HEALTHIER, WEALTHIER, WISER: A REPORT ON NATIONAL GREEN SCHOOLS

A REPORT BY GLOBAL GREEN USA



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Foreword / Executive Summary

Across the United States, a new movement has emerged in educational awareness and ecological stewardship known as high performance schools. These "green schools", characterized by an impressive set of performance standards including student achievement, economic savings, improved student health, and environmental protection, have grown in popularity over the last 10 years. A green school is often less costly to operate than a conventional school, is designed to enhance the learning and working environment for students and teachers, conserves natural resources, and is a focal point for the community.

In this report, Global Green USA outlines the significant benefits of green schools which include improved learning, reduced operating costs, and better student attendance (which translates into more dollars for school districts). In addition, this national report provides a green school practitioner guide, case studies, and a reference guide to draft a green school resolution. The report also offers the first overview of Global Green's landmark green schools initiative in New Orleans made possible by a grant from the Bush Clinton Katrina Fund.

Green schools are a model of sustainable, healthy living. In Los Angeles alone, the LA Unified School district is already in the process of building 21 green schools thanks to the efforts of Global Green USA. As a result, the cumulative benefits that will be reaped annually include:

- 67.7 kWh of electricity saved
- 57.7 million KBtu of natural gas saved
- 13.4 million gallons of potable water saved (6.1 million gallons indoor, 7.4 million gallons outdoor)
- 25.7 million gallons of stormwater treated on-site
- 38,779 tons of carbon dioxide emissions avoided – equivalent to planting 116,338 trees annually, or removing 6,463 cars from the road each year
- 25,000 students and staff benefit from reduced exposure to air pollutants such as formaldehyde and other volatile organic compounds, many of which are asthma triggers
- 23,600 children provided with improved learning environments through the provision of natural daylight and improved acoustics

The authors of this report hope to share these dramatic benefits with parents, teachers, students and school administrators throughout the country in the hopes of making green school construction the standard for school building.

The existing standards for high performance in schools are known as the Collaborative for High Performance Schools (CHPS) criteria. Included in these criteria are concerns for learning environments that are energy efficient, healthy, and comfortable. Although initially tailored for school districts in California, the CHPS criteria are quickly being used for schools across the country.

In recent years, green schools have been supported by the United States Environmental Protection Agency (EPA), the United States Department of Energy (DOE), the United States Green Building Council (USGBC), and the National Academy of Sciences. In light of the fact that an average school building has a life cycle of 50 years, the architectural and design considerations made at the outset are critical to sustainability and the health of students.

The concern for long-term benefit and equity is most prevalent along the sites destroyed by Hurricanes Katrina and Rita. In these areas, sustainable reconstruction is a high priority in the on-going efforts to replace destroyed and heavily damaged schools. Global Green, as a national leader in green building for affordable housing, schools and communities, is dedicated to realizing the green reconstruction of schools in New Orleans and the surrounding parishes..

Although green building has not been adopted as a national standard for all schools, this report outlines the confluence of policy, technology, and cost-effectiveness that inform today's decision makers concerned about achieving the highest standards of student health, attendance, and performance.

Our children deserve to learn in green schools that:

- are healthy
- enhance their learning potential
- are cost-effective
- minimize the impacts on the environment

School districts in California and across the nation are currently making historic investments in school infrastructure, creating a once in a generation opportunity to incorporate green building standards. In California alone, there is over $25 billion in new construction. This is a unique opportunity to create healthy, high performance classrooms that students and teachers will use for the next thirty years or more. This report outlines the quantitative benefits of green schools, including:

Improved Learning. A study covering more than 2000 classrooms in three school districts indicated that students with the most classroom daylight progressed 20% faster in one year on math tests and 26% faster on reading tests, compared to students in classrooms that received the least amount of natural light.

Lower Operating Costs. School districts can save 20-40% on annual utility costs for new schools and 20-30% for renovated schools if green school design criteria are incorporated. For example, energy use in green schools can be reduced by up to 40% and water use by up to 30% compared to conventional school buildings.

Increased Attendance. One half of our nation's schools have problems linked to poor indoor air quality. Poor indoor air quality contributes to respiratory infections and can trigger asthma attacks, which leads to absences. Increased absences result in less funding from the state for average daily attendance (ADA). One half of the nation's schools have problems linked to poor indoor air quality. Poor indoor air quality contributes to respiratory infections and can trigger asthma attacks, which lead to absences. Increased absences result in less funding from the state for average daily attendance (ADA). In Washington, D.C., for example, effective indoor air quality programs that address environmental quality have resulted in ADA increases from 89% to 93%.[1]

Better Public Investment

A 2003 report to California's Sustainable Building Task Force concluded a 2% initial investment in green construction would yield ten times the initial savings of that investment over the life of the school. A recent report entitled "Greening America's Schools" found that the marginal cost of building a green school is less than 2% more than that of a conventional school (about $3 per square foot), but provide returns on investment and financial benefits that are 20 times as large.[2] Based on these findings it can be concluded that if all new school construction and school renovations went green today, energy savings alone would total $20 billion over the next 10 years.

The United States Green Building Council in 2007 announced a new green building rating system called LEED for Schools designed for K-12 schools and and higher education buildings. The rating system is designed to improve student productivity, health and learning capacity. In specific terms, it addresses issues such as mold prevention, classroom acoustics, design planning and environmental site assessment.[3]

[1] Source: Healthy School Environment and Enhanced Educational Performance – The Case of Charles Young Elementary School, Washington, DC, Carpet & Rug Institute, January 2002
[2] Source: Greening America's Schools: Costs and Benefits by Gregory Kats, A Capital-E Report, October 2006
[3] Source: www.usgbc.org/leedforschools

Do green schools improve a student's academic performance?

The quality of the school building has a direct impact on student performance -- students perform better academically in better buildings.

Given that the average public school was built 42 years ago, according to the National Center for Education Statistics, maintaining school infrastructure is important not only to protect the district's capital investment, but also to ensure high student performance. In fourteen studies comparing building age with student achievement, researchers found that students in old buildings scored 5-7 percentage points lower than students in new buildings. Poor facilities may also effect the career decisions of teachers. Among teachers who rated their facilities C or below, over 40% said that these poor conditions have led them to consider leaving their school.

