA has developed tools in cooperation with its partners, and offers technical assistance to help determine the emissions implications of a range of policy options. These quantification tools include the Clean Air and Climate Protection Software and the State Greenhouse Gas Inventory Tool.

States have made great progress in implementing innovative and cost-effective energy efficiency and renewable energy programs and policies that achieve multiple

benefits, including reducing greenhouse gases. EPA technical assistance and guidance help states and municipalities adopt clean energy strategies and then share these successes with their peers through EPA-sponsored technical forums for state policymakers and other information-exchange opportunities.

National Aeronautics and Space Administration

The National Aeronautics and Space Administration (NASA) conducts education, training, and public awareness on climate change, using NASA's observational, research, and modeling assets.

Primary, Secondary, and Higher Education

NASA's Earth Explorers Series supports educator enhancement and systemic improvement in elementary, secondary, higher, and informal education by encouraging the use of NASA-unique resources in Earth system and climate research.

Training Programs

Earth System Science Fellowship Program—This program supports individuals pursuing master's or Ph.D. degrees in Earth system science, climate change, and related research.

New Investigator Program in Earth Science—This program encourages integrated environments for research and education for scientists and engineers in Earth-Sun systems and climate research at the early stages of their professional careers.

On-line Resource or Information Centers

Earth System Science Learning Resources—NASA produces and sponsors a wide-ranging suite of Earth system science education products for elementary through postsecondary instruction and informal education.

Earth Observatory Newsroom—NASA's on-line newsroom for journalists features the latest news on Earth science research released from all NASA centers and more than 80 universities participating in NASA's Earth programs through sponsored research. NASA's Earth Observing System also pro-

vides journalists with a ready source of international expertise on global climate change science and policy.

Climate Change Outreach and Education

Press Releases—NASA's press releases on climate change science often result in feature articles in the media.

Visuals—NASA also produces visuals to help explain climate change science concepts to the media and prepares "Science Writers Guides" for NASA's climate change-related missions, which are distributed at press briefings and available on-line through the Earth Observatory Newsroom.

NASA Television—NASA Television programming is made available to television outlets and reformatted for formal and informal educational settings. It is also presented to tens of thousands of people in a live theater format at various education, science, and public events.

Science for the Public—In addition, NASA funds thousands of scientists at NASA centers and in academia who give public talks and interviews explaining the science of climate change.

Video Library—NASA Television maintains a library of video news releases and educational videos for distribution to the media, educational institutions, and the public. These videos include data visualizations, conceptual animations, and interviews with expert scientists on the subject of climate change.

NASA Publications—NASA also publishes brochures, fact sheets, and lithographs explaining climate change science. The Global Change Master Directory brochure and website point users to where they can obtain data on Earth science and climate change.

Competitive Solicitations—NASA funds universities, museums, professional societies, and NGOs to provide climate change-related education through competitive solicitations for education and outreach programs.

Partnerships

GLOBE Program—Through a consortium of scientists, institutional partners, and

schools in 107 countries, the Global Learning and Observations to Benefit the Environment (GLOBE) Program, jointly sponsored by NASA, the National Science Foundation (NSF), and the Department of State, aims to improve student achievement in science and mathematics, increase scientific understanding of the Earth system and climate, and enhance the environmental awareness of individuals worldwide.

Television Productions—NASA often collaborates on its television productions with partners like USGS, the National Snow and Ice Data Center, the U.S. Forest Service, and EPA.

Research Support—NASA's Socioeconomic Data and Applications Center partnered with the SysTem for Analysis, Research and Training, USAID, the United Nations Environment Programme, the Third World Academy of Sciences, and the NASA Goddard Institute for Space Studies in supporting the Data, Methods, and Synthesis Activity of the Assessments of Impacts and Adaptations to Climate Change in Multiple Regions and Sectors, including support for researchers in developing countries.

U.S. Department of Commerce/National Oceanic and Atmospheric Administration

Climate Education Working Group

This group develops education and outreach products, activities, and lesson plans for K-16 teachers and the general public to enhance their understanding of climate change and other important climate topics.

Climate and Global Change Postdoctoral Fellowship Program

This program is helping to create the next generation of climate researchers who will predict and assess global climate change on seasonal-to-centennial time scales. More than 100 program participants have worked at agencies, laboratories, and institutions of higher education.

