APPENDIX E

PUBLIC EDUCATION AND OUTREACH - NARRATIVE

CC-5 Public Education and Outreach

INTRODUCTION
The Maryland Climate Action Plan recommended that the state build upon current educational efforts and action campaigns of state agencies, utilities and non-profit organizations in order to combine efforts to reach diverse audiences, as well as to assure the dissemination of scientifically based factual information. MSDE and MDE co-chair the Mitigation Workgroup's Education and Outreach subcommittee.

The Maryland Climate Action Plan calls for the development of an education and outreach plan targeting three major tasks:
Climate Change Awareness and Energy Efficiency Education for Maryland Residents and Institutions
Maryland –Specific Climate Change Curricula and Energy Efficiency in Schools
Media Coordination

This section describes the activities that occurred in PreK-12 Education in the 2008-2009 school year. This section addresses the activities occurring in Maryland public schools, both through instruction and through school construction and facilities. These activities will be addressed in turn.
The Climate Action Plan (page 37) provided suggested activities including:
- Use of the Clean Air Partners' On the Air curriculum, which includes a unit on climate change.
- Coordination with the EmPOWER Maryland Clean Energy School Program, using green school building projects in instruction.
- Develop professional development workshops on-line and on-site for educators.

Summary of Activities:
Goal 1: Develop Maryland-specific lessons on climate change, energy conservation, and energy efficiency aligned with the State Curriculum and Core Learning Goals, and integrate into the K-12 curriculum.

Accomplishments Curriculum Connections
• Identified appropriate Climate Change Literacy resources to use in instruction.
• Expanded the MSDE Environmental Education Climate Change Resource page to include lessons designated for appropriate grade levels.
• Reviewed, aligned and posted a link to Clean Air Partners *On the Air* lessons.
• Partnered with Maryland Public Television in "Changing the Balance: A Case Study in Climate Change" grant.
• Linked to Maryland-specific lessons developed by Maryland Department of Natural Resources.
• Presented the PreK-12 Climate Change Pledge to Local Superintendents.
• Supported efforts of the Sustainable Chesapeake Program at The Conservation Fund (CSSPAR), in partnership with National Geographic, to apply for, and obtain, funding of

$10,000 to produce a map illustrating the issue of climate change in Maryland. MSDE is partnering in the development of content and distribution of the map to all school systems.

Maryland State Department of Education Environmental Education Website

Maryland State Department of Education Environmental Education website hosts a Climate Change Education resource page and classroom toolkit. Lessons, websites, and unit plans for all appropriate grade levels are included on the site. MSDE incorporated language from the national Climate Literacy Standards into the draft Maryland State Environmental Literacy Standards. These standards represent what an environmentally literate Maryland high school graduate will know about climate and climate change, as well as describe the analysis and decision-making skills involved in the investigation of environmental issues.

The Climate Literacy Standards were developed in April, 2007as a part of a national workshop entitled *Climate Literacy: Using the AAAS project 2061 Science Literacy Research to Develop Weather and Climate Literacy*. Lead agencies included the National Oceanic and Atmospheric Administration (NOAA) Office of Education (U.S. Department of Commerce) and the American Association for the Advancement of Science (AAAS). Sponsors included NASA Goddard Space Flight Center and the U.S. Climate Change Science Program's Communications Interagency Working Group. Input on the standards was garnered from more than 100 members of the education and climate science communities. The Climate Literacy Standards define climate literacy as one who "understands the influence of climate on you and society and your influence on climate".

A climatically literate person:
- *Understands the essential principles and fundamental concepts about the functioning of weather and climate and how they relate to variations in the air, water, land, life and human activities both in time and space;*
- *Can communicate about the climate and climate change in a meaningful way;*
- *Is able to make scientifically informed and responsible decisions regarding the climate.*

Reference: *Climate Literacy: Essential Principles and Fundamental Concepts*, 2007, NOAA, AAAS Project 2061.

Maryland-Specific Lessons

A series of lessons, developed through the Maryland Department of Natural Resources, help students study coastal hazards and different impacts shoreline changes have on people and the natural environment. The Maryland Coastal Hazards Lessons are grouped into six units Coastal Hazards, Coastal Processes, Weather, Sea Level Rise, Biological Community, and Human Activities.

Clean Air Partners' *On the Air* Curriculum

MSDE worked with the Clean Air Partners and MDE to align the Clean Air Partners *On the Air* activities with the Maryland State Curriculum. For more than 10 years, Clean Air Partners has strived to improve public health and the environment by working with businesses, organizations and individuals throughout the region to raise awareness and reduce air pollution through voluntary actions. Clean Air Partners developed ***On the Air***, an interactive teaching kit that engages students in the exploration of their environment as they study important air pollution topics such as: Criteria Air Pollutants, the Air Quality Index, Ozone, Particulate Matter, Our lungs and Health, Community Sources and Solutions, and Climate Change.