When building new schools, it is essential to incorporate the best design practices available. This is particularly relevant as numerous studies show that the central features of high performance schools -- including ventilation, daylighting, and acoustics -- have a direct impact on academic outcomes.

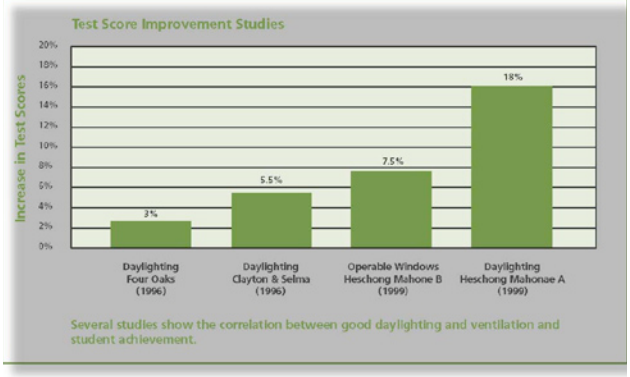
The National Research Council of the National Academy of Sciences found that a growing body of evidence suggests that "lighting may play an important nonvisual role in human health and well-being."

Facts:

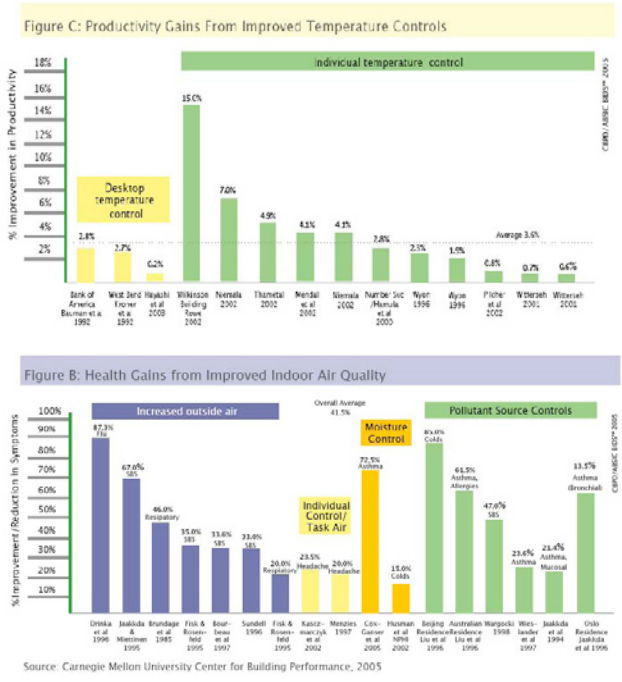
- Each year since the 1997 restoration of Charles Young Elementary School, standardized test scores have risen at the school. Prior to the restoration, nearly half of all students scored in the bottom quartile of the national test scores. Since the restoration, well over half of the poorly performing students rose to national average attainment levels.
- A number of studies have found a significant positive correlation between student achievement and temperatures falling within the human comfort zone. Students in non air-conditioned buildings performed 3-12 percentile rank points lower on various measures than students in air-conditioned buildings.
- A study by the Heschong Mahone Group, covering more than 2,000 classrooms in three school districts, indicated that students with the most classroom daylight progressed 20% faster in one year on math tests and 26% faster on reading tests than those students who learned in environments that received the least amount of natural light.

Daylighting is a central component of high performance design. Providing natural daylight provides biological stimulation for hormones that regulate body systems and moods, provides opportunities for natural ventilation, and reduces the need for artificial light, thereby reducing energy costs.

- A number of studies have demonstrated a positive correlation between appropriate acoustical conditions and student achievement. A California study found that 3rd grade students in noisy buildings were .4 years behind in reading and .2 years behind in math of students in quiet buildings.
- Green features can also be incorporated into school design as teaching tools. Students often learn better when abstract concepts are demonstrated to them visually. For instance, some schools have placed utility meters in a visible location in the classroom, while others have incorporated stormwater management into the landscape design..
- A comprehensive study of Chicago and Washington, D.C. schools found that better school facilities can add 3 to 4 percentage points to a school's standardized test scores in math and reading, even after controlling for demographic factors. This study found that between 2000 and 2001 this study tests the independent effects of school conditions and supports a point which other research has already indicated – good facilities are linked to better test results.[4]



• One of the leading national centers of expertise on the topic is the Carnegie Mellon University Center for Building Performance. Their Building Investment Decision Support (BIDS) program has reviewed thousands of studies that relate technical characteristics such as lighting, thermal control and ventilation, to tenant responses, such as productivity or overall health. The improvement and reduction in symptoms is striking in the following graphs.



Source: Carnegie Mellon University Center for Building Performance, 2005

Are Green Schools cost-effective?

Green schools are smart economic investments for our communities, our children, and our planet. Over the life of a building, costs related to operations are more than three times higher than initial construction cost. The potential small increase in construction costs for a green school is paid back multiple times over the life of the building. Furthermore, as more high performance schools are built, design and construction costs will decrease while energy and water savings will increase.

Context: State budgets are tight, with school districts receiving less money and being told to do more with it. As a result, the central debate about high performance schools is whether any additional costs translate into real long-term savings.

There is a growing body of research showing that while there is the possibility of increased up-front costs to construct high performance schools, there is demonstrated savings in operation and maintenance costs since less water and energy are used in these schools. Because schools built today will be in operation for the next thirty to fifty years at least, it is imperative to consider the life-cycle costs of the building (costs and benefits over the economic life of the building).

Facts:

- A 2003 report to California's Sustainable Building Task Force concluded a 2% initial investment for construction costs would yield ten times the initial savings of that investment. For instance, if a building costs $10 million to construct, it may cost about $200,000 more up-front to incorporate green building features. But, over the life of the building, which is assumed conservatively to be 20 years, the green building features will yield savings totaling $2 million.
- A report published in July 2004 by Davis Langdon, an international construction consultancy, was a comprehensive

[4] Source: Public School Facilities and Teaching: Washington, D.C. and Chicago by Mark Schnieder for the Neighborhood Capital Budget Group in November 2002.

analysis of construction costs for many different kinds of green buildings, including schools. The report surveyed LEED buildings. LEED is the most popular standard for commercial green building, and some high performance school standards have used LEED as a template. The report concluded "there was no significant difference in the construction costs for LEED-seeking versus non-LEED buildings in any of these categories."

