

MONTGOMERY COUNTY PUBLIC SCHOOLS, ROCKVILLE, MARYLAND

FY 2014

Environmental Sustainability MANAGEMENT PLAN



2013 DISTRICT SUSTAINABILITY AWARD WINNER
U.S. DEPARTMENT OF EDUCATION





VISION

We inspire learning by providing the greatest public education to each and every student.

MISSION

Every student will have the academic, creative problem solving, and social emotional skills to be successful in college and career.

CORE PURPOSE

Prepare all students to thrive in their future.

CORE VALUES

*Learning
Relationships
Respect
Excellence
Equity*

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Dr. Beth Schiavino-Narvaez
*Deputy Superintendent of
School Support and Improvement*

Dr. Kimberly A. Statham
*Deputy Superintendent of
Teaching, Learning, and Programs*

850 Hungerford Drive
Rockville, Maryland 20850
www.montgomeryschoolsmd.org

A Letter From the Superintendent

Dear Community Members:

MONTGOMERY COUNTY PUBLIC SCHOOLS' (MCPS) commitment to responsible environmental stewardship spans more than 35 years, dating back to the 1970s when our first energy policy and program took shape. Since then, we have become a national leader in sustainability and environmental stewardship. The U.S. Department of Education recognized four of our schools with the National Green Ribbon School Award since the inaugural year of 2012. In 2013, MCPS was recognized with the District Sustainability Award by the U.S. Department of Education. These awards reflect the outcome of tremendous collaboration across our many offices, departments, and schools to create successful programs and best practices in sustainability.

Our commitment to sustainability is helping us create healthy learning and living environments for our students, teachers, staff, and community by integrating economic, social, and environmental considerations in all of our decisions. We have made significant progress in the areas of resource conservation, materials and waste cycles, transportation, building construction and maintenance, and information technology. As a result, we have conserved significant energy and resources and also saved our school system millions of dollars by simply being more efficient. We also have built a world-class education for sustainability into our curriculum and programs so that our students will be equipped with skills, knowledge, and an ethic of sustainability.

The Environmental Sustainability Management Plan celebrates all MCPS has achieved to date and charts a course for the next chapter of our sustainability programs and practices. The following pages convey goals, describe a planning framework for taking action, and articulate how we will measure our progress into the future. This plan is a living document to which we will continue to add strategies and actions that keep us moving forward. Working together to implement the Environmental Sustainability Management Plan in the 21st century, we will continually explore innovations that keep us at the forefront as pioneers in the journey toward a more sustainable future.

Sincerely,



Joshua P. Starr, Ed.D.
Superintendent of Schools
Montgomery County Public Schools

“Your status as a 2013 District Sustainability Awardee affirms the commitment your district has made to environmental stewardship, student and staff health, and sustainability education.”

ARNE DUNCAN
Secretary of Education, U.S. Department of Education

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Montgomery County Public Schools (MCPS) is the recipient of multiple 2012–2014 U.S. Department of Education Green Ribbon School Awards:

- Francis Scott Key Middle School (2012)
- Cedar Grove Elementary School (2013)
- Summit Hall Elementary School (2013)
- District Sustainability Award (2013)
- Travilah Elementary School (2014)

MCPS is also the recipient of Malcolm Baldrige National Quality Award (2010), the nation’s highest Presidential honor for performance excellence, including a focus on organizational sustainability.

Background and Approach

THE CONTEXT of the Montgomery County Public Schools (MCPS) Environmental Sustainability Management Plan begins with a history of sustained commitment to environmental stewardship and education. With the adoption of Board Policy ECA, Energy Conservation (www.montgomeryschoolsmd.org/departments/policy/pdf/eca.pdf) in November 1973, the Board of Education made commitments to pursue energy conservation efforts and preserve natural resources, while providing a safe and comfortable learning environment for all staff and students. The leadership of MCPS in the various aspects of sustainability is documented in this plan and by the following notable milestones in the school district's long journey:

- Outdoor education and environmental program—1963
- Board of Education adopts the Energy Conservation policy—1973
- Lathrop E. Smith Environmental Education Center opened—1974
- Installation of building energy management systems—1980
- Formation of an energy management unit—1985
- Development and publication of the Annual Resource Conservation Plan—1985
- Systemwide lighting retrofits, including T-8 lamps, electronic ballasts, and exit signs—1991
- School Energy Rebate Team (SERT) initiated to support school-based energy conservation—1993
- Facility Design Guidelines provide guidelines for building energy-efficient schools—1993
- Procurement of deregulated electricity and natural gas—2000
- Maryland Green School Certification program—2000
- First school with geexchange heating and cooling—2001
- Systemwide retrofits of water-conserving fixtures, submetering irrigation systems—2003
- Leadership in Energy and Environmental Design (LEED) through United States Green Building Council—2003
- School Energy and Recycling Team (SERT) program reinvented with facilitators and the inclusion of recycling—2004
- Systemwide retrofit of lighting systems with 25-watt T-8 lamps and outside lighting controlled with electronic astronomical time clocks—2006
- Opening of Great Seneca Creek ES—First LEED-certified school in MCPS and state—2006
- Wholesale portfolio procurement of electricity and natural gas—2007
- Installation of production-scale solar photovoltaic systems through power purchase agreements—2008
- State of Maryland Environmental Literacy Requirements—2011
- Environmental Literacy Plan under development—2014
- Environmental Sustainability Management Plan—2014

MCPS benefits from being part of the state of Maryland and Montgomery County, which tend to lead much of the country in environmental initiatives and state and local environmental regulations. Some examples include environmental site design to minimize impacts of stormwater run off, clean energy renewable energy offsets, LEED certification, recycling rate performance, and forest conservation. Actual implementation of the MCPS Environmental Sustainability Plan may be modified in response to the future course of these regulations.

Environmental Reports

As a leader in school-system environmental sustainability, MCPS receives requests from local, state, and national organizations; committees; school systems; and governmental agencies to present our best practices, current initiatives, and innovations in sustainability. MCPS participates in multiple work groups and communicates progress and success in regulatory compliance, innovation, education, and dedication to sustainability. MCPS develops and contributes to a number of reports that present various aspects of MCPS

environmental performance, achievements, and plans. These reports include the following:

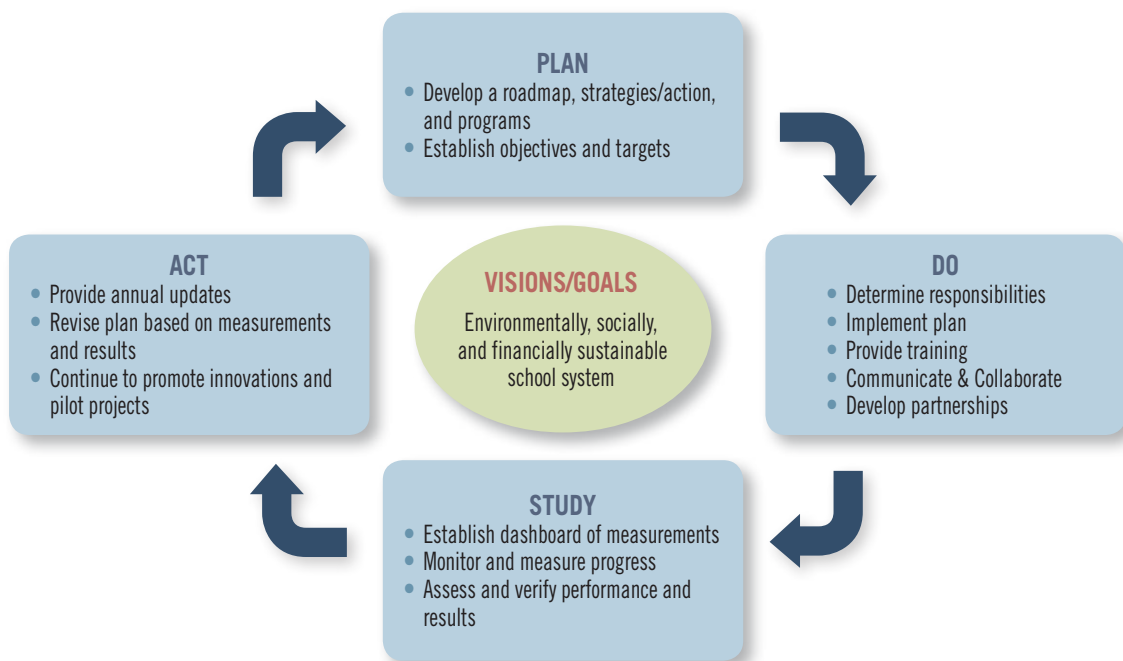
- Maryland Interagency Committee on Energy and Utilities Management—Resource Conservation Plan: www.montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/pdf/MCPSRCP.pdf
- Maryland Interagency Committee on School Construction—High-Performance Building Initiatives in Maryland Public Schools: www.pscp.state.md.us/reports/high%20performance%20initiatives%20jan%202010.pdf
- State of Maryland—Recycling Plan: [www.montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/Sustainability/StateRecyclingReport\(Rev.Feb.2013\).pdf](http://www.montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/Sustainability/StateRecyclingReport(Rev.Feb.2013).pdf)
- Council of Governments—National Capital Region Climate Change Report: www.mwcog.org/uploads/pub-documents/zldXXg20081203113034.pdf
- Montgomery County—Climate Protection Plan: www6.montgomerycountymd.gov/content/dep/downloads/air/2009mococlimprotplan.pdf
- Montgomery County—Solid Waste Hauling Report: www.montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/Sustainability/Hauling%20Report-MCPS-February2013.pdf
- Montgomery County—Annual Recycling and Waste Reduction Report: www.montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/Sustainability/AnnualRecyclingandWasteReductionReport.pdf

- Montgomery County—Municipal Separate Storm Sewer System (MS4) Annual Report: www6.montgomerycountymd.gov/content/dep/downloads/npdes/FY12_MS4_Annual_Report_Final_3_15_13.pdf

Approach

The Plan is well aligned with the values found in The MCPS Strategic Planning Framework and the *Culture of Respect Compact*. As a part of MCPS’s emphasis on excellence and organizational effectiveness/efficiency, based on core values of the strategic plan, the mentioned accomplishments over four decades were direct results of the school system’s commitments to environmental sustainability and various forms of continuous improvement. This commitment and efforts have been documented and recognized through the Malcolm Baldrige National Quality award in 2010.

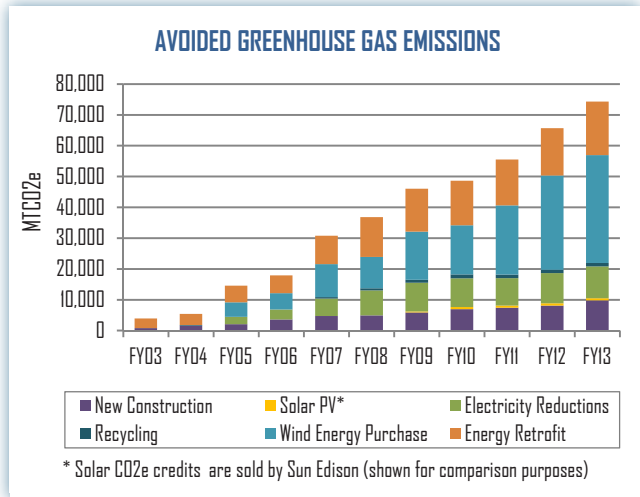
MCPS continues to utilize a variety of tools and methods for its continuous improvements, including the Plan-Do-Study-Act (PDSA) model, Six Sigma, LEAN, and others. These management tools will be employed in the implementation of various goals, strategies, and action plans. It will help us coordinate efforts, track progress, and explore innovations for the future, considering financial, social, and environmental performance of the entire school system and, most important, provide a model of sustainability for preparing our students to be 21st century citizens.