National Climatic Data Center

The National Climatic Data Center maintains the world's largest archive of weather-related data used by specialists in meteorology, insurance, and agriculture,

and indirectly in most business sectors. The center includes a section on paleoclimate data, which was developed to help educate, inform, and highlight the importance of paleoclimate research in helping scientists and others better understand global warming, climate variability, and climate change.

Climate Prediction Center

The Climate Prediction Center develops climate outlook products to help farmers, businesses, and the public better plan for extreme weather events related to climate variations. It issues drought, hurricane, and winter outlooks, along with El Niño-Southern Oscillation advisories, and threats assessments.

National Science Foundation

Consistent with its mission to support research and education across a broad range of science and engineering disciplines, NSF funds research in numerous areas related to global climate change. NSF's Directorates for Geosciences; Biological Sciences; Social, Behavioral, and Economic Sciences; Education and Human Resources; Mathematics and Physical Sciences; Computer and Information Science and Engineering; and the Office of Polar Programs participate in the Climate Change Science Program and provide access to climate-related results from principal investigators.

NSF is the principal federal agency charged with promoting science and engineering (S&E) education. To this end, NSF supports the development of a diverse and well-prepared scientific and technical workforce, and a scientifically literate citizenry. NSF programs support:

- the development of instructional materials, curricula, and methods for kindergarten through graduate school;
- programs that increase public interest, understanding, engagement and life-long learning in S&E, including informal education, such as museum exhibits and IMAX films;
- robust research and development of effective S&E education practices; and

- broadening participation of underrepresented groups, geographic regions, and types of institutions in all S&E fields.

Because NSF provides awards—principally to academic institutions—to accomplish these objectives, it does not directly disseminate climate information. The agency provides support to the principal investigators to develop results, databases, and educational practices that the scientific community uses for research and education purposes. In addition to funded education projects, investigators at academic institutions who conduct research related to climate change contribute to the education of undergraduate, graduate, and postdoctoral students who work on those research projects.

NSF partners with other agencies to support specific programs related to education, training, and outreach. Examples include the GLOBE Program and the SysTEM for Analysis, Research and Training (START). (See Chapter 8 for more activities.)

NSF's Office of Legislative and Public Affairs works with the media, federal and state government representatives, industry representatives, and NSF grantees to facilitate a broader understanding of science and global climate change. Outreach activities include news releases, in-depth special reports, and special events open to the public.

OTHER FEDERAL ACTIVITIES

Climate Change Science Program

The Climate Change Science Program (CCSP) is responsible for communicating with a variety of stakeholders nationally and globally on issues related to climate variability and climate change science. The Communications Interagency Working Group leads CCSP's coordinated interagency communications efforts by:

- assisting in developing communications strategies and materials for synthesis and assessment products issued by CCSP working groups and affiliated agencies;
- developing and advancing a strategy for improving, integrating, and promoting the content of websites operated or sup-

ported by CCSP and its participating agencies, recognizing that the sites are essential communication and outreach tools; and

- identifying opportunities for outreach to specific audiences through constituent briefings, exhibits at science conferences, and placement of CCSP speakers on panels.

Highlights of Recent CCSP Interagency Communications Activity

Following are highlights of recent CCSP communications activities coordinated at the interagency level:

- Published and distributed *Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Year 2007 (CCSP and SGCR 2006a)*.
- Published *Ecosystems and Climate Change: Research Priorities for the USCCSP in 2006* (Lucier et al. 2006).
- Managed and improved CCSP websites, which receive an average of 5,000 hits a day.
- Assumed responsibility for the Global Change Research Information Office, which disseminates U.S. scientific research information that would be useful in preventing, mitigating, or adapting to the effects of global change.

Highlights of CCSP Interagency Communications Plans Through FY 2007

Some of the communications activities coordinated at the interagency level and planned through FY 2007 include the following:

- Prepare, publish, and disseminate the fiscal year 2007 and 2008 editions of *Our Changing Planet*.
- Disseminate new synthesis and assessment products, effectively communicating important conclusions to the relevant stakeholder communities.
- Facilitate stakeholder participation in the U.S. government review of draft documents from the Intergovernmental Panel on Climate Change.
- Maintain and enhance the content and services of the CCSP website.