- According to the Collaborative for High Performance Schools (CHPS), school districts can save 20-40% on annual utility costs for new schools and 20-30% for renovated schools if high performance design and criteria are incorporated. CHPS estimates green building practices may increase hard construction costs by approximately $1 per square foot (.4-.6% of total construction) and increase soft costs by $1.10-$1.40 per square foot (4% increase in total soft costs).
- The Michael E. Capuano Early Childhood Center in Somerville, Massachusetts saved over $58,000 per year in energy costs due to increased use of natural lighting. The Cuba Middle-Senior High School in Cuba, Illinois achieved 50% savings in operation costs after installing an advanced heating, ventilating and air conditioning system (see page 24 17 for full case study).
- In response to the clear economic benefit of building green schools, the Louisiana Recovery Authority passed legislation giving priority to green schools during the reconstruction of New Orleans and surrounding parishes (see page 25 11 for full case study).
- In a 2003 report to the Los Angeles Unified School District about implementing high performance standards, LAUSD's consultant said the actual construction costs of the school facilities will be comparable to the costs of building a school using traditional design criteria.
- The United States Green Building Council reports that green schools on average save $100,000 per year – enough to hire 2 new teachers, buy 500 new computers, or purchase 5000 new textbooks.

Table A: Financial Benefits of Green Schools ($/ft²)	
Energy	$9
Emissions	$1
Water and Wastewater	$1
Increased Earnings	$49
Asthma Reduction	$3
Cold and Flu Reduction	$5
Teacher Retention	$4
Employment Impact	$2
TOTAL	$74
COST OF GREENING	($3)
NET FINANCIAL BENEFITS	$71

Source: "Greening America's Schools" by Gregory Kats

In an assessment of 30 schools, a report on greening schools notes that the additional $3 per square foot is the result of using more resilient, durable, and recycled materials; highly efficient mechanical systems; and water conservation measures.[5]

The figure on page 6 illustrates the additional money each school would earn if the attendance rate increased by 1%, 1.5%, and 2% above the LAUSD average.

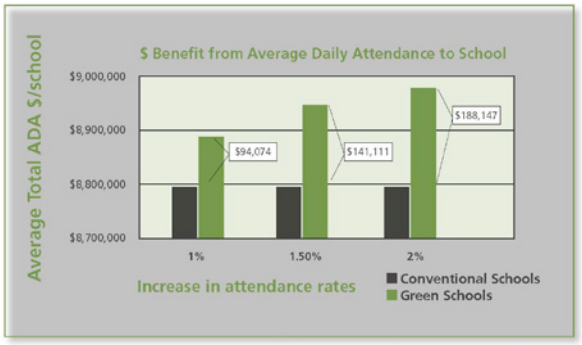
Based on 2004 data from the Los Angeles Unified School District (LAUSD), an average school could earn an additional $94,000-$188,000 from the state by increasing average daily attendance (ADA) through green schools which are projected to significantly reduce the number of student sick days. For the district as a whole, this would translate into $14 million to $28 million additional dollars based on the 150 new schools projected to be complete by 2012.[6]

Research shows there are fewer absences in green schools because the indoor air quality reduces asthma triggers and sources for respiratory infections.[7] Fewer asthma attacks and respiratory infections mean fewer missed school days, which

[5] Source: Greening America's Schools: Costs and Benefits by Gregory Kats, A Capital-E Report, October 2006

[6] In 2004, LAUSD is eligible for $7,912 per student, based on average daily attendance. There are 1,189 seats per school (average), meaning LAUSD could earn $9.4 million per school. However, the current attendance rate is 93.5%, resulting in a loss of $611,479 per school per year.

[7] "The Healthy and High Performance School," Derek G. Shendell. (2004) www.healthyschools.org



translates into more money to the school district. Global Green USA conservatively estimates a range of increased attendance rates ranging from 1-2%.

The increased cost of green design has frequently been offset by financial savings elsewhere, for example in reduced code compliance costs and HVAC systems. Achieving full savings on costs requires an early integration into the design of a school as it is more difficult to retrofit a school than to apply sustainable methods from the outset of construction.

Are Green Schools better for the environment?

Green schools are better for the environment because they use less energy, less water, incorporate non-toxic materials and can make positive contributions to local ecoystems. Not only is this beneficial for the planet, but school districts can benefit too, as they typically use large amounts of their budgets to light, heat, and cool school facilities. High performance schools can be used for teacher salaries, supplies, and other educational needs.

- Energy use in green schools can be reduced by up to 40% compared to conventional school buildings.

Energy consumption can be reduced by employing smart practices and design for the lighting, cooling, and heating systems. There is a range of practices to reduce energy consumption including: using energy-efficient lamps and fixtures with occupancy and daylight sensors, using trees to shade buildings to reduce air conditioning demand, using natural ventilation where possible, using Energy Star appliances, using programmable thermostats to eliminate the need to shut off heating and cooling systems in a room when there are no occupants, etc.

- Basic efficiency measures can reduce a school's water use by at least 30%.

Green schools reduce water consumption by using efficient technology and fixtures both inside and outside the school building. To reduce water for landscaping green schools include native and drought tolerant landscaping. When irrigation is needed, it is critical to use high-efficiency irrigation systems and use reclaimed water or captured rainwater as much as possible. In addition to water efficient landscaping, green schools can employ water saving fixtures and equipment such as: low-flow or waterless toilets, automatic faucet shut-off controls in the bathrooms, low-flow showerheads in locker rooms, and high efficiency dishwashers in school cafeterias.

- Building construction accounts for the use of 40% of many materials, such as steel and concrete, and 25% of virgin wood harvested.

Green schools use materials based on their efficiency and effect on indoor air quality. Designers are encouraged to use durable materials that are easy to maintain, clean, and recycle and also use materials that contain recycled content. It is also critical not to use toxic materials because they may contribute to poor indoor air quality.

The Cahuenga New Elementary School #1 in Los Angeles, California uses recycled-content materials: acoustic tile, insulation, and concrete with 25% fly ash and 50% of wood used is from sustainably managed forests certified by the Forest Stewardship Council (see page 21 14 for full case study).

- 4% of the entire municipal waste stream comes from schools primarily food and paper.

Green schools encourage recycling by ensuring that there is enough space on campus for trash separation, and by purchasing recycled products for both construction and operations. Simple recycling practices can save the school district money and is a great teaching tool.