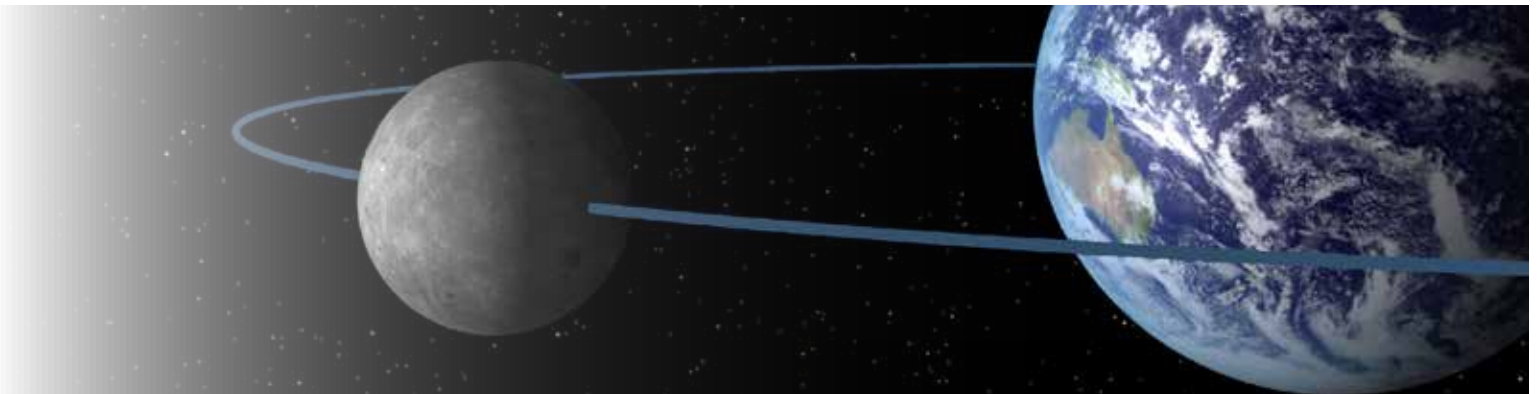
Baseline Summary

IN 2013, MCPS spent \$48 million to light and heat its schools and buildings, operate its buses and vehicles, dispose of waste, and provide water and sewer services. These activities resulted in the generation of the equivalent of 178,000 metric tons of carbon dioxide (MTCO₂e), or approximately 1.2 MTCO₂e per student per year.

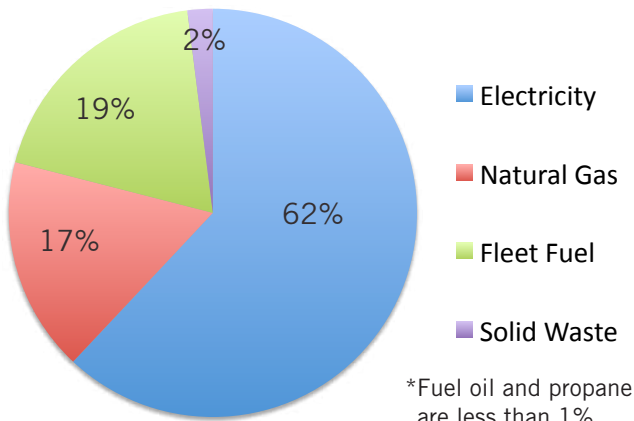
These greenhouse gases are equivalent to the amount of fuel it would require to take 1,800 trips to the moon, or 4.6 trips to the sun, or nearly 170,000 students and staff to drive individually to Baltimore once a week for a year.



MCPS has reduced greenhouse gas emissions by over 70,000 MTCO₂e through a variety of programs and initiatives as described in this plan. This represents a 28 percent reduction in the MCPS carbon footprint since 2003. Solar PV and recycling represents over two percent reduction of the overall MTCO₂e reduction in FY13.



CARBON FOOTPRINT
FISCAL YEAR 2013
GREENHOUSE GAS EMISSIONS, BY SOURCE



The carbon footprint pie chart illustrates the contributions from the various categories of greenhouse gas emissions. The largest source of greenhouse gas emissions is associated with the energy consumption of MCPS buildings. Electricity and natural gas account for 79 percent of the greenhouse gas emissions of the school system. As explained in the subsequent pages of this plan, MCPS has made tremendous improvements in building energy efficiency. Priorities for reducing greenhouse gas emissions include improving building energy efficiency and fleet vehicle efficiency—the categories of greatest opportunity.



Our Vision for Sustainability

WE LEAD AS A WORLD-CLASS EXAMPLE of how to collaborate and be environmentally, socially, and financially sustainable across our school system. Our students are equipped with skills, knowledge, and an ethic of sustainability to be stewards and leaders for present and future generations.

What is Sustainability?

Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability maintains the conditions under which humans and nature can exist in productive harmony—including the social, economic, and other requirements of present and future generations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

About Montgomery County Public Schools

2013–2014 Facts at a Glance



Students

- Student enrollment: 151,289
 - Elementary School: 73,916
 - Middle School: 32,237
 - High School: 45,136
- Largest school system in Maryland
- 17th largest school system in the United States
- Student Diversity
 - White: 48,533 (32.0%)
 - Hispanic: 41,499 (27.4%)
 - African American: 32,397 (21.4%)
 - Asian: 21,760 (14.4%)
 - Two or more races: 7,017 (4.6%)



Schools

- Total schools: 202
 - Elementary Schools: 133
 - Middle Schools: 38
 - High Schools: 25
 - Career and Technology Center: 1
 - Special Schools: 5



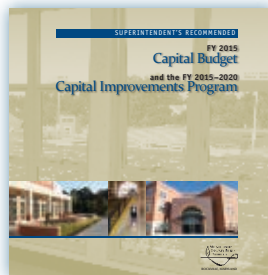
MCPS Employees

- Total employees: 22,597
 - Teachers: 12,110
 - Administrators: 801
 - Supporting Service Employees: 9,344



Facility Assets

- 24,554,063 square feet of building
- 3,497 acres of real property



Budgets

- \$1.366 billion six-year Capital Improvement Program (FY 2013–2018)
- \$2.225 billion FY 2014 operating budget

Current State

MONTGOMERY COUNTY PUBLIC SCHOOLS (MCPS) has a demonstrated commitment to innovation in environmental sustainability, responsibility, and education. MCPS is a leader in green and healthy-schools initiatives and integrates environmental literacy into the curriculum and instructional programs at all grade levels. Since the early beginnings of energy-conservation programs, MCPS has actively pursued energy management through a team of dedicated professionals and consistent investment. Engaged students, staff, local partners, and community members develop and enhance environmental sustainability and stewardship at MCPS through a variety of venues and initiatives. MCPS has embraced a culture of sustainability that deeply permeates the schools and the organization.

Following are the current state of initiatives and achievements that span a broad range of environmental sustainability:

Student Education, Awareness, and Actions

Over the past several decades, MCPS has assumed a leadership role at the state level in supporting and promoting environmental education in schools. MCPS administrators and teachers were among the principal founders of the Maryland Association of Environmental and Outdoor Education. The association has thousands of members statewide, including lead environmental educators in MCPS. The goal of this organization is to build a citizenry that understands and is responsibly engaged in advancing sustainability to address human needs and conserve the Earth's natural resources. The MCPS associate superintendent of curriculum and instructional programs and the supervisor of outdoor environmental education programs are current members of the leadership team and steering committee, respectively, for the Maryland Governor's Partnership for Children in Nature. The Partnership's goal is to improve and expand opportunities for children to learn about, play in, and experience the natural world. It is cochaired by the superintendent of the Maryland State Department of Education and the secretary of the Department of Natural Resources. These MCPS undertakings are evidence of the district's deep commitment to environmental sustainability and education.



Highlights of Effective Environmental Sustainability and Education in MCPS:

- An Environmental Literacy Plan, a living document, is continually reviewed, monitored, and improved to ensure that students meet the state graduation requirement in environmental literacy.
- Curriculum 2.0, a new integrated curriculum, incorporates environmental education topics at every grade level as a context for trans-disciplinary teaching.
- A systemic residential outdoor environmental education program for every Grade 6 student (around 10,000) focuses on the environmental science and stewardship of the local watershed.
- Secondary School Project-based Learning units use environmental issues/topics as a context and integrate science, technology, engineering, and mathematics (STEM) learning.
- Myriad high school curriculum offerings and career pathways in regular, honors, and Advanced Placement levels focus on environmental studies, including biology, government, ecology, U.S. history, environmental science, and horticulture.
- An approved school garden process with resources to create edible and native gardens help teachers use gardens as classrooms for teaching across the curriculum.
- An established professional development program in the content and methodology of environmental education integrates STEM teaching.
- A “green culture” is embedded through the formal and informal curricula, incorporation of environmental stewardship through the formal curriculum, and daily attention to resource conservation via the SERT program.



Vegetated Roof

Building Construction, Maintenance, and Operations

- Fourteen schools are certified as Gold under the U.S. Green Building Council (USGBC) LEED program and have Environmental Performance Indexes (EPIs) of approximately 35 to 45 kBTUs/SF/year.
- Geoexchange systems provide heating/cooling in 16 schools, and six more systems are under construction
- The newer LEED-certified schools achieve approximately 30 percent improvement in energy efficiency
- Since 2008, MCPS has incorporated Environmental Site Design features into all of its new construction projects. Some of these features include infiltration trenches, bio-retention ponds, and vegetative roofs.
- Green Seal Standards are used to select cleaning products for the Healthy High Performance Cleaning program.
- A dedicated air-quality team of professionals provides proactive and reactive services, based on USEPA guidelines, to ensure healthy air quality in schools.
- Since the 1990s, new school construction has installed dedicated ventilation systems for healthy clean air with energy recovery and proper dehumidification.
- New classrooms are designed for daylight harvesting through windows or clerestory.
- Low or no-VOC materials are required in all construction.
- Pesticide use is minimized through a strictly regulated Integrated Pest Management program.
- Drinking water has been tested for lead in all drinking fountains.

- Each classroom with direct contact with the ground is tested for radon.
- The MCPS school nutritional program is recognized by the U.S. Department of Agriculture: all 132 elementary schools received the Healthier U.S. School Challenge Award, and 56 schools received the award at the Silver level.

Energy and Natural Resource Conservation

- For FY 2013, the MCPS Energy Performance Index (EPI) (BTUs/SF/year) is less than half of the 1978 EPI, 30 percent less than in 1989, and 20 percent less than in 2003. The FY 2013 MCPS EPI is 54 kBTUs/SF (see Figure A in the application appendix).
- The School Energy and Recycling Team (SERT) program supports students and staff in all MCPS schools as they take active responsibility for reducing energy and water consumption and solid waste. Students engage in an array of SERT activities that provide productive outlets for enthusiasm and creativity to reduce environmental impacts.
- Energy consumption reductions exceed 10 percent per year (FY 2008–FY 2012 over FY 2003 baseline)
- Water consumption is 20 percent lower (FY 2011–2012 over FY 2008 baseline)
- Average recycling rate exceeds 60 percent (FY 2009–FY 2012)
- MCPS partners with a solar power provider to host production-sized solar PV systems that provide between 20 to 40 percent of the power requirements of eight schools during peak production hours. Solar power production information is provided on a user-friendly website for teachers and students to analyze.
- Overhead fluorescent lighting through low mercury T-8 lamps and electronic ballasts reduces lighting costs by 35 percent.
- MCPS is one of the first public school systems to be a MS4 stormwater discharge co-permittee and formally reports its pollution prevention and stormwater management activities in the Montgomery County annual MS4 report to the state.
- MCPS partners with the Maryland Cooperative Extension Service, the Audubon Naturalist Society, and the Montgomery County Master Gardeners to support school-initiated gardening. Gardening resources for schools are available on the MCPS website.
- MCPS partners with the local parks department to host community gardens on MCPS property.