Smithsonian Institution

Every year millions of U.S. and foreign visitors view Smithsonian exhibits in Washington, D.C., New York City, and other cities hosting Smithsonian traveling exhibits. In fulfilling its mission to promote the "increase and diffusion of knowledge," the Smithsonian educates the public about many areas of science, including global warming.

Deltas-Global Change Program

Initiated at the Smithsonian's National Museum of Natural History in 1995, this multidisciplinary, multinational research

program assesses geological and environmental changes that seriously affect selected deltas in different climatic regions around the world.

Forces of Change

Through exhibits, publications, computer projects, and a variety of public programs, the National Museum of Natural History's *Forces of Change* examines the connections among the physical, biological, and cultural forces that shape the world. The program helps people see connections between seemingly remote forces, such as gas bubbles within the Antarctic ice cap and

famines in tropical Africa. The museum's Global Links and Antarctica exhibits are examples of how *Forces of Change* communicates these connections.

Arctic Studies Center

The Arctic Studies Center invites the public to explore the history of northern populations, cultures, and environments and the issues that matter to northern residents today, including climate change. Visitors can excavate arctic sites, support indigenous efforts to preserve cultural heritage, and work with communities and scholars to share the treasures preserved in museum collections and archives.

TABLE 9-1 Governmental On-line Climate Change Educational Resources

Resource	Description	Website
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT		
Global Climate Change Program	Provides an overview of the program and its efforts in more than 40 countries.	http://www.usaid.gov/our_work/environment/climate/pub_outreach/index.html
Mexico Landfill Gas Partnership	Helps evaluate the feasibility and potential benefits of collecting and using landfill gas for energy recovery in Mexico.	http://www.epa.gov/lmop/international.htm
Global Partnerships	Describes the programs that support USAID's efforts to improve conditions for people around the world.	http://www.usaid.gov/our_work/global_partnerships/
U.S. DEPARTMENT OF AGRICULTURE		
Agricultural Research Service		
ARS Global Change Programs	Discusses the program's background, goals, and research components.	http://www.ars.usda.gov/research/programs/programs.htm?NP_CODE=204
Agriculture Research	Provides on-line access to USDA's monthly science magazine.	http://www.ars.usda.gov/is/AR/
Global Change Program Office	Coordinates climate change activities across USDA agencies, and interacts with other federal agencies, the legislative branch, and international partners on climate change issues affecting agriculture and forestry.	http://www.usda.gov/oce/global_change/index.htm
Natural Resources Conservation Service		
NRCS Fact Sheet	Presents opportunities for managing carbon sequestration and reducing GHGs using conservation incentive programs.	http://www.nrcs.usda.gov/feature/outlook/Carbon.pdf
Voluntary Reporting On-line Carbon Management Tool	Provides an on-line tool for estimating and voluntarily reporting carbon sequestration and GHG emissions.	http://cometvr.colostate.edu/

TABLE 9-1 (Continued) **Governmental On-line Climate Change Educational Resources**