Stormwater Management
Open Charter School, Los Angeles-Before

Stormwater Management
Open Charter School, Los Angeles-After

Why are Green Schools healthier?

People spend more time indoors than outdoors. This means children spend most of the time either in a school building or inside a home. Thus, it is critical to ensure these buildings are not harmful to their health. Most parents are aware of the dangers of outdoor air pollutants, like smog, but few realize the dangers of indoor air pollutants.

One half of our nation's 115,000 schools have problems linked to indoor air quality. The EPA states indoor levels of air pollutants can be two to five times higher than outdoor levels. Poor indoor air quality contributes to respiratory infections and can trigger asthma attacks in susceptible kids. More asthma attacks and respiratory infections mean more absences from school. More absences from school means smaller operating budgets for the school districts. This is why good indoor air quality is so important, and why a green school's adequate air ventilation, use of materials with little or no toxic substances, and sound maintenance practices are so valuable.

Overall, green schools are built with the precautionary principle in mind. This principle states materials known to be free of toxic substances are preferable to materials that may have such substances. This ensures there are no harmful sources in the building that may one day be found to be harmful to a child's health.

Context for Schools: The way a school is built and the materials used are critical to a student's health. Children are particularly vulnerable to illness because their respiratory and immune systems are not fully developed. Furthermore, children under the age of 12 spend about 86% of their time indoors-with 21% of the time being spent in schools. In a 2006 report, the National Research Council of the National Academy of Sciences reported that there is sufficient scientific evidence to establish an association between excess moisture, dampness, and mold in buildings and adverse health outcomes, most notably asthma and respiratory symptoms, among both children and adults.[8]

The primary factors that cause children to stay home from school due to illness are high concentrations of indoor and outdoor air pollutants. Critical indoor pollutants are nitrogen dioxide, mold, and other microbial organisms. These pollutants can cause respiratory infections and trigger asthma attacks. When children are forced to stay home the average

[8] "Green Schools: Attributes for Health and Learning." Committee to Review and Assess the Health and Productivity Benefits of Green Schools, National Research Council, 2006. http://www.nap.edu/catalog/11756.html

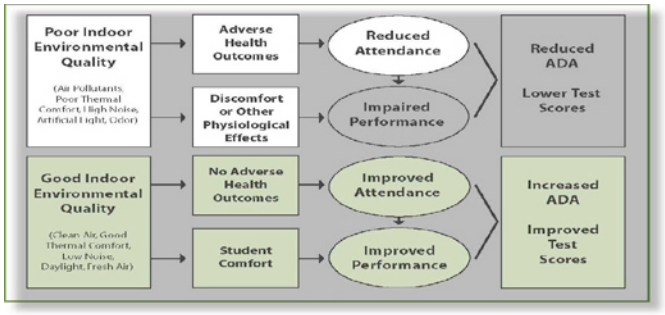
daily attendance (ADA) of the school decreases. Because the ADA is a key factor in determining the operating budget for a school, these student absences have long-term effects for school district budgets as a whole.

Facts:

- The U.S. EPA estimates that asthma accounts for 1.2 million missed school days per year in California—the leading cause of school absenteeism due to a chronic illness.
- The American Lung Association has found that American school children miss more than 14 million school days a year because of asthma worsened by poor indoor air quality.[9]

Good indoor air quality can minimize the environmental triggers for asthma. Green schools offer good indoor air quality by providing adequate ventilation, eliminating/controlling sources of contamination, and incorporating good maintenance practices to prevent moisture and dust accumulation and exposure to harmful chemicals and pesticides.

In green schools, materials are selected carefully to prevent the introduction of environmental toxins. This includes using paint and adhesives and flooring with low or no volatile organic compounds (VOCs), and avoiding composite wood products that have added urea-formaldehyde.



A recent review by Carnegie Mellon of five separate studies evaluating the impact of improved indoor air quality on asthma found an average reduction of 38.5% in asthma in buildings with improved air quality.

- Of the 48 pesticides most commonly used in schools, the U.S EPA classifies 22 as possible or probable carcinogens.

Green schools incorporate integrated pest management and utilize janitorial practices that minimize use of harmful chemicals.

Green Schools Reconstruction in New Orleans

The complete destruction of homes, offices, and schools in New Orleans and throughout the Gulf coast wrought by Hurricanes Katrina and Rita was devastating. In Louisiana, approximately 236 public and private schools were destroyed or extensively damaged, displacing 245,000 students and more than 30,000 teachers and other employees. Only 53 schools have reopened for the 2006-2007 school year.

Global Green, a national leader in green building for affordable housing, schools and communities, is dedicated to realizing the green reconstruction of schools in New Orleans and the surrounding parishes.

Source: http://dnr.louisiana.gov/sec/execdiv/techasmt/programs/institutional/Learning_From_Disaster_low.pdf

Alex Wilson photographer

Global Green has already realized significant achievements in the policy realm, and Global Green has plans in place to conduct educational

[9] "Asthma in Children fact sheet." American Lung Association, 2002, www.lungusa.org/asthma/ascpedface99.html

outreach and implement the "greening" of 5 schools this summer. Increased student performance, reduced sick days, improved teacher retention, and reductions in energy costs are merely a few of the benefits of green schools. Building green schools in hurricane affected areas will be a significant contribution to the recovery efforts of New Orleans and help attract teachers and families back to the region.

Project Funding

In September 2006, the Bush-Clinton Katrina Fund awarded Global Green a $2 million grant over 2 years to support its novel approach to rebuild Green Schools in New Orleans.

Policy Achievements

Critical assistance has come from the Louisiana Recovery Authority (LRA), charged with dispersing federal funds to help rebuild hurricane impacted areas in Louisiana. The LRA asked Global Green to draft school criteria to utilize in releasing funds to schools in need of repair and rebuilding. Completed in December 2006 and adopted in January 2007, this policy states that "preference will be given to projects that include green building."[10] This policy also incorporates an insurance component which may qualify green schools for reduced insurance rates, construction insurance and ongoing operations insurance.