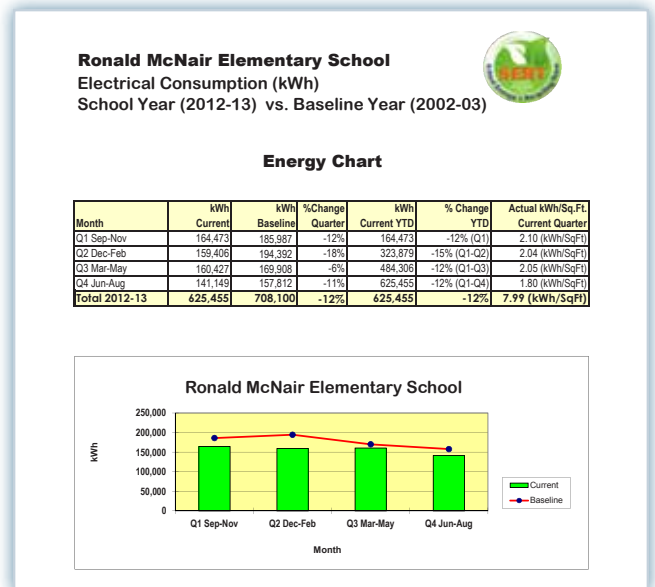
Student Education, Awareness, and Actions

MCPS HAS WOVEN an ethic of environmental sustainability throughout its formal and informal curricula. Our efforts are driven by an Environmental Literacy Plan—a living document that ensures that students not only meet state graduation requirements in environmental literacy but also integrate environmental education across content areas and at every grade level.

The MCPS Outdoor Environmental Education Program (OEEP) promotes collaboration to create edible and perennial gardens, engage students in small-scale reforestation projects, and promote student service learning opportunities. Every year, more than 10,000 students in Grade 6 have the opportunity to participate in environmental science and outdoor stewardship activities.

The School Energy and Recycling Team (SERT) program instructs and guides staff and students at all MCPS schools as they work together to foster a culture of conservation. Classroom activities, toolkits, videos, and friendly contests with awards give our students rich and rewarding experiences in environmental stewardship.

By actively monitoring and promoting resource conservation at schools, individual SERT/green teams are creating awareness and affecting behavior change. A portion of the costs



avoided is based on performance and behavior shared with schools, through a structured awards program. SERT teams at individual schools lead the way to a sustainable future by monitoring and promoting resource conservation, including energy, water, natural gas, recycling, materials, and goods.

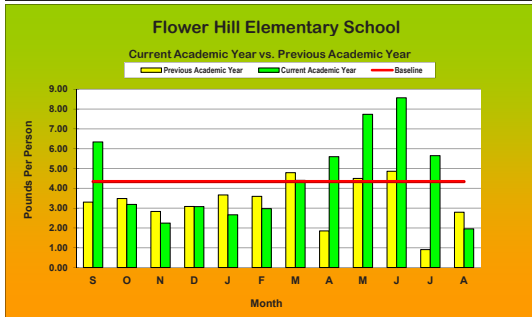
MCPS schools are encouraged to seek Maryland Association for Environmental and Outdoor Education (MAEOE) Green School Certification. This voluntary certification program promotes learning that incorporates local environmental issue investigation and professional development with environmental best management practices and community stewardship.

MCPS avoided more than \$2.7 million in energy costs and reduced GHG emissions by nearly 10,000 MTCO_{2e}



**Flower Hill Elementary School
Recycling Chart Pounds Per Person (PPP)
2011-12 VS. 2012-13**

Month	Previous Academic Year Monthly PPP	Current Academic Year Monthly PPP	PPP Change 2011-12 VS. 2012-13
September (S)	3.30	6.34	3.04
October (O)	3.48	3.19	-0.30
November (N)	2.83	2.25	-0.58
December (D)	3.09	3.08	-0.01
January (J)	3.67	2.66	-1.00
February (F)	3.59	2.98	-0.62
March (M)	4.79	4.40	-0.39
April (A)	1.85	5.60	3.75
May (M)	4.50	7.74	3.23
June (J)	4.86	8.57	3.70
July (J)	0.91	5.65	4.74
August (A)	2.79	1.96	-0.84
YTD AVG	3.31	4.53	1.23



It's your world... choose to conserve.

As of: 2/26/2014

- Engaged students in action to address a local or regional environmental problem, including field and outdoor experiences for all students (annually)
- Ensured all students have an opportunity to engage in learning about the environment in a natural setting (schoolyard, community, or off-site natural setting)
- Established professional development plan program to support effective delivery of an integrated environmental literacy curriculum for classroom teachers and administrators
- Established school-based energy conservation and recycling programs engaging students and staff to reduce building energy and water use and increase recycling—supported by training, timely reporting of performance, awards, recognition, and financial incentives.
- Established formal partnership with environmental groups, such as the Audubon Naturalist Society, to support environmental literacy through classroom and student-engaged environmental projects.

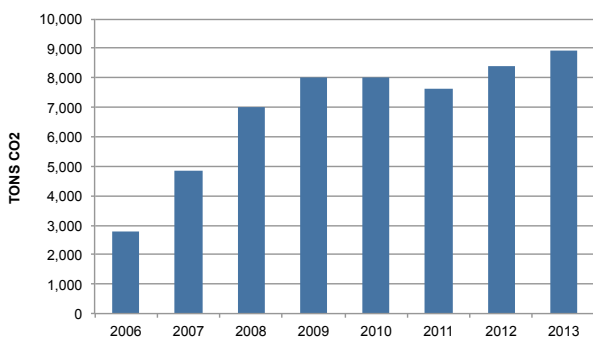
Current Strategies and Measurements

- Established environmental literacy committee for the development of a multi-grade and multi-discipline environmental literacy program
- Completed environmental curricular gap analysis to identify strengths and weaknesses of the environmental literacy curricular program
- Revised curricula to infuse environmental literacy standards through an integrated program
- Supported active student engagement in authentic environmental issues and problems

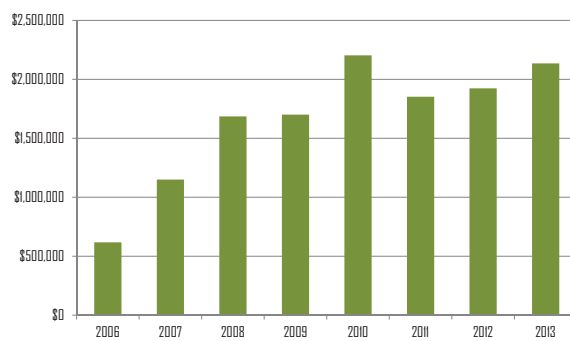
Goals

- Increase student knowledge and engagement in environmental sustainability and sustainable practices
- Use our buildings and grounds as tools to support education for environmental sustainability and outdoor stewardship
- Make 50 percent of our schools MAEOE-certified Green School by 2024. As of 2013, 45 MCPS schools are MAEOE-certified Green School.
- Reduce greenhouse gas (GHG) emissions by 12,000 MTCO₂e through SERT school-based energy and recycling efforts

CO2 EMISSION REDUCTION THROUGH kWh AVOIDANCE



ENERGY COST AVOIDANCE



Strategies/Actions

- OEEP will continue to promote outdoor environmental stewardship through small scale reforestation projects, removal of non-native plants, and collaboration on edible and perennial garden initiations.
- OEEP created a dedicated webpage on its website as a guide for schools to create school gardens. Through the website, OEEP will continue to provide schools with guidance, resources, procedures, and approval processes to create instructionally-based gardens at the school site. Four choices of garden templates are available for native gardens, each with suggested plants: two native plant habitat gardens—one for shade and one for sun, a senses garden, and a butterfly garden. A list of recommended plants for edible gardens in containers is also on the website.
- The SERT program will showcase the green features in school buildings to students to support sustainability education.
- The SERT program will continue to assist schools to create and support green teams in each school and actively engage in school and community events and activities to promote environmental sustainability.
- OEEP and the SERT program will assist schools to meet the requirements of the MAEOE Green School certification application process by providing customized school-based professional learning, school data, and assistance with the implementation of best management practices, student programs, and guidance to complete the application process.
- The SERT program will continue to promote the culture of conservation among the building occupants that contribute to the GHG emissions by:
 - ensuring that the lights are turned off when room is unoccupied
 - using natural lighting when possible by opening and adjusting the blinds
 - turning the computers off at the end of use instead of waiting for automatic shutdown
 - de-lamping where possible
 - promoting the use of task light at the teacher’s desk when student are not in the classroom
 - controlling infiltration by keeping doors and windows shut
 - reducing plug loads
 - reducing waste, reusing and increasing recycling participation



Building Construction, Maintenance, and Operations

MCPS HAS A CRITICAL RESPONSIBILITY to plan, build, maintain, and operate sustainable facilities that meet the needs of current and future generations. Environmental sustainability is a long-term vision and, as such, MCPS must have goals and strategies that include deeply embedded values related to environmental responsibility and resource efficiency.

A PRIMARY GOAL in this category is to articulate sustainability principles in planning, construction, maintenance, and operation processes and policies that aim to protect resources and reduce the overall impact of our facilities on human health and the natural environment. While MCPS currently implements many industry-leading green building strategies, the school system must develop the cohesiveness of these strategies with the overall sustainability plan that must be developed. In order to develop these practices we must continue to strive for the most effective 21st century learning environments while being an active participant in industry research and development.

to help building owners and operators be environmentally responsible and use resources efficiently. The LEED for Schools rating system was developed to address the design and construction of K–12 schools. The rating system is based on LEED for New Construction, but focuses on classroom acoustics, master planning, mold prevention, environmental site assessment, and other issues important to schools. To achieve LEED Gold within the LEED for Schools system involves having significant features for Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process.

Current Strategies and Measurements

Facility Design Guidelines: MCPS developed Facility Design Guidelines www.montgomeryschoolsmd.org/departments/construction/publications/guidelines.shtm in 1993 that formally standardized processes and the design/construction specifications for new and revitalization projects outlined in the Capital Improvements Program. The Facility Design Guidelines continues to serve as a vital tool for producing high-quality capital projects in a consistent and timely manner. In 2003, the Facility Design Guidelines were updated to incorporate sustainable design features and practices that are aligned with the various categories in the Leadership in Energy and Environmental Design (LEED).

LEED is a set of rating systems for the design, construction, operation, and maintenance of green buildings. Developed by the U.S. Green Building Council (USGBC), LEED is intended

Facility	LEED Certification Level	Year Achieved
Great Seneca Creek ES (new)	Gold	2007
Francis Scott Key MS (replacement)	Gold	2009
William B. Gibbs, Jr. ES (new)	Gold	2010
Cashell ES (replacement)	Gold	2010
Carderock Springs ES (replacement)	Gold	2011
Cresthaven ES (replacement)	Gold	2011
Cabin John MS (replacement)	Gold	2012
Farmland ES (replacement/renov)	Gold	2012
Cannon Road ES (replacement)	Gold	2012
Seven Locks ES (replacement)	Gold	2012
Paint Branch HS (replacement)	Gold	2013
Flora M. Singer ES (new)	Gold	2013
Glenallan ES (replacement)	Gold	2014
Garrett Park ES (replacement)	Gold	2014

Using the updated Facility Design Guidelines, MCPS produced Great Seneca Creek Elementary School in August 2006, the first Gold-rated LEED-certified school in Montgomery County and the state of Maryland. Subsequently, Montgomery County and the state of Maryland passed legislations in October 2006 requiring a minimum of Silver rating in LEED certification for new major construction projects. MCPS now has 14 LEED-certified schools, all with Gold ratings.