Resource	Description	Website
U.S. DEPARTMENT OF ENERGY		
Carbon Dioxide Information Analysis Center	Responds to information requests from users concerned about the greenhouse effect and climate change.	http://cdiac.esd.ornl.gov/
Climate Change Technology Program	Provides a wealth of information and reports on technologies being developed to mitigate climate change.	www.climatetechnology.gov/
Climate VISION Program	Provides information on activities being pursued under this voluntary public–private partnership program to reduce greenhouse gas emissions.	http://www.climatevision.gov/
Enhancing DOE's 1605(b) Voluntary Greenhouse Gas Registry Program	Serves as a source of information on revisions to the "1605(b)" voluntary GHG registry.	http://www.pi.energy.gov/enhancingGHGregistry/index.html
Energy Information Administration	Provides all manner of current and historical energy data.	http://www.eia.doe.gov/
National Institute for Global Environmental Change	Helps decision makers and communities better respond to regional-scale or ecosystem-scale effects of climate change, and educates the public on climate change and energy-related environmental risks.	http://nigec.ucdavis.edu/
Energy Efficiency and Renewable Energy		
Office of Energy Efficiency and Renewable Energy	Describes DOE's work toward enhancing U.S. energy efficiency and expanding sources of renewable energy.	http://www.eere.energy.gov/
Building Technologies Program	Offers information on reducing energy consumption in homes and other buildings.	http://www.eere.energy.gov/buildings/
Building Toolbox	Presents a comprehensive guide and software tools for designing, constructing, or renovating more efficient, affordable buildings.	http://www.eere.energy.gov/buildings/info/toolboxdirectory.html
ENERGY STAR	Offers businesses and consumers energy-efficient solutions that save money and reduce GHG emissions (joint program with EPA).	http://www.energystar.gov/
FreedomCAR and Vehicle Technologies Program	Provides information on the program's goal of examining the research needed to improve vehicle fuel efficiency.	http://www1.eere.energy.gov/vehiclesandfuels/about/partnerships/freedomcar/index.html
Energy Hog Campaign Site	Presents information about improving energy efficiency in the home.	http://www.energyhog.org/
Energy Savers	Provides homeowners with tips on saving energy and money.	http://www.eere.energy.gov/consumer/tips/
Home Energy Saver	Offers the first web-based do-it-yourself energy audit tool.	http://hes.lbl.gov/
Hydrogen Fuel		
Hydrogen Fuel Initiative	Provides information on this Presidential initiative to reduce America's dependence on foreign oil.	http://www.eere.energy.gov/hydrogenandfuelcells/presidents_initiative.html
International Partnership for the Hydrogen Economy	Describes the partnership's work to accelerate the development of hydrogen and fuel cell technologies.	http://www.iphe.net/
FutureGen Project	Presents an initiative to build the world's first integrated sequestration and hydrogen production research power plant.	http://www.fe.doe.gov/programs/powersystems/futuregen/

TABLE 9-1 (Continued) **Governmental On-line Climate Change Educational Resources**

Resource	Description	Website
Fossil Energy and Carbon Sequestration		
Office of Fossil Energy	Describes DOE programs in fossil energy research and development.	http://fossil.energy.gov/
DOE Carbon Sequestration Programs	Examines DOE's research and development programs in carbon capture and storage.	http://fossil.energy.gov/programs/sequestration/
Carbon Sequestration Regional Partnerships	Discusses the public- and private-sector partnership efforts to determine the most suitable technologies, regulations, and infrastructure needs for carbon capture, storage, and sequestration.	http://fossil.energy.gov/programs/sequestration/partnerships/index.html
Carbon Sequestration Leadership Forum (CSLF)	Reviews CSLF activities toward developing cost-effective technologies for capturing and storing CO ₂ .	http://www.cslforum.org/
Nuclear Energy		
Office of Nuclear Energy	Describes DOE programs in nuclear fission research and development.	http://www.ne.doe.gov/
Generation IV Nuclear Energy Systems Initiative	Discusses DOE's research into the next generation of nuclear systems.	http://nuclear.energy.gov/
Global Nuclear Energy Partnership	Provides information on the partnership, grants, and job opportunities.	http://www.gnep.energy.gov/default.html
Fusion Energy		
Fusion Energy Sciences	Describes DOE programs in the fusion energy sciences.	http://www.sc.doe.gov/feature/fes.htm
ITER Project	Describes the work of an international partnership toward demonstrating the feasibility of using fusion power to produce electricity.	http://www.iter.org/
Resources for Educators and Students		
For Students and Kids	Offers on-line energy, engineering, and science education for kids.	http://www.energy.gov/forstudentsandkids.htm
For Educators	Provides details on educational resources, scholarships and internships, contests and competitions, and support for schools and universities.	http://www.energy.gov/foreducators.htm
EERE Kids—Dr. E's Energy Lab	Provides an on-line resource for kids on all types of energy efficiency and renewable energy.	http://www.eere.energy.gov/kids/index.html
Ask a Scientist	Serves as an archive of answers to science questions from K-12 students and teachers, and an opportunity to ask new questions.	http://www.newton.dep.anl.gov/aas.htm
Resources for Researchers		
Research and Grant Programs	Provides information on support for research and development programs, educational institutions, and careers at DOE.	http://www.energy.gov/forresearchers.htm
Office of Science	Describes DOE's fundamental research programs.	http://www.sc.doe.gov/

TABLE 9-1 (Continued) **Governmental On-line Climate Change Educational Resources**