Educational Outreach

In light of the adopted LRA policy, Global Green plans to conduct educational outreach for school administrators and facility managers to educate them on the new criteria and how to adhere to it by demonstrating the benefits of green building, which include decreased energy costs and improved student test scores. Global Green held their first training workshop in August 2007. All administrators from impacted school districts were invited to attend and were provided with technical expertise to meet the new standards and receive financial benefits. The parishes include Orleans, St. Bernard, Jefferson, Cameron, and Plaquemines. The only requirements are that: 1) they are a public school with an open admissions policy, 2) they offer a range of public education opportunities, and 3) they educate between pre-K to 12th grade levels.

Green Seed Schools

The Green Seed Schools program will provide technical assistance via energy audits and indoor air quality evaluations to 5 schools in New Orleans. Small grants in the range of $75,000 per school will be provided to help offset the cost of efficient products.

The program will also support curriculum development. This will include developing an art program at 10 New Orleans elementary and middle schools, an animated presentation entitled 'Green Power Girl' tailored to incorporate the message of sustainable building, and a 'mobile teacher' who would travel between schools teaching science classes on solar power, renewable energy, and sustainable building.

Model Green Schools

Global Green's Model Green Schools program will expand on Global Green's policy and curriculum successes by investing in one new school construction and one major school renovation in New Orleans. This program will go beyond the services of the Green Seed School program by providing the full suite of sustainability attributes such as green roofs, solar PV-readiness, rainwater harvesting, and solar hot water systems. Global Green will work with architects and contractors to make sure that major construction decisions are made with efficiency and sustainable energy in mind. Small grants will offset the marginal cost of buying superior sustainable products. The target schools have been selected and will be announced in the first quarter of 2008.

Insurance Component

In partnership with the Fireman's Fund and local insurance actuaries, Global Green is developing the rationale for reduced insurance rates at green schools throughout the Gulf coast. Green-certified buildings have been

shown to have lower risk of electrical fires, lower "total loss" rates, and a number of other reduced risk factors for insurers.

Conclusion

Green schools provide an excellent way to promote hands-on, interdisciplinary learning and increase green space and biodiversity throughout communities. Global Green's reconstruction efforts in New Orleans will provide measurable benefit to a community in need.

Case Studies

Cahuenga New Elementary School #1 Los Angeles, California

Cahuenga New Elementary School #1 is setting the standard for the Los Angeles Unified School District 's (LAUSD) groundbreaking $11.7 billion New School Construction Program. The LAUSD New Construction Program is the largest school construction and repair effort in the nation's history, with plans to build 150 new schools by 2012.

In 2001, LAUSD adopted the first of two green guilding policies mandating that all future schools meet the Collaborative for High Performance Schools (CHPS) criteria – thus launching the largest high performance / green school building program in the nation.

Cahuenga New Elementary Schools #1 is the first school completed under the green building program to meet CHPS criteria.

The school is located in the densely-populated inner-city Koreatown neighborhood of Los Angeles. This area has a diverse population of immigrants primarily from Mexico, Central America, South Korea, and the Philippines. The school consists of a 3 story classroom, a 1 ft. story multipurpose room, and a lunch area. A vertical design on a constrained site ensures there is open space for recreation.

Cahuenga New Elementary School #1 incorporates more than 35 specific green building measures that enhance the building and student performance. As a showcase school for LAUSD 's CHPS program, the school has earned 46 out of a possible 81 CHPS points. This surpasses the minimum CHPS score of 28 points by 60 percent.

Specific Green Features are:

Water & Stormwater

- Low-water use shrubs and high efficiency irrigation systems minimize water use.
- Playground incorporates a bioswale to collect water, filter it, and enable it to percolate into the water table —thereby reducing the quantity of water and pollutants leaving the site.

Durable Materials and Resource Conservation

- Rapidly renewable materials, engineered plywood web joists and natural linoleum.
- Recycled-content materials: acoustic tile, insulation, and concrete with 25% fly ash.
- 50% of wood used is from sustainably managed forests certified by the Forest Stewardship Council.

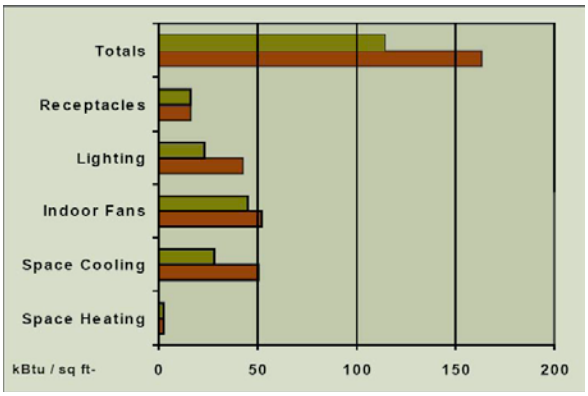
Student Health and comfort

- Clerestory classroom windows provide optimal daylighting to promote better learning environment (all classrooms reach the CHPS standard of a minimum 2% daylight factor).
- Indoor air quality protection during construction (building flush, duct protection), which also promotes respiratory health.
- Superior acoustic performance (35 dba) through double-glazed windows, sealant, and R-19 insulation which creates an improved learning environment.
- Operable windows provide natural ventilation and increased comfort.
- Low VOC emitting materials: paints, ceiling tiles, carpets, adhesives, and sealants, which reduce asthma and other respiratory triggers.

Energy Efficiency

- Energy performance 33% better than required by 2001 Title 24 requirements
- Cool roof to reduce heat absorption in summer time
- Day and occupancy sensors to reduce energy use and utility costs
- Window overhangs and light shelves to maximize daylight and comfort
- Annual savings in energy costs estimated to be $60,000, with a 2.9 year payback on the initial investment
- Energy Star package rooftop gas-electric units on the 2nd and 3rd floors

PROJECTED ENERGY USE



Challenges & Lessons Learned

Monitoring – The CHPS protocols for proper demolition, construction, and handling/storage of materials require extensive monitoring. The architects praised the diligence and tenacity of LAUSD's Inspector of Record (IOR). Both the Owner 's Authorized Representative (OAR) and IOR felt the specifications for this site were unique and suggested that additional training for inspectors working on CHPS schools would be helpful, including a checklist with common pitfalls and corrective actions. The architects themselves also took time to visit the site to ensure the procedures were followed. The lesson learned is that construction team members like the OAR and IOR can be key allies in ensuring that CHPS requirements are met.