The LEED-certified schools incorporated design/construction processes and sustainable design features that result in safer and healthier buildings. Another goal of LEED certification is to reduce the carbon footprint through the use of energy-efficient and environmentally friendly technologies that increase performance while reducing maintenance and operation costs. MCPS has an additional 17 capital projects registered for LEED certification in the pipeline.

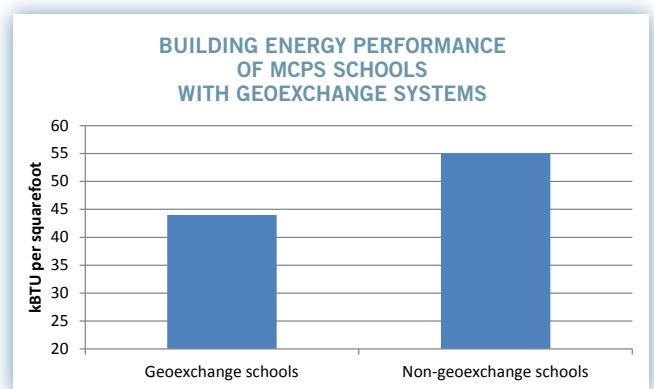
Examples of Sustainable Building Features:

- Minimal building footprint to reduce impervious area
- Pervious paving for parking lots to reduce stormwater runoff
- Bio-retention ponds and swales to control quality and quantity measures of stormwater management system
- Orientation of building and spatial relationships to maximize day-lighting in occupied spaces, especially classrooms
- Reuse/repurpose/recycle 88 percent of the construction waste materials
- Energy-efficient low-e window system
- Lighting—highly efficient T-8 direct/indirect fixture with occupancy sensors
- HVAC—Geoexchange system that harvests energy by utilizing constant ground temperature, and efficient Energy Recovery Units (ERU) that recapture energy from the exhaust air—reducing energy consumption
- Finishes—Low Volatile Organic Compound (VOC) paint, carpet adhesives, vinyl composition tile (VCT) floor to improve air quality
- Vegetative roof—Filters stormwater runoff for quality measure of overall stormwater management, while providing additional insulation layer
- Water-efficient toilet fixtures
- Cool roof—white coating on roof to deflect solar heat during hot summer days
- Recycled construction materials

- Forest Stewardship Council—certified wood products
- Sloped interior ceilings to maximize day-lighting in classrooms
- Demand-based ventilation system for assembly areas
- Rapidly renewable materials, sudias bamboo, cotton insulation, wheatboard, and cork.

Geoexchange System

MCPS piloted the first geoexchange system in 2001. Currently, 21 schools are being heated and cooled with the geoexchange system. Geoexchange, also known as geothermal, heating and cooling systems have proven to be the



most energy-efficient and environmentally safe space conditioning systems available. Geoexchange systems harvest the constant ground temperature and use the Earth's mass to store energy for the purposes of heating and cooling buildings. Energy is transferred through an underground piping



Concept Diagram of Geoexchange System

Schools with Geoechange System	Year of Operation
Spark M. Matsunaga ES	2001
Great Seneca Creek ES	2006
Little Bennett ES	2006
Richard Montgomery HS	2007
Bells Mill ES	2009
Cashell ES	2009
Francis Scott Key MS	2009
William B. Gibbs, Jr. ES	2009
Carderock Springs ES	2010
Cresthaven ES	2010
Cabin John MS	2011
Cannon Road ES	2012
Flora M. Singer ES	2012
Garrett Park ES	2012
Paint Branch HS	2012
Seven Locks ES	2012
Beverly Farms ES	2013
Gaithersburg HS	2013
Glenallan ES	2013
Herbert Hoover MS	2013
Weller Road ES	2013
Bel Pre ES	2014
Wilson Wims ES	2014
Candlewood ES	2015
Rock Creek Forest ES	2015

system between the building and ground to provide year-round heating and cooling. The system uses conventional heat pumps, similar to units found in homes, but uses the underground piping system in lieu of outdoor condenser fans. This scenario enables a building to maintain comfort conditions without using large commercial chillers and boilers. These chillers and boilers require not only annual maintenance, but also a large volume of space within a building. This space and maintenance avoidance tied to the overall energy efficiency results in a return on investment of 7 to 12 years for a given facility.

Stormwater Management Program

Montgomery County is made up of 8 major and more than 150 smaller watersheds. Stormwater runoff from MCPS schools effects all of these watersheds. These watersheds are tributaries to the Chesapeake Bay and its numerous estuaries. In stewardship to our environment, MCPS is committed and dedicated to protecting and improving our natural resources and the quality of water in our local and regional watersheds and natural resources.

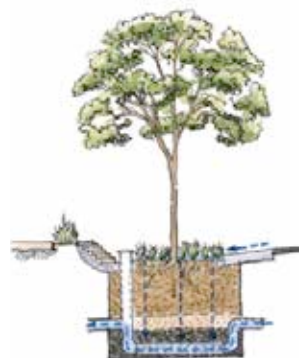
MCPS implements on-site stormwater management facilities that meet or exceed the latest federal, state, and local requirements, using environmental site design (ESD) techniques. Some of the ESD stormwater management measures and facilities that MCPS incorporates into its site and building designs include the following:

- Impervious area reduction via installation of vegetated roof areas
- The use of alternative porous pavements to promote groundwater recharge
- Bio-retention facilities
- Infiltration practices
- Vegetated, bio-swales

As a co-permittee with Montgomery County under the state’s Municipal Separate Storm Sewer System (MS4) Permit, MCPS works collaboratively and cooperatively with the county’s Department of Environmental Protection to identify school-site opportunities to facilitate the installation of ESD stormwater management measures to improve water quality by reducing the county’s overall untreated impervious surfaces. In 2013, the program performed maintenance at 32 stormwater facilities and incorporated ESD techniques into new capital projects, completing 160 stormwater management facilities.



Environmental site design for stormwater management

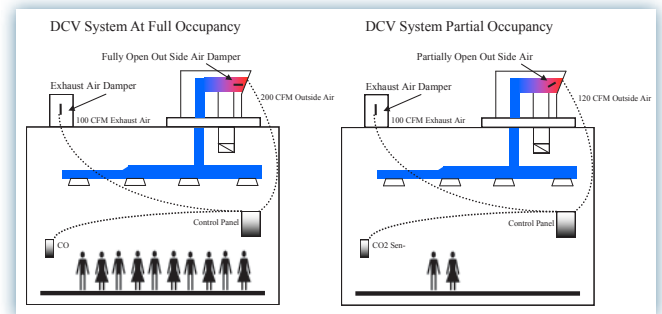


Building Maintenance Plans

As stewards of over 24,500,000 square feet in more than 220 facilities, MCPS strives to maintain the indoor environments in an environmentally, socially, and economically responsible manner. With a proactive Indoor Air Quality (IAQ) program, focusing on preventive maintenance and customer service, the MCPS IAQ Team has continuously improved indoor air quality since it was formed in 2000. The IAQ Team developed its own program—the Building Maintenance Plan (BMP), which provides relatively low-cost vital preventive maintenance and uses environmentally friendly products during the process. Similar to an owner’s manual for the building’s HVAC system, the BMP is used by school-based staff to maintain the school’s ventilation equipment in optimum condition. The IAQ Team has developed and delivered BMPs to 91 schools. As a result of preventive maintenance activities, the IAQ Team has met performance measures for temperature and ventilation since the program started. The BMP also brings awareness to the importance of using products that have been reviewed for safety and environmental impact—only “approved” products are permitted in schools.

Energy Management Systems (EMS)

MCPS has a centralized energy management system (EMS) and installed Automated Temperature Control (ATC) system at all its facilities to regulate central heating, ventilation, and air conditioning (HVAC) systems and to maximize energy savings by controlling when systems are operating. The centralized EMS allows capabilities to turn on the HVAC systems while school is in session and minimize output when school is not in session. For special events and community use, schedules are consolidated and only specific areas (zones) are turned on as needed. The EMS are equipped with features to increase operating efficiency. The system detects space temperature, even in the “unoccupied mode,” and determines the optimal time to turn the system on and off in order to achieve or maintain the desired set point. In many of the large gathering spaces, such as lunchrooms, gymnasiums, and auditoriums, the systems are equipped with Demand Controlled Ventilation (DCV), which allows the systems to detect the volume of occupants, based on CO² detection. Ventilation and the provision of fresh air then can be modulated to respond to the demand and reduce energy consumption.



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Demand Controlled Ventilation automatically adjusts the amount of outside ventilation air according to the number of occupants.

Environmental Services and Indoor Air Quality

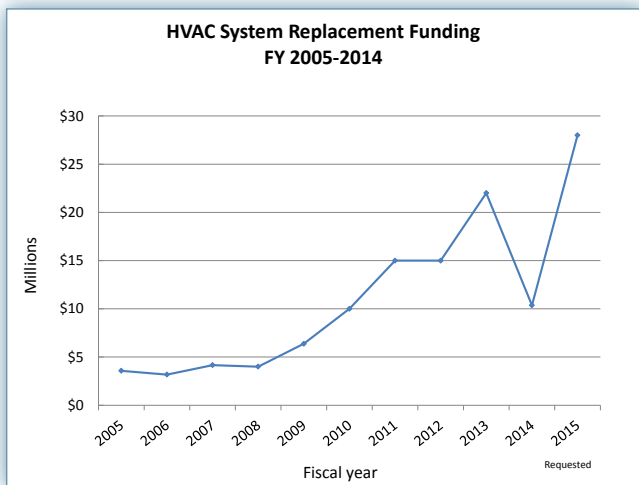
The sustainability initiative to improve and maintain good indoor air quality has been achieved through implementation of a comprehensive indoor air quality program. Through the implementation of building-specific BMPs, MCPS has earned the EPA’s Tools for Schools Excellence Award and, more important, improved the learning environments for students and staff. To avoid air quality issues in relocatable buildings, the IAQ unit proactively inspects all relocatable classrooms on an annual basis, using a written assessment checklist. In 2013, MCPS inspected nearly 500 relocatable buildings. While our primary goal is to address IAQ proactively, the IAQ program also implements a formal IAQ Complaint Response Program, which addresses complaints in an effective and efficient manner. Over the past 10 years, the IAQ unit has responded to an average of 250 complaints per year. Other components of the MCPS IAQ sustainable framework include an Environmentally Preferred Purchasing Program and a staff of environmental professionals and technicians who respond to a wide variety of unforeseen environmental challenges and requests for assistance, including identification and management of a variety of hazardous materials.

Integrated Pest Management

The MCPS integrated pest management (IPM) program promotes a safe learning environment through monthly school inspections. The inspections identify and correct conditions that encourage pests by reducing food, water, and shelter for pests, and prevent damage by pests. This integrated approach results in the least possible hazard to people, property, and the environment and minimizes unnecessary pesticide application. The collaboration with schools provides an opportunity to educate school staff on best practices for pest management.

HVAC Replacement Program

The HVAC replacement program implements the systematic replacement of the HVAC equipment to maximize indoor environmental quality (IEQ) and energy performance, while reducing a significant equipment backlog. The replacement process involves a full building analysis to ensure that energy-efficiency and IEQ are optimized for each facility. The focus on the HVAC systems and its relationship to sustainable facilities has grown the program by 600 percent over the past 10 years, resulting in buildings that consume less energy, offer a healthier environment, and increase comfort. Due to the large amount of school construction that occurred with enrollment increases beginning in the 1980s and the deferral of HVAC system replacements due to capital funding constraints, the backlog in HVAC system replacements has grown to \$177 million. MCPS has consistently highlighted the need to increase capital funding for HVAC system replacement. The chart below indicates the funding level over the past decade.