The ***On the Air*** kit includes that are:

- tied to and cross referenced to both the required curriculum and the state's education standards
- interactive-including hands-on activities, labs, and investigation
- inquiry based and designed to develop critical thinking skills
- complete with background information, student worksheets, teaching props, and visual aids
- relevant, fun, and engaging for students

The *On the Air* curriculum and kit, developed specifically for sixth grade students in Washington D.C., Virginia and Maryland, are available to public and private schools located within the jurisdictions of the Metropolitan Washington Council of Governments and the Baltimore Metropolitan Council. *On the Air* has been presented to more than 1,400 students in the metropolitan Washington-Baltimore region.
Reference: http://www.cleanairpartners.net/onTheAir.cfm

Changing the Balance: A Case Study in Climate Change

Maryland Public Television (MPT), in partnership with MSDE, received a grant from the Corporation for Public Broadcasting (CPB) to develop *Changing the Balance: Digital Assets Investigating Climate Change* (CtB), a bundle of learning objects that look at the ways human activities affect climate change and how climate change affects the biosphere. In addition to producing these discrete, portable assets, MPT will also create an instructional framework that incorporates these assets in a storyline focused on present-day investigations into these topics. Accompanying teacher materials will assist teachers in using each of the assets in a pedagogically appropriate manner to look at a myriad of climate- and science-related topics.

Understanding the impact of human activities on climate was identified in CPB's request for proposals as a target of difficulty for students and teachers. By extending that concept to look at the effects of climate change on the biosphere, these assets can amplify student's appreciation of climate change, showing that there are enormous environmental consequences of our actions.

MPT will build on a decade of experience in digital development to create highly effective products that will be extremely useful to a wide variety of teachers. MPT expects to complete the project by Spring 2010.

In order to examine the cycle of human activity, climate change, and changes in the biosphere, MPT will produce the following digital assets in addition to an instructional framework:

*   A Flash interactive in which students explore the greenhouse effect of gasses in the atmosphere by experimenting with the levels of radiation emanating from the Sun and being captured and reradiated by the Earth. In this, students explore how greenhouse gases (GHG) in the atmosphere regulate this interchange. Students can adjust the "thickness" of the atmosphere by increasing the number of carbon dioxide molecules in it, seeing the results of their actions in terms of Earth temperature levels. Students will also be able to adjust the amount of radiation coming from the sun by selecting arrows of differing sizes that represent decreased or increased levels of radiation. Clickable areas of the interactive will reveal information nuggets, such as the reason this is called the greenhouse effect.

*   A Flash animation that looks at the way carbon dioxide and other greenhouse gases behave on a molecular level, showing, for example how carbon dioxide molecules vibrate to redirect absorbed energy and their relative efficacy in capturing radiation as compared to water vapor or other GHG such as methane in the atmosphere.

*   A Flash interactive that allows students to explore sources of greenhouse gases produced by human activity. Students are presented with two images of an area (a relatively rural area in 1940 that becomes a 2005 urban center). In each image, students can click on various objects (cars, buses, factories, etc.) to compare how much carbon dioxide is being produced. An accompanying "repository" grows or diminishes as students click on individual elements, demonstrating the relative size of the GHG emitted by different objects such as cars, green space vs. paved urban areas, etc.

*   A slide show, with 10-15 images, showing details of the carbon cycle, following this biogeochemical sequence by examining carbon reservoirs (plants, biosphere, oceans, and sediment) and how carbon is exchanged among them and the atmosphere.

*   A Flash interactive that allows students to interact with graphs from different continents or areas, recording recent rising temperature data in each area or continent. By moving their cursor over a directed question, students trigger a highlighted area in the chart, where they can either find the answer or use the information to reflect on an answer.

*   An audio podcast on how fossil fuel burning fits into the global carbon cycle, and concentrated on how the excessive fossil fuel burning has accelerated the production of greenhouse gases. Petroleum, coal, and natural gas usage around the globe will also be featured.

*   An audio podcast with slides that talks about malaria, its effects on humans, and the problems now occurring in uplands Africa, where climate changes are one of the factors creating ideal habitats for mosquitoes and, hence, leading to more and more virulent cases of malaria in areas that have never had to deal with this threat. The podcast will also offer details about the history of malaria in other regions, such as Europe and Panama and the ways in which old tools, such as DDT to control mosquito populations and the use of synthetic quinine to aid malaria victims, have become ineffective. It will conclude by extending the discussion to look at how climate change might affect the spread of other vector-borne diseases, such as dengue fever, African sleeping sickness (Trypanosomiasis), yellow fever, and Lyme disease.

Slides will feature historic as well as current images.