Resource	Description	Website
U.S. DEPARTMENT OF THE INTERIOR		
National Park Service		
Greening of the National Park Service	Promotes the use of sustainable energy and practice of environmental leadership in national parks.	http://www.nps.gov/renew/
Climate Friendly Parks Initiative	Provides an overview of this joint NPS/EPA energy efficiency initiative.	http://www.nps.gov/climatefriendlyparks/
Sustainability News	Published biannually, asks important questions about and offers appropriate responses to reducing GHG emissions and mitigating the effects of climate change.	http://www.nature.nps.gov/SustainabilityNews/index.htm
U.S. Geological Survey		
The USGS and Science Education	Provides public information about natural resources, natural hazards, geospatial data, and quality-of-life issues.	http://education.usgs.gov/
Earth Surface Dynamics Program	Presents USGS global change research activities, data sets, fact sheets, frequently asked questions, and information about the U.S. Climate Change Science Program.	http://geochange.er.usgs.gov/
U.S. DEPARTMENT OF TRANSPORTATION		
Center for Climate Change and Environmental Forecasting	Provides data on national and global transportation-related emissions, and information about related research projects, reports, partnerships, and events.	http://www.volpe.dot.gov/
It All Adds Up to Cleaner Air	Educates the public about the connections between their transportation choices, traffic congestion, and air pollution.	http://climate.volpe.dot.gov/addsup.html
U.S. ENVIRONMENTAL PROTECTION AGENCY		
Partnership Programs		
EPA's State and Local Clean Energy Programs	Provides information about EPA's support of the clean energy efforts of state and local governments.	http://epa.gov/cleanenergy/stateandlocal/
Business/Industry Outreach	Presents key sources for partnership programs for reducing GHG emissions.	http://www.epa.gov/air/ccd.html http://www.epa.gov/cppd/ http://www.epa.gov/otaq/
ENERGY STAR	Helps businesses and homes save money and protect the environment through energy-efficient products and practices (joint program with DOE).	http://energystar.gov/
Climate Leaders	Describes EPA's work with companies to develop long-term, comprehensive climate change strategies.	http://www.epa.gov/climateleaders/
SmartWay Transport Partnership	Establishes incentives between various freight industry sectors and EPA to improve fuel efficiency and reduce GHG emissions.	http://www.epa.gov/SmartwayLogistics/swplan.htm
Green Power Partnership	Discusses EPA's support of organizations that are buying or planning to buy electricity generated from renewable energy sources.	http://www.epa.gov/greenpower/

TABLE 9-1 (Continued) Governmental On-line Climate Change Educational Resources

Resource	Description	Website
Methane Reduction and Recovery Partnerships		
Methane to Markets Partnership	Describes an international initiative that promotes cost-effective methane recovery and use in agriculture, coal mines, landfills, and oil and gas systems.	http://www.epa.gov/methanetomarkets/
AgSTAR Program	Encourages the use of methane recovery (biogas) technologies at confined animal feeding operations that manage manure as liquids or slurries. (Sponsored with USDA and DOE.)	http://epa.gov/agstar/
Coalbed Methane Outreach Program	Discusses EPA's work with coal companies and related industries to reduce methane emissions.	http://epa.gov/cmop/
Landfill Methane Outreach Program	Promotes the use of landfill gas as a renewable, green energy source.	http://epa.gov/lmop/
Natural Gas STAR Program	Identifies and promotes the implementation of cost-effective technologies and practices to reduce methane emissions from the oil and natural gas industry.	http://epa.gov/gasstar/
Climate Change Outreach and Education		
Climate Change	Educates general audiences about climate change science and impacts, GHG emissions, and mitigation actions.	http://www.epa.gov/climatechange/
Climate Change, Wildlife, and Wildlands Toolkit for Teachers and Interpreters	Contains materials for educating the public about how climate change is affecting U.S. wildlife and public lands. Produced in partnership with NPS and the U.S. Fish and Wildlife Service.	http://epa.gov/climatechange/wycd/ORWKit.html
Sea Level Rise Reports	Provides an extended abstract on which EPA sea level rise reports produced over the past 25 years contain relevant information on particular issues and what to read first.	http://epa.gov/climatechange/effects/coastal/slrreports.html
Harvard Green Campus Initiative	Presents an on-line manual designed to help colleges and universities initiate student internship programs aimed at improving energy efficiency and reducing GHG emissions.	http://www.greencampus.harvard.edu/greenteams
Climate Change Kids Site	Explains global warming and climate science and includes interactive games about climate change.	http://epa.gov/climatechange/kids/index.html
Global Warming Wheel Card Classroom Activity Kit	Helps students link their own energy use to global warming.	http://epa.gov/climatechange/downloads/ActivityKit.pdf
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
Climate Change Outreach and Education		
NASA Education Links and Publications	Offers brochures, fact sheets, and lithographs explaining climate change science.	http://disc.gsfc.nasa.gov/education_links.shtml http://eospsso.gsfc.nasa.gov/eos_homepage/for_educators/educational_publications.php
Students' Cloud Observations On-line Project	Provides information on climate change in the context of the effects of clouds on climate.	http://asd-www.larc.nasa.gov/SCOOL/
The GLOBE Program	Offers participants in the GLOBE Program, grades K-12, an interactive science and education learning experience.	http://www.globe.gov/