Green Cleaning

The Healthy High Performance “Green” Cleaning Program (www.montgomeryschoolsmd.org/departments/schoolplantops/PDF/Green%20Cleaning%20Draft%204-2014.pdf) informs facility managers and educates the building service staff at all MCPS facilities on how to achieve “green housekeeping” requirements. The program establishes proactive housekeeping standards that promote a healthy and sustainable environment. These standards cover proper selection and use of chemicals and equipment and green cleaning procedures. Additionally, this program ensures

that the interior of facilities are maintained in a manner that maximizes the amount of pollutants extracted; minimizes worker/occupant exposure to harmful contaminants and cleaning residues; minimizes the amount of chemicals, particles, and moisture accumulated and/or released into the air by the cleaning process; and disposes of cleaning waste in an environmentally responsible manner.

Fats, Oils, and Grease

This program provides maintenance for more than 200 grease interceptors at MCPS facilities. The proper maintenance of interceptors protects the environment by preventing sanitary sewer overflows that could contaminate local water bodies and damage property. In addition, school staff is educated on best practices to minimize fats, oils, and grease (FOG) through awareness training. A future initiative is the incorporation of FOG best management practices into the Family and Consumer Sciences (FACS) curriculum, promoting environmental stewardship.

Equipment Repair Program

This program repairs approximately 1,350 pieces of various building service and maintenance equipment annually. By repairing the equipment in house, the program has resulted in a reduction in equipment repair cost by 41 percent, significantly improved average turnaround repair time from four weeks to nine days, salvaging/reuse of parts, preventive maintenance to extend the life-cycle of equipment, and recycling of waste materials.



Goals

- Implement life-cycle-assessment procedures that follow International Organization for Standardization (ISO) 14040 standards
- Develop planning standards that target compact core design and open-space preservation for each project
- Explore Net-Zero building concept
- Continue to design and construct new school buildings to achieve the evolving and increasingly difficult LEED Gold standards
- Employ the best operational practices for indoor environmental quality and develop a measurement and verification process
- Develop a Building Maintenance Plan for all schools by 2024

Strategies/Actions

- Pilot energy-efficient building elements with the directive to achieve a 25 kBtu per building square foot per year operating efficiency by 2017. Each element will be evaluated throughout the construction and operational processes to determine the most effective solutions for sustainable design standardization.
- Actively participate in industry organizations such as AIA, USGBC, American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and Associated Builders and Contractors (ABC). Participation will include research of new technology and standards as well as peer review of regional school districts to share innovations and results. This is a continuous education process that will meet sustainability goals as well as MCPS professional development milestones.

- Ensure operations and maintenance (O&M) personnel are part of the project planning and development process to retain the green criteria designed at the onset of the project. Design strategies and (in some cases) the overall operational intent is impacted during the transition from construction to operation. To minimize this impact, the design review and commissioning processes will undergo a process improvement to ensure that all building stakeholders who are actively involved participate by 2016.
- Develop current energy management systems to include improved building thermal monitoring and operation of lighting systems by 2017. Current systems have the capability to monitor environmental aspects such as temperature, humidity, occupancy, light levels, and IAQ conditions but they do not report and trend this information in a manner that is beneficial to each facility. By 2017, a dashboard system will be implemented to provide students and staff with real-time information that will allow them to contribute to the overall efficiency of the building.
- Refine Facility Design Guidelines to include green architecture that strives to reduce energy, water, and materials consumption used during construction. The Facility Design Guidelines are continually updated to reflect current standards and trends but not from an overall sustainability perspective. This sustainability update will occur initially in 2015 but will continue in parallel to all other strategies to reflect successes, challenges, and the current goals of the design team.



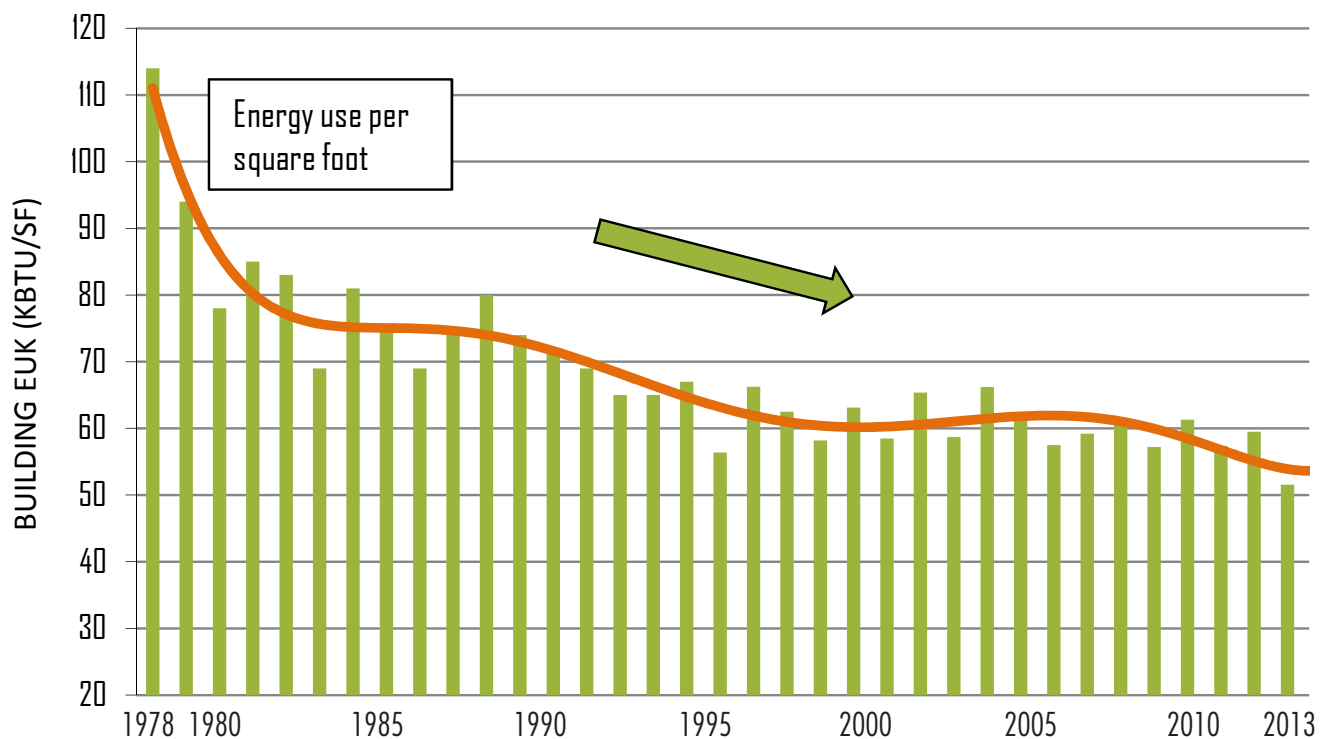
LEED—or Leadership in Energy and Environmental Design—is a national and international green building standard developed by the U.S. Green Building Council. MCPS has 13 schools certified as Gold, with certification for 17 more schools under way.

Energy and Natural Resource Conservation

MCPS HAS BEEN A NATIONAL LEADER in using technology to conserve natural resources for almost 35 years. From installing the latest lighting technology to maximizing efficiency in classroom heating and cooling, MCPS has reduced energy use and associated greenhouse gas emissions substantially.

BUILDING ENERGY USE INTENSITY (EUI) is useful to show how efficiently a building uses energy. MCPS's sustained reductions in energy consumption over 35 years is the payoff from consistent investments in energy efficiency and a commitment to environmental responsibility.

MCPS BUILDING ENERGY USE INDEX

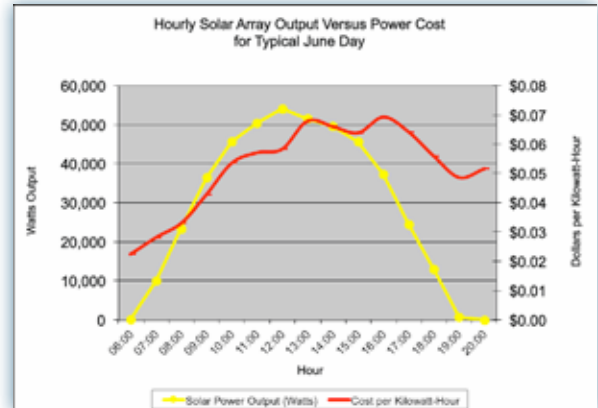
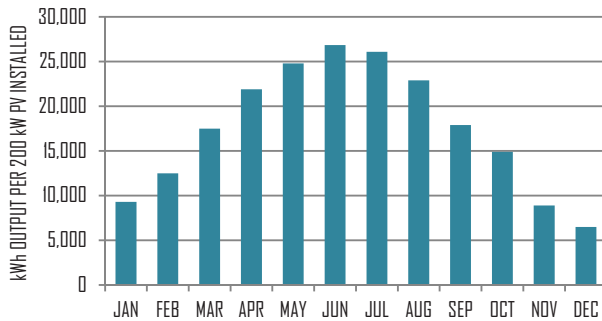


Solar Power Purchase Agreements

MCPS has established power purchase agreements (PPA) for on-site electric renewable energy generation. These contracts hold a stabilized rate below the cost of conventional grid electricity and provide additional risk management for electric rates well into the future.

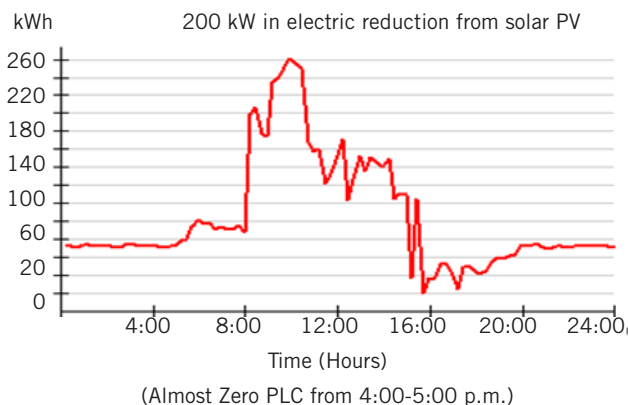
A PPA allows a government building owner to host the operation of a solar photovoltaic (PV) system on the roof of a building. A solar developer installs, owns, and maintains the solar array and sells power directly to the building owner. Unlike a government building owner, the developer is able to access significant cost offsets to solar projects available under state and federal tax incentives. The building owner benefits from electricity at below-market rates, with no upfront cost or risk.

ANNUAL kWh OUTPUT OF STANDARD SOLAR 200 kW ARRAY



Schools	Capacity (kWAC)	Number of Panels	Completion Date
Clarksburg HS	260	1,466	01/23/2009
Lakelands Park MS	133	770	02/10/2009
College Gardens ES	86	497	02/12/2009
Richard Montgomery HS	135	784	06/30/2009
Francis Scott Key MS	100	564	12/20/2009
Quince Orchard HS	319	1,799	12/20/2009
Sargent Shriver ES	80	495	12/20/2009
Parkland MS	151	851	01/20/2010
Total:	1,264	7,226	

SAMPLE PROFILE FOR LAKELANDS PARK MS



MCPS expects to deter a significant fraction of the Peak Load Contribution (PLC) for our schools by hosting solar installations. Recent rate increases in PLC charges would have raised the utility cost for MCPS by \$4.5 million per year, if not abated. The buildings with solar PV systems experience reduced annual PLC charges. As illustrated in the sample profile for Lakelands MS, the load contribution during the 4:00–5:00 p.m. time period, when the PLC is typically assessed, was reduced substantially to a minimal level, due to the power output from the solar PV system.