Substitutions – Even if the plans and specifications are very specific regarding the sustainability features, particularly the materials, often contractors and sub-contractors make last-minute substitutions without understanding the specific green requirements. The consequence of such changes is a reduction in the overall green quality of the project and a potential reduction in CHPS points. The lesson learned is to clearly specify the green attributes and to ensure everyone is aware of the effort to use green materials.

Training – Currently, training for high performance schools focuses on the design of the building. No such training is required for doing the actual construction. Because contractors are expected to follow detailed specifications, it is critical that they are trained about high performance schools to avoid mistakes or misinterpretations during implementation of the design.

Feedback mechanisms – Design intent has to be carried out easily during construction. For example, the indoor air quality specifications require keeping the ducts clean during construction. However, the IOR noted that the work is often done out of sequence so the ducts will be cleaned and then more dry-wall is installed, so the ducts need to be cleaned again. It was also difficult to use the High Efficiency Particulate Air (HEPA) vacuum for the whole duct because the specifications did not include access panels. A feedback mechanism between the construction team and the design team is essential to better implement CHPS criteria for future projects.

It is difficult to find property in Los Angeles

to build all the necessary new schools. Typical available land in the areas that need the schools is in dense urban areas. Consequently, LAUSD has modified its specifications for school size from the state standard. This presents a design challenge and opportunity for architects who are more accustomed to designing a sprawling school facility. This school has served its purpose as a showcase school by demonstrating that it is still feasible to meet the CHPS requirement despite site challenges (orientation, urban density).

Crosswinds Arts and Science Middle School Woodbury, Minnesota

Completed in November 2001, the Crosswinds Middle School in Woodbury is not only a successful example of a green building, but an integrated learning experience. Crosswinds serves as a bridge between urban and suburban areas, and between art and science. The school is situated on land that is rolling and fertile, as such the architects designed a building meant to be a dense aggregation of structures to preserve the flow of the wetland across the site. The total payback period for this Middle School was 2.1 years.

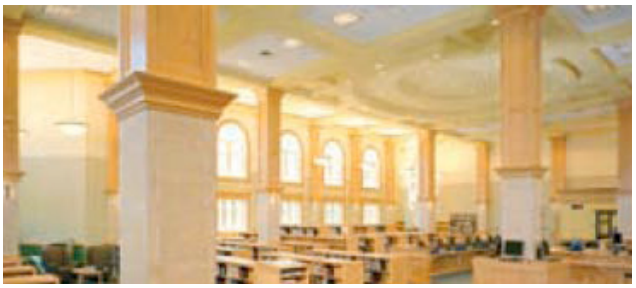
Biomimicry

The design of green buildings is influenced by nature as model, mentor and measure. Biomimicry introduces ways to learn from the natural world, and uses an ecological standard to judge innovation. The construction of the Crosswinds Middle School drew inspiration directly from nature and uses native perennial plants and grasses, combined with limited use of lawn grass, to minimize site maintenance. Brick and metal panels provide a durable building exterior which is low-maintenance. A curved metal roof creates clerestory lighting and allows the entrance of daylight within the central area of each of the six focused instructional units. Additionally, increased natural lighting enables students to be more attentive during class periods.

The building was designed by Cuningham Group Architecture, P.A. and a 2005 assessment of the benefit to students of its high performance was coordinated by Minnesota Office of Environmental Assistance.

Source: http://www.pca.state.mn.us/oea/publications/highperformance-brochure.pdf

Whitman-Hanson Regional High School Whitman, Massachusetts



Source: http://www.masstech.org/greenschools/green_schools/WhitmanHanson-4pgs.pdf

Whitman-Hanson is a new 234,500 square foot high school that employs green building design throughout its architectural planning. The school's green building features not only save on utility costs but also serve to provide a healthy atmosphere essential for students and faculty. The estimated energy savings are over $100,000 a year with estimated water savings estimated at 603,540 gallons per year.

Heating and Cooling

The heating, ventilating, and air conditioning (HVAC) system is a "reactionary" system that senses the level of occupancy throughout the building and responds accordingly. This design component is meant to regulate humidity and temperature. Ventilation dampers modulate and adjust the heating based on the number of

occupants. The high efficiency chiller system significantly reduces energy consumption because its design is correlated to the building occupancy schedule. Other energy-saving features include high efficiency condensing boilers that convert fuel into heat, demand controlled ventilation with an energy recovery system, and variable flow pumping which decreases pump power at minimum-load conditions.

The school is a pilot project for the Massachusetts Green Schools Initiative, a partnership between the Massachusetts School Building Authority and the Massachusetts Technology Collaborative.

Michael E. Capuano Early Childhood Center Somerville, Massachusetts

This two-story, 80,000 square foot school is designed to accommodate 560 students ranging from toddlers to first graders. In addition to educating students, it sits on the edge of a city park and is a community resource with a full-size gym and public gardens. It is predicted that the Capuano Center will achieve energy savings 38% beyond building code and more than $58,000 per year in energy costs.

Natural Lighting

The primary source of light at the Capuano Center is daylight. Translucent skylights with diffuse double glazing broadly distribute light and effectively reduce glare in second-floor classrooms. The 45 degree skylights have light wells and are painted white to increase the reflection of light into interior work spaces. In addition, clerestory windows and south-side light shelves bring natural light deeper into the first-floor classrooms, reducing the need for electric lighting. Most of the classrooms use light-colored walls near windows to bounce light deeper into the room which is complemented by ceiling tiles which have an 88% light reflectance.

The design enhancements were funded from a local utility and a Green Schools Initiative grant from the Massachusetts Technology Collaborative.

Source: http://www.masstech.org/greenschools/green_schools/Capuanobrochure.pdf

Cuba Middle-Senior High School Cuba, Illinois

An effective green school is often measured by its ability to capitalize on energy savings. In 1999, the Cuba School District approved a new facility that would achieve over 50% savings in operation costs. The school integrates energy savings, smart monitoring, and a HVAC system all designed to provide the highest level of safety and comfort for staff and students.

Renewable Energy

This holistic energy efficiency package is complemented by a 60kw photovoltaic system which now allows Cuba Middle-Senior High School to sell back power to the electric company, while geothermal heat pumps keep the building warm.

Source: http://www.cdb.state.il.us/schools/HealthySchoolsGuide.pdf

Washington Middle School Seattle, Washington

Built in 2006, Washington qualified for a Gold certification on the LEED scale.[11] In less than one year, energy savings have reached 25%.