TABLE 9-1 (Continued) **Governmental On-line Climate Change Educational Resources**

Resource	Description	Website
Climate Change Outreach and Education (continued)		
Earth Science Frequently Asked Questions	Provides answers to frequently asked questions about global environmental change.	http://gcmd.nasa.gov/Resources/FAQs/faqpage.html
State of the Cryosphere	Provides educational material on the status of snow and ice as indicators of climate change.	http://nsidc.org/sotc/
Earth Explorers Series	Encourages educators to use NASA-unique resources in Earth system and climate research.	http://science.hq.nasa.gov/education/earth_explorers/index.html
Earth System Science Fellowship Program	Supports individuals pursuing master's or Ph.D. degrees in Earth system science, climate change, and related research.	http://research.hq.nasa.gov/code_y/nra/current/Fellowship-ESS01/
Earth Science Education Plan	Characterizes the overriding principles, objectives, and plan for ensuring the successful results of Earth science communication efforts.	http://science.hq.nasa.gov/research/epo.htm
Resource and Information Centers		
Earth System Science Learning Resources	Lists on-line resources for a wide-ranging suite of Earth system science education products.	http://science.hq.nasa.gov/education/catalog/resources/resources_index.html
Global Change Master Directory Learning Center	Contains data and information about global environmental change.	http://gcmd.nasa.gov/Resources/Learning/
Goddard Institute for Space Studies	Offers information about the scientific results of climate modeling, as well as educational opportunities.	http://www.giss.nasa.gov/
Earth Observatory	Publishes satellite imagery and scientific information focusing on the Earth's climate and environmental change.	http://www.earthobservatory.nasa.gov/
Earth Observatory Newsroom	Features the latest news on Earth science research released from all NASA centers and more than 80 universities participating in NASA's Earth programs.	http://www.earthobservatory.nasa.gov/Newsroom
New Investigator Program in Earth Science	Encourages climate research at the early stages of the professional careers of scientists and engineers.	http://www.nasa.gov/audience/foreducators/postsecondary/features/F_New_Investigator_Program.html
Climate Change Products		
Scientific Visualization Studio	Presents numerous data visualizations relating to changes in the Earth's climate, including the Conceptual Imaging Lab's animations of Earth's complex processes.	http://svs.gsfc.nasa.gov/
Global Change Master Directory	Points users to information about climate change data and services.	http://gcmd.nasa.gov/
Daily Earth Temperatures from Satellites	Contains information on global atmospheric temperature trends.	http://pm-esip.nsstc.nasa.gov/amsutemps/
Goddard TV	Presents video news releases and educational videos that include data visualizations, conceptual animations, and interviews with expert scientists on the subject of climate change.	http://www.gsfc.nasa.gov/gtv.html
Assessments of Impacts and Adaptations to Climate Change	Facilitates access to extensive data, software, and bibliographic resources related to climate impacts, adaptation, and vulnerability across multiple sectors.	http://sedac.ciesin.columbia.edu/aiacc/

TABLE 9-1 (Continued) **Governmental On-line Climate Change Educational Resources**