Large-scale PV systems (from 80 kilowatts up to 319 kilowatts) have been completed at eight schools. As a result, MCPS is one of the leading hosts of net-metered, solar power purchase agreements in Maryland, with 1,264 kilowatts of installed capacity. The combination of these solar arrays is predicted to produce a capacity charge cost avoidance of approximately \$150,000 in FY 2014. A list of the existing systems is provided in the table on page 18.

MCPS is using very efficient 25-watt fluorescent lamps and electronic ballasts systemwide to reduce the lighting energy by more than 30%. This represents more than \$2 million per year of cost avoidance.

Peak Load Management

PJM Interconnection, LLC (PJM) is the independent system operator of the electric grid that serves MCPS. A significant charge instituted by PJM is the Peak Load Contribution (PLC) charge. This charge is assessed against all consumers of electric power on the five days of the summer when demand for power is at the maximum on the PJM system. This charge is based on each consumer's demand for electric power that coincides with PJM's five peak hours. The purpose of the charge is to recover the cost to have full generation and transmission capacity available for the highest demand periods. These PLC charges vary from year to year. They typically amount to 10 to 15 percent of MCPS's cost for electricity—\$2.7 million to \$4 million. Charges based on the summer 2012 assessments will be especially high with the potential of increasing MCPS's electricity cost by \$4.5 million between FY 2013 and FY 2014.

To defray part of these additional charges, MCPS has developed a program to reduce peak electrical demands at facilities during the summer afternoon hours when the charges are most likely to be set. The program uses energy management systems to curtail central plant chillers and pumps to many facilities during the peak demand hour each weekday, while SERT "energy sweepers" simultaneously walk the facility to turn off unnecessary lights and plug loads.

Peak load management (PLM) efforts were enhanced with the installation of advanced electric meters that record use in 15-minute intervals. MCPS personnel review the performance of schools at the critical hours on a weekly basis for compliance with PLM directives. Where compliance was not achieved or other scheduling problems were observed, correctional measures were undertaken and tracked to completion in a database. Cost avoidance for the efforts during the summer of 2013 was \$1.7 million.

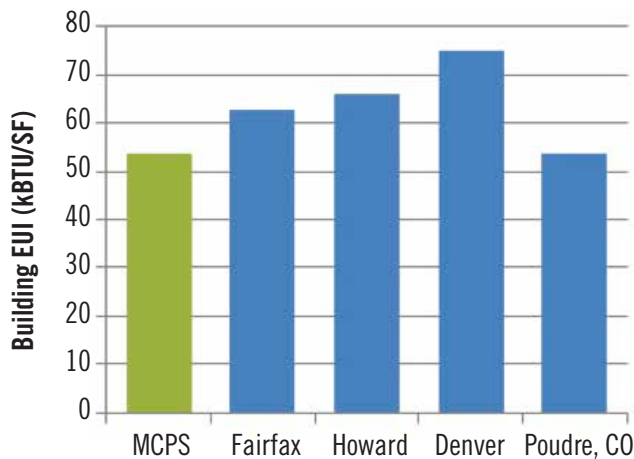
Utility Procurement

MCPS controls utility costs through competitive procurement of deregulated energy supplies. Since 2007, MCPS has procured electricity in preplanned blocks of on-peak, off-peak, and around-the-clock products for various times of year. This is all managed through a wholesale account with the PJM Independent System Operator. PJM operates the electric grid for a large portion of the eastern United States. Recently, MCPS adopted a similar methodology for the procurement of natural gas. The transition to the new method became effective in July 2012. This method of procurement risk management helps to insulate MCPS from market volatility while providing access to lower wholesale pricing.

MCPS UTILITY COST AND CONSUMPTION SUMMARY
FY 2011–2013

Utility Type	Fiscal Year 2011	Fiscal Year 2012	Fiscal Year 2013
Electricity			
\$ COST	29,302,712	26,901,447	27,562,712
KWHs	224,133,756	217,940,231	219,894,411
Fuel Oil			
\$ COST	152,177	160,002	14,383
GALLONS	37,906	32,950	4,205
Natural Gas			
\$ COST	9,373,578	6,959,959	6,062,834
THERMS	6,523,832	5,049,227	5,755,217
Propane			
\$ COST	74,176	73,771	50,477
GALLONS	35,736	36,708	34,520
Water & Sewage			
\$ COST	2,510,325	2,779,790	3,055,972
Kgals	401,051	394,479	404,310
Total Cost \$	41,412,968	36,874,969	36,746,378

ENERGY USE COMPARISONS



Lighting and Energy Retrofits

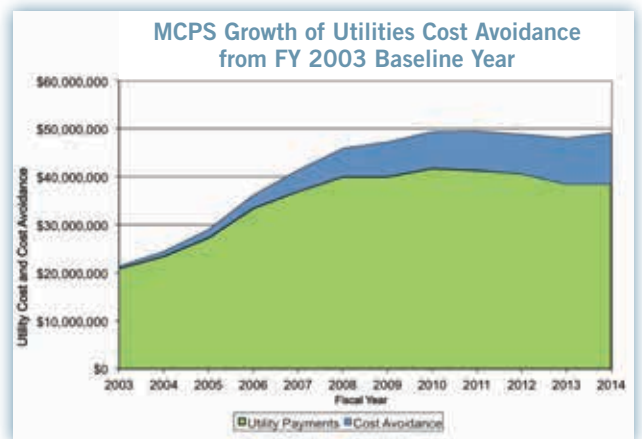
MCPS has administered an energy retrofit program since the 1980s. In the 1980s, the primary focus of the energy retrofit program was to install energy management systems to schedule and control the HVAC systems. In the 1990s, the energy retrofit program was expanded to include lighting retrofits. Most Montgomery County public schools have been retrofitted with T-8 lamps and electronic ballasts. In addition, mercury vapor fixtures have largely been replaced with metal halide fixtures, incandescent fixtures were changed to compact fluorescent, and incandescent exit signs were changed to LED signs. During the 1990s, MCPS received more than \$2 million of utility company rebates to help finance the energy retrofit program.

A second generation of lighting retrofits occurred in 2006 and 2007 and primarily focused on replacing 32-watt T-8 lamps with 25-watt T-8 lamps. These higher-efficiency lamps have substantially longer life and reduced energy consumption by 25 percent without a noticeable reduction in illumination. Financing was provided by the Maryland Energy Administration and has allowed MCPS to make the 25-watt T-8 lamp its standard lamp for four-foot fluorescent fixtures. After the two lighting retrofit initiatives, the lighting systems are approximately 40 to 50 percent more energy-efficient, contributing to the overall MCPS energy performance in the middle 50s kBTU/SF per year, which is a 30 percent overall improvement since 1989.

Another energy conservation opportunity was the unreliable electro-mechanical time clocks that operated all exterior lighting for schools. These clocks waste energy as pins

become loose, power failures cause loss of time, and the clocks do not compensate for monthly changes in sunrise/sunset times. As a result, lights were frequently on when not needed, resulting in the waste of a substantial amount of energy. In 2006–2007, MCPS installed digital astronomical time clocks, designed for exterior lighting in all schools. These electronic clocks have digital accuracy, daily sunrise/sunset adjustments, seven-day capacitor backup for power outages, and are programmable through a laptop computer.

The most recent retrofit initiative is to develop a program for the use of LED technology. The retrofit of auditorium and parking lot lighting is the best current school application of the LED technology. As a pilot project, two auditoriums and two parking lots currently are in the process of being retrofitted with LED light fixtures.



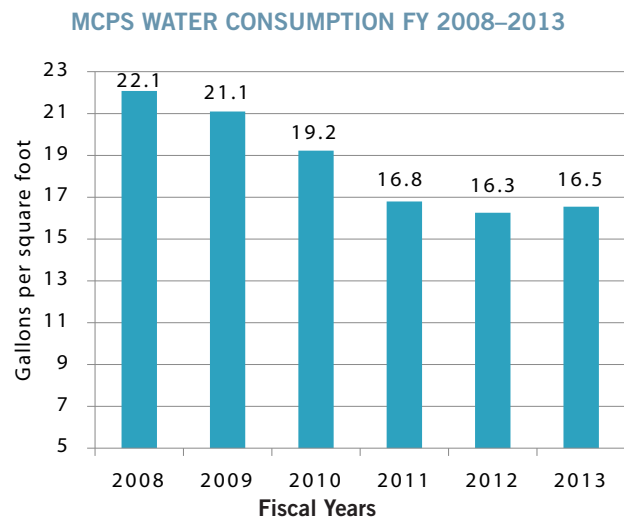
Relocatable Classroom HVAC Control

MCPS has nearly 500 relocatable classrooms, the energy equivalent of six elementary schools, and needed a means of scheduling the HVAC units. A first-of-its-kind application was developed by MCPS using Carrier’s “Broadcast Energy Savings” (BES) technology. MCPS and Carrier jointly developed the approach in which an Internet interface allows MCPS to control the HVAC schedules and thermostat set-points at all relocatables. This project has large savings because the control of relocatable classrooms was originally done through manual thermostats and ran constantly. The use of conventional seven-day programmable thermostats is impractical because of the inability to verify programs at more than 400 locations and the inability of seven-day programmable thermostats to schedule holidays, breaks, and summer closings. The BES interface supports a 24-hour override to a setback temperature, or “snow day” command,

allowing MCPS to shut down relocatables and save energy opportunistically. This system makes it feasible to efficiently control large numbers of relocatable classrooms, with a payback of under a year. Since the deployment of this control network, MCPS has been shifting to green relocatable classrooms that have HVAC controls that “learn” schedules through occupancy sensors and include many other energy-efficient and sustainable features.

Water Conservation

Water consumption is monitored and SERT facilitators conduct quarterly inspections and refer water conservation opportunities to the school staff or the Division of Maintenance as needed. Water conservation has been integrated into the elementary curriculum. In addition, water-efficient devices are standard on all new construction projects. Many



schools also have been retrofitted with low-flow devices. Since 2010, SERT has focused on water conservation at high schools because they are the largest per capita users of water and use large amounts for irrigation. Since 2008, SERT has achieved a 20 percent reduction in high school water use.

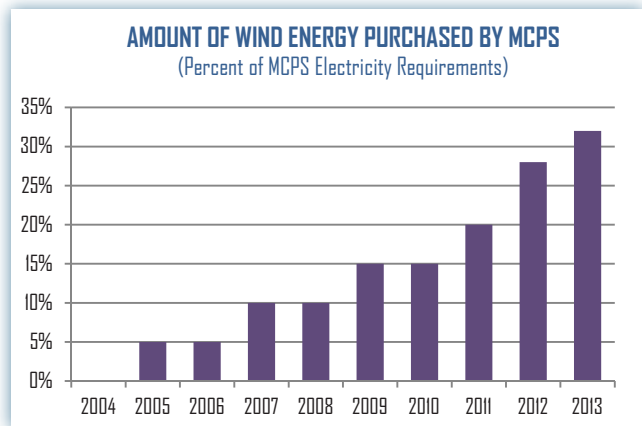
Forest Conservation

The Montgomery County Forest Conservation Law aims to save, maintain, and plant forested areas for the benefit of county residents and future generations. For each revitalization/expansion and addition project, MCPS completes forest conservation requirements to meet these stringent regulations. Forest-conservation measures for individual projects may include on-site retention in an undisturbed condition (on-site easement), off-site reforestation using a designated forest mitigation bank, or acquisition of an off-site protective

easement for existing forested areas not currently protected. Currently, MCPS has brought under forest-conservation easements more than 44.3 acres on Board of Education property and has more than 21.8 acres of off-site forest conservation credits.