Renewable Energy

The solar array provides 1400 watts DC peak capacity and is an elegant example of the ease with which photovoltaic solar power can be installed in a high-school. The installation of these solar panels was facilitated by the Seattle School District and the Seattle Planning Department.

Source: http://www.seattle.gov/light/Green/greenPower/Accomplishments/washington.asp

Green School Practitioner Guide

The following selection of successful practices are meant to support the continued growth of green schools by using a joint-use strategy, an integrated pest management strategy, and a sustainable design teaching tool, all of which can be used together or separately.

Joint-Use:
A Strategy for Green Schools

Based on the project experiences of New Schools Better Neighborhoods (NSBN), the following guide provides a step-by-step overview of the process for establishing a community-centered school. It offers practical information for community leaders who want to rouse public support, collaborate with both governmental and nonprofit institutions, and embark on the complex, but rewarding, process of changing a city one neighborhood at a time. This NSBN produced practitioner's guide, underwritten by Global Green, contains information useful to community leaders and stakeholders interested in creating greener, healthier, more cohesive neighborhoods through joint-use schools. More than an educational or architectural challenge, this process encompasses a broad range of public policy issues and, most importantly, it involves everyday citizens to help them envision, and achieve, a community asset that might not come about by conventional means.

As many communities across the country struggle with the social and environmental consequences of suburban sprawl and unmanaged urban growth, a new trend in school design that addresses a range of community problems is emerging. Joint-use schools create partnerships with other community resources including libraries, parks, health clinics, youth programs, and even farmer's markets. This can reverse the trend of sprawl, attract more people to live and raise families closer to the core of the city, and make efficient use of scarce materials and land. Reducing sprawl and outward migration can also reduce the environmental impacts of traffic, and lead to transit-oriented, pedestrian-friendly development and other hallmarks of smart growth. The design of smaller schools and more compact neighborhood environments where housing is within close proximity to schools enhances personal mobility and transportation without taxing the environment.

Community-centered schools, whether developed in a school district or as charter, private, or parochial schools, are efficient because they maximize land use on land that is already urbanized. The majority of available space in urban areas tends to consist of brownfields, empty lots, and abandoned buildings. Developing joint-use facilities on

[11] The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is the nationally accepted benchmark for the design, construction, and operation of high perforamance green buildings.

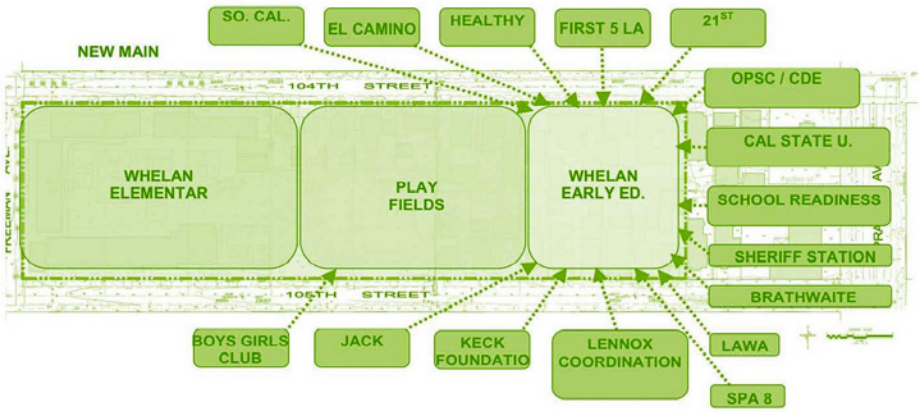
formerly blighted property can revitalize communities and conserve open space. Joint-use, community-centered schools achieve dramatic environmental benefits regardless of whether they use green construction methods. If the community invests un sustainable construction methods, these benefits are even higher. Through a proper master planning process, a school can enhance any community whether rich, poor, inner city, or suburban.

Design elements such as walking and biking paths, parks and recreational spaces can be incorporated in joint-use facilities to encourage exercise and outdoor activities. Furthermore, community-centered schools offer the chance to form partnerships with, among other entities, parks/ recreation centers, farmer's markets, community gardens, and environmental groups who might program the space and nurture opportunities for healthy living.

as anchors to neighborhoods by providing a range of services that can be accessed and utilized by all residents and community stakeholders.

To accomplish this mission, NSBN promotes smaller schools that can build upon and accommodate existing community property and facilities to save on the time, money, land, and other resources. NSBN employs a collaborative master planning strategy as a framework for the best way to site, design, and build public schools, and it naturally results in schools that benefit the broadest possible segment of the community. Building schools that are responsive to their social, economic and political context requires a planning process that incorporates community input and encourages dialogue. The result is a process and a community facility that makes the whole community environmentally and socially sustainable, as opposed to constructing single-use buildings (regardless of construction methods) without a holistic vision for the population. By facilitating a collaborative master planning process, NSBN helps create healthier, smarter, more cohesive neighborhoods. NSBN has facilitated the planning and funding of many pilot projects throughout the Los Angeles area and has focused on inner city neighborhoods such as Pico Union, Boyle Heights, and East Hollywood, and countless other communities throughout Los Angeles County.

DIAGRAM OF POSSIBLE PARTNERS



Integration of Various Elements

In addition to using environmentally friendly design and construction practices, schools have a special opportunity to be green because of their potential to serve as centers of communities. By maximizing limited resources, joint-use community-centered schools also enable lower-income communities to improve their environment through a design and planning process that does not rely on potentially expensive technology or architecture. Community-centered schools allow people to think about and engage in their neighborhood, thereby encouraging greater integration of a local population's resources and cultures, and joint-use offers the most comprehensive opportunity to protect the environment and promote community health.

NSBN believes that these new facilities must be small, community-centered schools that serve

Guiding Principles for Collaborative Planning of Joint-Use

The most successful joint-use community-centered schools reflect not the vision of a single educator, architect, or school district, but rather the collective dreams of an entire community. Ultimately, a community-centered school is the physical manifestation of a process that brings those dreams together, finds compromises among them, and injects into them the excitement and energy necessary to bring them to fruition.