Resource	Description	Website
U.S. DEPARTMENT OF COMMERCE/NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION		
Resources for Educators and Students		
NOAA's Education Resources	Helps students, teachers, librarians and the general public access the NOAA's educational activities, publications, and booklets.	http://www.education.noaa.gov/
Climate Change and Our Planet: Specially for Kids	Lists NOAA's sites related to climate change tailored for kids in grades K-5.	http://www.education.noaa.gov/sclimate.html
Climate Change and Our Planet: Specially for Teachers	Lists NOAA's sites related to climate change tailored for educators.	http://www.education.noaa.gov/tclimate.html
OGP Video Library	Offers links to numerous videos on climate change.	http://www.ogp.noaa.gov/streams/index.html
Resources for Researchers		
A Paleo Perspective on Global Warming	Explains the importance of paleoclimate research and its relation to global warming.	http://www.ngdc.noaa.gov/paleo/globalwarming/home.html
Climate Program Office	Contains a variety of climate change topics, articles, and funding opportunities.	http://www.climate.noaa.gov/
Climate and Global Change Postdoctoral Fellowship Program	Provides information and application instructions for postdoctoral researchers seeking to be paired with host scientists at U.S. institutions working on climate studies.	http://www.vsp.ucar.edu/cgc.html
Climate-Related Products and Services		
Climate Portal	Provides access to a variety of NOAA's climate-related products, services, and organizations.	http://www.noaa.gov/climate.html
National Climatic Data Center	Provides access to an extensive database of weather-related information.	http://www.ncdc.noaa.gov/
Climate Prediction Center Educational Materials	Offers educational materials to help farmers, businesses, and the public understand the role of the climate system and to better plan for extreme weather events related to climate variations.	http://www.cpc.ncep.noaa.gov/products/outreach/education.shtml http://www.cpc.ncep.noaa.gov/products/expert_assessment
NATIONAL SCIENCE FOUNDATION		
NSF Special Reports		
Arctic Climate Change	Explores the complex factors that influence climate change, which require a multifaceted approach—from ships at sea to snowmobiles in Alaska—to study the process.	http://www.nsf.gov/news/special_reports/arctic/index.jsp
Ecology of Infectious Diseases	Discusses efforts to understand the underlying ecological and biological mechanisms behind human-induced environmental changes and the emergence and transmission of infectious diseases.	http://www.nsf.gov/news/special_reports/ecoinf/index.jsp
Autumn Weather Predicts Winter Snows	Explores the major role of large-scale weather patterns in controlling seasonal weather, along with the conditions of these atmospheric oscillations, to significantly improve long-range weather predictions.	http://www.nsf.gov/news/special_reports/autumnwinter/index.jsp
The (Environmental) Sensor Revolution	Introduces the Sensor Revolution—the world's first electronic nervous system.	http://www.nsf.gov/news/special_reports/sensor/index.jsp
Seafloor Science	Uncovers the mysteries of the ocean's most extreme environment—the seafloor.	http://www.nsf.gov/news/special_reports/sfs/index.jsp

TABLE 9-1 (Continued) **Governmental On-line Climate Change Educational Resources**

Resource	Description	Website
CLIMATE CHANGE SCIENCE PROGRAM		
CCSP	Provides information about the program and CCSP products and resources.	http://www.climatescience.gov/
U.S. Global Change Research Information Office (GCRIO)	As mandated in the Global Change Research Act, GCRIO is responsible for the physical and electronic dissemination of information resulting from the U.S. climate program.	http://www.gcrio.org/
SMITHSONIAN INSTITUTION		
Climate-Related Outreach and Education		
Global Warming: Focus on the Future	This web version of an exhibit that toured the U.S. encourages visitors to learn about the history of global warming, examines why it is a problem, and empowers them to help solve the problem.	http://globalwarming.enviroweb.org/
Forces of Change	Examines the connections among the physical, biological, and cultural forces that shape the world.	http://forces.si.edu/
Arctic Studies Center	Explores the history of northern peoples, cultures, and environments and such critical issues as climate change.	http://www.mnh2.si.edu/arctic/
Resources for Researchers		
Deltas-Global Change Program	Describes the research that drives this multidisciplinary, multinational program.	http://www.nmnh.si.edu/paleo/deltas/
Migratory Bird Center	Explores how climate change affects birds' migratory patterns.	http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/research/climate_change/default.cfm#ContentArea