*   A Flash animation demonstrating the symbiotic relationship of the female *Anopheles gambiae*, one of the 30 or 40 species of mosquitoes that are malaria vectors, and the *Plasmodium falciparum*, the most dangerous of the four parasites that carry malaria. The animation follows this process from the point the mosquito ingests the parasite as part of a blood feast in preparation for laying eggs, through the cyclical development of the parasite in its sporozoite, merozoite, and trophozoite stages in the mosquito, and finally, as the mosquito infects another person, where its saliva carries thousands of parasites to the new victim.

*   At least three images and one archival video clip) showing the mosquito in the act of biting a person.

*   A video of 3 - 5 minutes duration, using a documentary format and drawing together footage from NOAA, the CDC, and other relevant organizations, concentrating on the ways in which changes in temperature and precipitation patterns and the eradication of natural habitats in response to climate change are affecting plants and animals, especially mammals such as the polar bear and insects such as the Anopheles mosquito.

*   PFD text copies of all graphs and maps used in the production of the above assets

*   A teacher's guide featuring lesson plans that describe ways teachers can use the specific assets to address topics of concern in life sciences, earth and space science, and climatology, as well as suggestions for bundling assets to meet differing curricular goals. This reference will also offer many examples of multiple ways teachers can use the assets as the springboard for actual classroom experiments. In addition, the guide will present technology tips for teachers and suggest ways to interact with students to introduce, review, and extend their current curriculum.

Materials developed through the CtB project will meet middle grade national and state standards in climatology, earth and space science, life science, ecology, and environmental science. Because of the length of the applicable standards in all these disciplines, they are included in Appendix A.

MPT will make the resources developed for the CtB Project available in universal formats that can immediately be used in classrooms and elsewhere, with all rights cleared through Level Three and in complete compliance with PBCore Metadata standards.

These resources will be prominently placed and sustained on Thinkport.org as a cross-disciplinary collection of information and interactives on climate change. Thinkport already contains a rich collection of lesson plans that cover all grades and subject areas and a suite of innovative technology tools that offer learners a highly interactive and engaging online experience. On average, Thinkport logs one million page views and 200,000 visits per month. This site has received numerous awards and high praise from educators, education organizations, and technological entities. Thinkport already has an established weekly newsletter that will be a robust vehicle for announcing the availability of project materials; this newsletter is delivered electronically to 4,600 Thinkport members. In addition, the project would be prominently featured in ongoing Thinkport training sessions held with administrators, teachers, and others at the school, district, state, and national levels. In the past year, MPT staff has offered 50 of these trainings, reaching 2,715 members of the educational community. In addition, MPT presents at numerous national science, environmental, and technological conferences throughout the year where CtB project materials could be featured.

CtB Project elements will also be placed in PBS's Education Digital Content Asset Repository (EDCAR) as discrete assets and made available to other PBS stations, along with metadata tags to assure their utility.

Goal: Coordination with the *EmPOWER Maryland* Clean Energy School Program, using green school building projects in instruction

School Facilities and Construction

Summary of Activities
• MSDE School Construction and Facilities has been involved in implementing green practices within school construction and school maintenance and procedures.

- MSDE partnered with the Maryland Energy Administration in awarding $50,000 to three school systems to involve students, administrators and teachers, in cooperation with the school facilities personnel to develop a school system-based energy conservation program. One school system saved $1,000,000 its first year.
- Supported the Maryland Green Schools Award Program. An additional 67 schools achieved Maryland Green School status, raising the number of Green School to 271.
- Publicized school systems' activities and savings from *Energy Conservation & Efficiency in Our Schools Committee*.

The Maryland State Department of Education Division of Business Services School Facilities Branch is responsible for providing leadership and technical assistance to Maryland's 24 school systems with regard to long-range facility planning; capital improvement program development; educational specifications; and the design, construction, and maintenance of school facilities. This Branch administers the review and approval of locally funded school construction projects and leases by the State Superintendent of Schools. This Branch is responsible for developing guidelines and standards for the planning, construction, and maintenance of school facilities. The Branch reviews the facilities sections of the school systems' Bridge to Excellence Master Plans and Annual Updates, conducts the periodic Facilities Assessment Survey of all public schools in Maryland, and assists with the development of capital projects for the Department.

The School Facilities Branch is a part of a multi-agency program, the Interagency Committee on Public School Construction (IAC/PSCP), established under the Board of Public Works to provide State funding for school construction. The members of the IAC are the State Superintendent of Schools who serves as Chair, the Secretary of the Maryland Department of General Services, the Secretary of the Maryland Department of Planning, the appointee of the President of the Maryland Senate, and the appointee of the Speaker of the Maryland House of Delegates.

The Maryland High Performance Buildings Act was passed in April, 2008. The provisions of this act apply to new or renovated State buildings and to new State-funded public schools entering design after July 1, 2009. New schools are required to meet or exceed U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver rating.