Green Power Procurement

Prior to FY 2008, MCPS had procured 10 percent of its electricity as clean or renewable energy through purchase of renewable energy certificates (RECs). Since FY 2009, MCPS has purchased additional RECs to ensure that a minimum of 20 percent of its total electricity consumption is provided by renewable sources.



Stormwater Management

MCPS is one of the first school districts in the country to become an MS4 co-permittee (www6.montgomerycountymd.gov/dectmpl.asp?url=/content/dep/water/npdes.asp).

MCPS has formal agreements with Montgomery County Government (MCG) regarding stormwater management roles and responsibilities, including the maintenance of existing stormwater management facilities. MCPS reports annually to MCG, in compliance with the agreements and in support of the MS4 permit. In the 2011 MCG report (www6.montgomerycountymd.gov/content/dep/downloads/npdes/NPDESrpt2011.pdf), see pages III-30–35 for the MCPS annual report. This report details MCPS interagency SWM coordination, Fats, Oils, and Grease program participation, structural and nonstructural SWM facility maintenance, pollution-prevention training, spill-prevention control and countermeasure plans, industrial facility compliance activities, a listing of SWM measures in facility projects, and integrated pest management.

Information Technology

MCPS has taken advantage of information technology to implement several actions to improve environmental sustainability. MCPS purchases energy-efficient computers and monitors when new computers are needed. The school system also has made it standard practice to set computers to shut down automatically daily when not in use, to save energy. Virtualization of servers reduces the number of servers and the associated power consumption and infrastructure needs. Use of digital curriculum, wireless technology, and electronic devices reduces the amount of paper consumed. Desktop workstations are cleaned, repaired, and refurbished to allow for reuse, substantially reducing the number of new computers purchased. It is all part of our effort to design 21st century classrooms that maximize the flexibility and efficiency of space in schools, while promoting digital working environments that cut down on material needs such as paper.



MCPS has cleaned, repaired, or refurbished more than 9,000 desktop computers, which, if stacked on top of each other, would be taller than the tallest building in the world—Burj Khalifa, in Dubai.

Current Strategies and Measures

- Systemwide retrofit of lighting systems with electronic ballasts, 25-watt T-8 lamps in existing buildings
- Energy management controls of the HVAC systems in all schools
- Electronic control of HVAC in all relocatable classrooms
- Retrofit of electronic astronomical time clocks to control all parking lot lights
- Peak load management of summertime electric demand
- Hosting 1.2 megawatts of solar photovoltaic systems on eight schools through power purchase agreements
- Piloting LED lighting in auditoriums and parking lots
- Virtualization of servers to reduce the number of servers and the associated power consumption and infrastructure needs.
- Power management protocols to turn off computers when not in use.
- Use of digital curriculum, wireless technology, and electronic devices to reduce the amount of paper consumed.
- Desktop workstations that are cleaned, repaired, and refurbished to allow for reuse, reducing the number of new computers purchased substantially.

Goals

- Maximize building energy efficiency, achieving a systemwide building energy use of 45 kBtu per square foot per year by 2024
- Complete installation of building energy management systems in all buildings by 2024
- Increase the use of renewable energy sources
- Achieve a sustained reduction of energy use by computers and other equipment that plug in
- Reduce greenhouse gas emissions from electricity use by 15 percent by 2024
- Reduce water consumption by 20 percent by 2024

Strategies/Actions

- Proceed with LED lighting retrofit projects in areas most appropriate and cost effective for LED lighting systems, including auditoriums, parking lots, and security lighting. Continue to monitor the reliability and improvements in LED technology and evaluate the use of this technology in additional applications.
- Develop the systems needed to access Smart Meter electrical data for use in Peak Load Management, energy-efficient operations, energy-building investigations, and the validation of utility billing.
- Continue to coordinate with the private sector to explore cost-effective power purchasing agreements and other public-private partnerships that further sustainable goals.
- Monitor individual building energy and water performance to identify high-utility users for further investigation and appropriate actions.
- Employ energy audits and re-commissioning in buildings that have sustained high levels of energy use.
- Implement server virtualization and other emerging technologies to improve the energy efficiency of MCPS data operations.

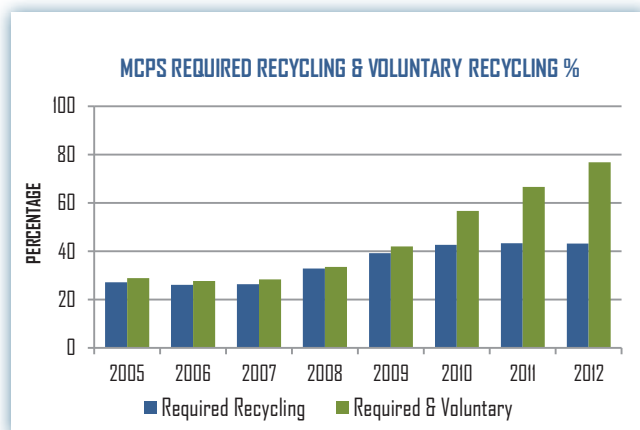


Materials and Waste Cycles

MCPS HAS MADE GREAT STRIDES in reducing our solid waste and being responsible environmental stewards in the goods we purchase.

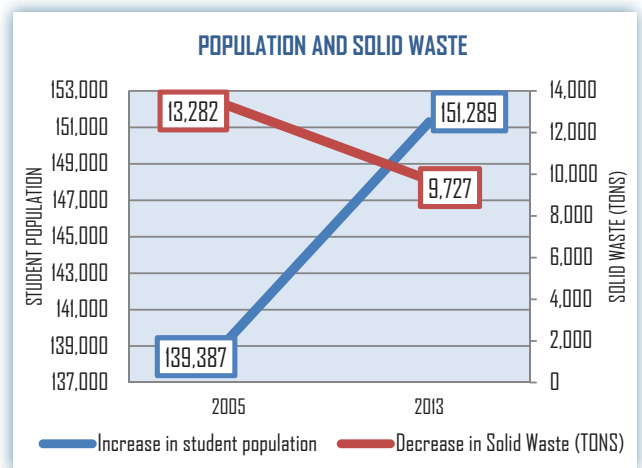
THE RECYCLING PROGRAM at MCPS began with the recycling of the four streams (paper/cardboard, bottles/cans, yard waste, and scrap metal) that are mandated by Montgomery County. Today, MCPS recycles more than 20 different items—from small items such as a drink pouch to major construction debris. The list of recyclable materials continues to grow each year as MCPS continues to independently and collaboratively explore new markets to recycle items that are most commonly generated at our schools and facilities.

With the increased participation through outreach, education, and deploying exterior and interior recycling bins and stations, our systemwide recycling rate reached nearly 77 percent in 2012, up from just over 27 percent in 2005. During this same time period, the amount of waste in tons we threw away dropped by 27 percent, despite an increase of approximately 12,000 in student enrollment.



While MCPS is reducing solid waste, the school system is reducing the amount of waste generated in the first place and purchasing more environmentally responsible products. Through a combination of technology and behavioral

changes, MCPS has reduced the number of cases of paper used per student, while also integrating environmental considerations into a wide range of other purchasing decisions — from light bulbs and furniture to vehicles in the MCPS fleet. Our green cleaning practices, now used across the school system, prevent waste and promote the use of certified green products.



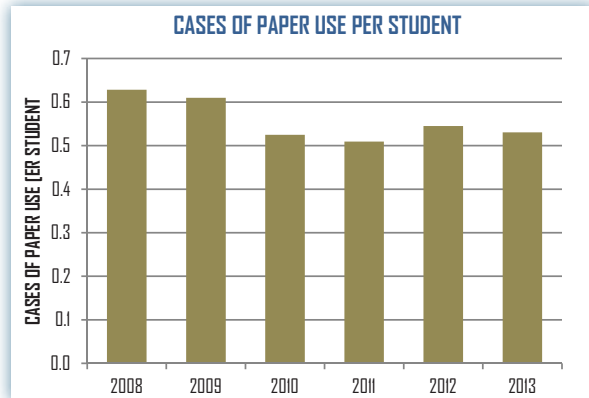
Current Strategies and Measurements

- Systemwide and consistent system of recycling bins implementing best practices for recycling infrastructure.
- Measuring and reporting recycling performance on a school-by-school basis
- More than 4,152 tons of scrap metals were recycled in 2012.
- Implement large-scale on-site shredding events.
- Maintain school-based recycling programs with awards, recognition, and financial incentives.
- Work with each MCPS office to identify and capture non-school-based recycling opportunities.

- Continue green procurement, including increasing materials that are recyclable and materials containing recycled materials.
- Use multiple strategies to reduce the consumption of paper, including default duplex printing and use of electronic communication of content for curriculum and administration.
- Implement systemwide use of green (environmentally- and health-friendly) cleaning products.

Goals

- Meet defined sustainable procurement guidelines of at least 50 percent of total goods and services purchased
- Increase total recycling rates to 80 percent by 2024
- Reduce waste production by 10 percent by adopting green procurement practices
- Develop protocols for increasing the reuse of materials



Strategies/Actions

- Conduct regular review of items purchased and explore sustainable products versus nonsustainable products
- Increase conservation awareness among staff and students and conduct systematic departmental review of items regularly used systemwide to determine their recyclability
- Explore new markets to recycle items that are currently not being recycled, work with MCPS vendors to encourage packaging of products with recyclable material; continue to provide outreach and education to staff and students to reduce waste and increase recycling. Division of Procurement to include “take-back” language in Request For Proposal (RFP) for vendors to recycle the items that they supply.
- Analysis of systemwide departmental and school needs and relocating furniture, electronics, equipment, and other material to increase reuse and reduce waste.
- Continue to salvage equipment and building hardware from school buildings that are scheduled to be revitalized for reuse.

MCPS recycles regularly more than 20 types of materials in the waste stream—from paper to scrap metal, batteries, and more. These recycling efforts saved the system around \$214,000 in 2012 by reducing “tipping” fees (the fees MCPS pays for the disposal of solid waste).



Transportation

CURRENTLY MCPS HAS 1,264 buses and transports approximately 100,158 students, traveling more than 100,000 miles every day. The primary objective of the transportation category is to focus on reducing carbon emissions; environmental impacts, including air pollution; and operating costs, while promoting walking or riding bicycles to schools.

School Years	# of Bus Routes	Miles Driven	# of Students Transported
2009–2010	1,117	19,025,226	97,100
2010–2011	1,102	18,891,219	98,535
2011–2012	1,108	19,371,775	100,158

Current Strategies and Measurements

- MCPS buses are replaced every 12 years, as required by state regulations.
- The bus fleet is fueled by ultra-low sulfur diesel, the latest bus fuel technology.
- Approximately 50 percent of buses are equipped with catalytic converters that reduce nitroxide
- Approximately 60 percent of the bus fleet is equipped with diesel particulate filters that block the black smoke exhaust
- MCPS purchases fuel-efficient vehicles, partial zero emission, hybrid, and flex-fuel vehicles to reduce fuel consumption.
- Fuel consumption for buses ranges from 6.2 to 7.1 miles per gallon (mpg).
- Fuel consumption for support vehicles range from 12 to 26 mpg.
- MCPS implemented “no idling” policy.