LEED for Schools criteria include:
- Sustainable sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation & Design Process

MSDE facilities planning guidelines are available from the School Facilities Branch. These publications are to be used by school systems in the planning and design of school facilities. Guidelines related to the environment include:

- Conserving and Enhancing the Natural Environment, 1999
- Indoor Air Quality (IAQ) management plans and technical bulletins, 1987-97
- Science Facilities Design Guidelines, 1994
- Technology Education Facilities Guidelines, 1994
- Facilities Guidelines for Fine Arts Programs, 2001
- Classroom Acoustic Guidelines, 2006

Conserving and Enhancing the Natural Environment provides directions for schoolyard habitats and outdoor classrooms which are to be incorporated into the planning, design, construction, and maintenance on new and existing school sites. Examples include:

- Native plants
- Rain gardens
- Wetlands
- Gardens
- Structures (Seating, work surfaces, wildlife viewing blinds, buildings, storage, amphitheaters)
- Habitat Components (Logs, snags, brush piles, water, nesting boxes, feeders)
- Courtyards
- Forest
- Meadows
- Trails
- No-mow zones

Use of these schoolyard habitats and outdoor classrooms is included within the MAEOE guidelines for schools to earn a Maryland Green School Award.

Current high performance building initiatives underway in Maryland public school systems include:

- Human element, behavioral modifications, training
- Conserving natural resources – energy, water
- Improved practices
- Energy procurement strategies
- Preventive maintenance programs
- Alternative energy sources – geothermal
- High performance design with and without LEED certification
- Innovations in policies, programs, regulations, guidelines

Additional policies and guidelines for school indoor and outdoor safety address:

- Indoor air contaminants
- Control methods & investigations
- IAQ management plans

- Integrated Pest Management policy
- Surveys – Lead in water 2004, Mercury in schools 2002, IEQ in portable classrooms 2006
- Technical Bulletins – HVAC, kilns, copiers, welding, carpets, air flow, relative humidity, carbon dioxide, actions during renovations and construction, filters.

Energy Conservation and Efficiency in Our Schools

Current efforts include partnering on Energy Conservation and Efficiency in Our Schools workgroup with the Maryland Energy Administration, the Public Service Commission, MSDE, members of the General Assembly, and utility companies serving Maryland. A grant program to school systems requires that facilities managers work with administrators, teachers and students to develop and implement an action plan to power down their building. Schools in Cecil County, for example, have reduced energy consumption by 33% or more in the past 4 months.

Goal 2: Implement the Governor's Regional Environmental Education Network (GREENet)

The Governor's Regional Environmental Education Network (GREENet) was created in Fall, 2008 to serve as a communications tool for formal educators, informal environmental educators, non-profits, community groups, state agencies, and others interested in and engaged in environmental education.

Summary of Activities

- Site developed and posted November 2008.
- Statewide PreK-12 groups formed.
- Representative identified for each county/region.
- More than 200 organizations have joined.

GREENet is a networking partnership that provides a forum to bring high-quality environmental education opportunities to network participants, teachers, students and to all Maryland's citizens. GREENet committees are dedicated to the open sharing of information and resources, coordination of efforts, and mutual support to encourage environmental knowledge and stewardship. The GREENet program, described in the report of the Governor's Commission on Climate Change, serves as the nucleus for the establishment of the statewide education plan.

The purpose of GREENet is to provide a formal structure through which these diverse stakeholders can accomplish their organizations' goals and objectives while pooling talents, leveraging resources, and sharing knowledge with like-minded partners in a larger, more focused way. The structure is patterned after the organizational framework for *Enviromentality*, a county-wide committee currently at work in Harford County.

A representative in each of Maryland's jurisdiction was identified as the nucleus for the establishment of a local GREENet group. These nuclear groups identify potential jurisdictional members, issue invitations to meet, and establish and maintain the local

GREENet group. The Maryland State Department of Education's Environmental Education Office provides the organizing framework for the jurisdictional groups and coordinates communication among groups statewide via website http:// mdinformee.ning.com.

GREENet groups plan activities within their county, with others in their geographic region or with others involved with a similar issue. For example, the Lower Eastern Shore may meet together as a geographic region on a particular issue. Likewise, the counties in the Potomac Watershed could meet together. Fluidity across jurisdictional boundaries allows for flexible groupings as situations warrant.

NEXT STEPS
The statewide structure began with the organization of environmental efforts within the PreK-12 community. Next steps include:

- Linking GREENet to the Governor's *Smart, Green and Growing* web site.
- Recruiting new members & organizations.
- Developing rooms for State and local governments, faith communities, business community and others.

Invitations will be extended to other forums, such as the faith community, business community, nonprofits and other institutions. Together, representatives of these groups form the nucleus of a statewide Environmental Education system for not only the PreK-12 community, but for all institutions around the State.