Goals

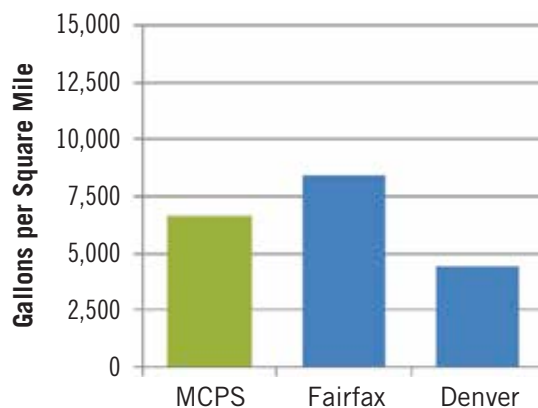
- Purchase most fuel-efficient buses and vehicles, including partial zero emissions, hybrids, and flex-fuel vehicles, based on emerging markets of latest fuel-efficient vehicle technology and its affordability.
- Achieve an overall fleet efficiency higher than eight miles per gallon (mpg) by 2024

- Increase the efficiency (mpg/use) of the auxiliary, non-bus fleet
- Reduce transportation greenhouse gas emissions by 20 percent by 2024
- Develop a more convenient method to generate carpool trips.

Strategies/Actions

- Promote programs and campaigns to increase the percentage of students and staff who walk and bike to school
- Explore ways to provide additional bike racks and shower/locker facilities at all schools by 2024.
- Collaborate with Montgomery County Department of Transportation and Parks Department to increase hiker/ biker pathways that lead to schools in master plans, improve safety at crosswalks, and explore feasibility of incorporating minimum of six-foot pathway along the school frontage at all schools by 2024.
- Increase the number of hybrids or alternative-fuel vehicles in the support fleet by 20 percent by 2019.
- Install catalytic converters on all school buses by 2019.
- Install diesel particulate filters on all school buses by 2019.
- Implement reserved staff parking spaces for fuel-efficient vehicles at all schools by 2017.
- Pilot vehicle-charging stations for electric vehicles at new capital projects by 2019.

FUEL USE COMPARISONS



EMERGING IDEAS:

Potential Pilot Projects

Expand retrofits of lighting to light-emitting diode (LED) technology:

Light-emitting diode (LED) lamps have steadily emerged as an energy-efficient lighting technology. MCPS has begun to pilot this technology in several areas of application. LED lighting has energy efficiency similar to advanced fluorescent lighting. It is also easy to dim the light output. Therefore, LED is an ideal technology to replace incandescent lighting where fluorescent lighting was not ideal. The largest application is in auditorium assembly halls. In addition to energy savings, the maintenance savings due to the much longer lamp life enhances the economic return on this technology. An initial LED pilot project was undertaken in 2013 involving the retrofit of auditorium lighting at Montgomery Blair High School. An additional two high school auditoriums also will be retrofitted with LED lighting in 2014. Various fixture and lamp manufacturers will be evaluated to ensure the best reliability. Based on the pilot project experiences, it is anticipated that a systemwide retrofit of auditorium house lighting will be conducted during 2015 through 2018.

LED lighting fixtures also are being piloted in new-school construction for parking lot and outside lighting applications. The initial installation will be evaluated and refinements in the subsequent designs will incorporate the lessons learned from the earlier installations.



Develop online courses and virtual schools for sustainability education:

MCPS is conducting research on sustainability programs already in place at many institutes of higher learning to

determine how campuses are integrating sustainability across the curriculum. Several of those programs include online courses. Online modules also are being explored as a strategy for extending learning from face-to-face environmental investigations within a specific school cohort to bringing multiple cohorts from a variety of MCPS schools together in a virtual space for sharing and evaluating data. Based on the outcome of the investigation, online courses may be developed for sustainability education.

Increase the number of schools certified under the MAEOE Green School program:

The Maryland Green School Awards program is a holistic, integrated approach to authentic learning that incorporates local environmental issues investigation and professional development with environmental best management practices and community stewardship. As of 2013, 45 MCPS schools are MAEOE Green School certified and the Lathrop E. Smith Environmental Education Center and the SERT program are MAEOE-certified Green Centers. It is our goal to have 50 percent of schools obtain MAEOE Green School certification by 2024. The Environmental Literacy Plan (ELP) Professional Learning Community will develop a proposal for an expanded MCPS recognition program for principals whose schools receive MAEOE Green School certification and maintain recertifications.

The Lathrop E. Smith Environmental Education Center, through its instructional programs, such as stream/pond investigation, exploring the water shed, tree identification, and other programs will assist schools to meet some of the requirements of the certification process. The SERT program will encourage schools to seek MAEOE Green School certification through its outreach program and assist schools to meet some of certification requirements by conducting individualized school staff trainings, providing available supporting artifacts, and assisting in the completion of the application process.

The increase in the number of MAEOE-certified Green Schools will further commit the students, staff, teachers, and community to environmental stewardship, develop daily sustainable living practices, and promote the importance of preserving our natural resources for future generations.



Increase the use of rapid feedback in utility energy monitoring:

Rapid feedback in utility energy monitoring can be achieved through the “Smart Meter” technology, which is available to all schools that are serviced by PEPCO. The goal of the Smart Meter technology is to provide the most recent 24-hour electrical usage data for each school. This rapid feedback system will enable MCPS to acquire the electrical consumption data from the meters at each school, and provide a presentation of that data through a web browser. This technology will result in electrical usage cost avoidance by our ability to obtain early recognition of high consumers of electricity. Furthermore, the acquisition of the data will improve our ability to forecast the utility budget for MCPS. It is projected that the Smart Meters will be installed and be functional in all PEPCO-serviced MCPS schools by the end of 2016. The implementation of this technology may require software development resources and the ability to store data on the server.

Integrate sustainability into elective secondary curriculum:

MCPS will continue to develop the Environmental Literacy Plan through analyzing the current Pre-K–12 curriculum to identify where environmental sustainability is addressed systemically, pinpoint areas for growth, and make recommendations. With embedded instruction around sustainability issues, students will deepen their understanding of solving complex issues related to environmental sustainability, while developing creative problem-solving skills to solve real-world problems.

At the high school level, MCPS will be developing problem-based learning units for high school science courses to align with the Next Generation Science Standards (NGSS). Many of the NGSS relate closely to environmental sustainability, and are expected to include problem-based learning units where students explore and propose solutions to environmental sustainability based problems. This work is expected to be completed over the course of the next four years, with full implementation of NGSS by the 2018–19 school year.

At the middle school level, MCPS will be developing a sustainability problem-based learning unit embedded into the Technology Systems course. This unit will focus on sustainable practices as they relate to the Maryland Voluntary Standards for Technology Education. The curriculum unit will be developed by the summer of 2014, and it will be available for schools to pilot during the 2014–15 school year, with eighth grade students.

Expand workforce training and education for sustainability:

MCPS will continue to develop the MCPS Environmental Literacy Plan, including strategies to increase professional learning opportunities in content knowledge, instructional materials, and methodology in environmental literacy. One strategy will be to continue to partner with various community stakeholders to provide professional learning for teachers around environmental sustainability. Another will be to identify additional grant sources to provide funding for the development and implementation of professional learning.

Grant-funded programs are assisting with providing professional learning for teachers. “Our Neighborhood, Our Watershed”—a NOAA-grant-funded initiative with OEEP—is a Grade 4 program in environmental literacy that includes 16 hours of professional learning for each Grade 4 teacher. The Construction Trades Foundation staff is exploring various funding sources to allow their teachers to attend environmental program training delivered by the National Center for Construction Education and Research (NCCER).

Explore Net-Zero building concept:

Within the overall initiative of green building and sustainable architecture, the Net-Zero energy building concept achieves one primary goal of completely or very significantly reducing energy use and greenhouse gas emissions for the life of the building. While Net-Zero buildings provide inherent sustainable feature, they also provide the opportunity to control operating costs and eliminate volatility in utility costs for the life of the building. To achieve an operational building with zero net energy consumption, we must first strive to reduce our Environmental Performance Index (EPI) to 20 kBtu/sf/year or better and implement a Net-Zero culture, starting at the conceptual phase of a building and continuing through the lifecycle of operations. The design component of this concept is fairly straightforward but the culture shift of facility operations and integration into curriculum will take deep change from all stakeholders. It is the goal that the first Net-Zero building design charrette will take place in 2016, with a corresponding 2020 building opening.

Growing Our Sustainability

MCPS ALREADY IS MEASURING SUSTAINABILITY performance in many areas. Expanding the use of specific systemwide measures provides a means to report our progress interactively.

Next Steps

In addition to prioritizing and detailing strategies for implementing this environmental sustainability management plan, other next steps may include the following:

- Continuing to expand our benchmarking efforts—how we compare with other school systems in our sustainability performance
- Refining our goals to add specific targets and completion years
- Creating a sustainability “scorecard” so we can share what we are measuring and our progress on implementing the plan
- Updating our environmental sustainability management plan biannually, with applicable amendments in between years to be aligned with the Capital Improvement Program.
- Updating Board of Education Policy ECA-Energy Conservation to reflect the broader commitment to environmental sustainability.



Glossary

Greenhouse Gases

Gases such as carbon dioxide that traps the Earth's heat, contributing to climate change (usually measured in tons)

MTCO₂e

Equivalent metric tons of carbon dioxide, a standard measure for greenhouse gases

Renewable Energy

Energy that comes from non-fossil-fuel-based sources that do not run out, such as wind and solar

Fossil Fuels

Fuels that come from non-renewable energy sources, such as gasoline and oil

Geothermal

Geothermal energy is the heat from the Earth

Building Automation

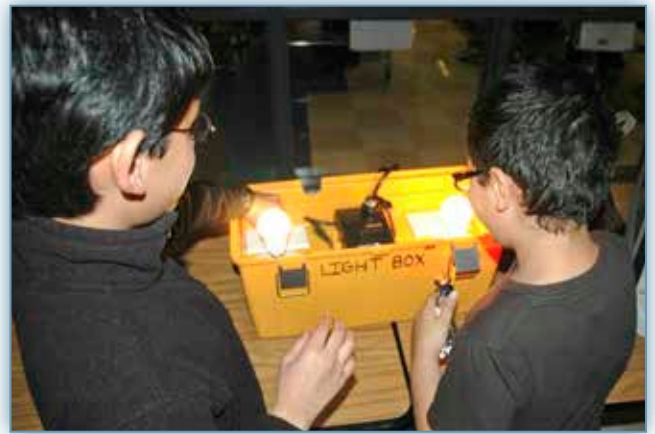
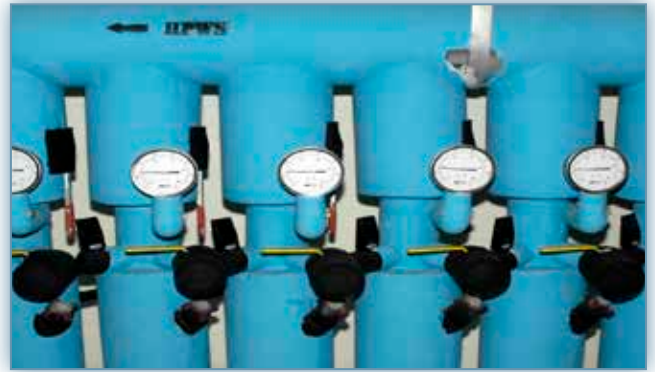
Centralized, interlinked networks of digital hardware and software that monitor and control building environments

Climate

A measurement in patterns of weather over long periods of time

kBTU

A measurement of heat created by burning any material, with one BTU being the amount of heat necessary to raise the temperature of one pound of water by one degree Fahrenheit



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State Environmental Education Leadership: A 50-YEAR LEGACY

MCPS has long supported and promoted school environmental education in Maryland. Our administrators and teachers were among the principal founders of the Maryland Association of Environmental and Outdoor Education. System leadership also plays an active role in the Governor's Partnership for Children in Nature—aimed at improving and expanding opportunities for children to experience, learn about, and play in the natural world.





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