A joint-use, community-centered school requires a planning and development process that may be unfamiliar to most school districts and communities, yet still requires all the funding and approvals of a conventional school. For this reason, successful community-centered schools must follow a series of steps to ensure that the final product truly maximizes local resources and fulfills as broad a collection of community needs as possible. Moreover, community-centered schools often must draw on unconventional funding sources or financial partnerships and community leaders must pursue funding for not only the school itself but also for the critical steps that take place literally before the school is even on the drawing board.

The process of discussing the community's needs and desires is known as master-planning, and the goal of master planning is to conceive of the physical plant – the campus, its buildings, the buildings' function, and the relationship with the surrounding built environment – that will fulfill those needs and desires. Master planning sessions may take the form of focus groups, surveys, open discussions, model-building sessions, architectural presentations, and any other gathering that allows stakeholders to share ideas with facilitators who can collect those ideas and help turn them into a cohesive whole. To ensure success, organizers must lay the groundwork with some crucial pre-planning steps:

Access Predevelopment Funds and Partners

The joint-use collaborative process represents a significant investment of time, resources and technical expertise, and a large part of the process takes place before drawings are rendered or bricks are laid. While most school districts and other organizations are accustomed to investing in real property and improvements, they may not be willing to put up significant funds to facilitate the community planning process. This process, though, is crucial, and it is imperative to identify partners who can gain access to predevelopment funding and take on the initial risk of funding neighborhood master planning and site design efforts.

Identify an Intermediary Organization to Act as Facilitator

A third party intermediary plays a neutral, independent role whose sole responsibility is to figure out how all the agencies involved can work together and ensures that the organizers' ideas do not overwhelm those that come from the community at large. The intermediary organization also serves as the single voice capable of bringing together a diverse group of stakeholders. This group must include strong, credible facilitators who can maintain a broad perspective on underlying civic interests and balance those interests with community needs.

Additionally, this organization can help organizers work with governmental agencies that are necessarily involved in the establishment of any public school. Bureaucratic obstacles often present significant challenges to uninitiated citizen activists, and a facilitator can provide invaluable experience with and knowledge of the various government agencies that will be key participants in the process, such as the mayor, city council, and city departments, in addition to the school district. Knowing how government is run, what its interests are, and the constraints and opportunities of which public agencies can take advantage are key to a successful collaborative planning and development effort.

Engage Broad Community Participation

Community residents can be the biggest advocates for getting projects built. No matter how diverse the community, residents not only understand what exists and how agencies operate, but also can organize and exert influence for positive change. The planning process must hold accessible, convenient meetings, and organizers must advertise as broadly as possible. Any interested party that is excluded, either intentionally or unintentionally, may very well be the one that brings a revolutionary idea or forges a necessary connection to make the project succeed.

Communication with the community

Facilitate Communication Among Organizations Involved in the Planning Process

The state, regional, and local government agencies responsible for public schools often operate as separate systems, pursuing separate time tables and working under complex regulatory frameworks. The intermediary organization should facilitate coordination and communication among a supportive school district, civic, and community leaders and organizations. However, to ensure success, participants must be willing players, open and flexible to design recommendations so long as they meet their program objectives and timing requirements, and committed to building out the master plan once it is developed.

Phase I – Initiating the Collaborative Master Planning Process

The phases of implementation may need to be considered during the process; however, each project will vary depending on existing resources, partnerships, and assets. The planning process for joint-use outlined below is not in any way a linear progression toward the final goal.

Advisory Committee

An advisory committee is a group of stakeholders and institutional partners that act as a liaison to the community and provide their technical or specialized knowledge to move the project forward. The first step in the collaborative process is for committee members to commit to a joint master planning process with a shared goal, purpose and vision that is inclusive of the mission to build facilities that improve quality of life for the neighborhood. A strategy for moving the advisory committee toward consensus on a specific goal is to create and sign a memorandum of understanding (MOU) outlining each party's individual goals, purpose and responsibilities as well as a schedule for completion of the site. A MOU is not a legally binding document but it serves as a tool to keep parties committed to the process. Identifying the needs, time frames, constraints as well as the resources of committee members should be established early in the process, in order to avoid future roadblocks.

In addition to establishing clarity of purpose for committee members, other objectives for initial meetings include:

- Achieve an understanding of the proposed project early in the process
- Define expectations and responsibilities for each member
- Define criteria for site selection
- Develop criteria for partner function and selection
- Devise a wish list of master concept planning goals

- Anticipate community concerns and identify suggestions for resolving them

The advisory committee should include design and architecture specialists who can create a feasible design that meets the criteria of the stakeholders involved in the planning process. Designers should map both the constraints and opportunities for the site and develop a working site model that the collaborative team can use to review its options and ensure that its primary goals are being met.

Initial Planning

Initial planning of the general concept needs to be undertaken before identifying potential sites for the facility. The general concept plan may include potential site configurations, rough cost estimates, a general concept of space and facility needs. Once the stakeholders' criteria for a site have already been established, a private consultant may need to be contracted to conduct a site feasibility study.

Site Identification

Once the collaborative group arrives at one or more general concept plans, the group can move on to identify potential sites. Finding suitable sites requires an understanding of the targeted area's demographics and socioeconomic conditions, and it must keep in mind the community's zoning limitations, its resources and existing facilities, as well as its most pressing wants and needs. In identifying a potential site for the facility, the committee should consider adaptive re-use of existing structures, such as under-used or vacant office or industrial buildings. Centrally located sites in dense neighborhoods with access to public transportation are ideal for reducing the costs and environmental impacts of transportation.

Research

Preliminary research to gather information around the necessary steps for implementation is critical to the collaborative process. Some critical pieces of information to move the project forward might include strategies for site acquisition, the process for site approval (i.e. conditional use permits), site acquisition, the legal aspects of the facility, potential partners, financing options, a rough project budget, and potential funding sources. Committee members should also be aware of funding limitations, zoning and licensing restrictions, the purpose and role of participating organizations, as well as clarity of purpose. People's investment in the project relies on project feasibility, good information, and transparency around the constraints that must guide the design and planning effort. Stakeholders must be able to voice and resolve concerns before moving forward with any one plan, thereby paving the road toward consensus.

Outreach to Local Stakeholders

The project facilitators should engage individual stakeholders, stakeholder groups as well as the broader community to participate in the visioning process for the design and character of the joint-use facility. Local stakeholders, including residents, members of the faith community, parents and youth, local businesses, are all potential partnerships to move the project forward and build a broad base of support. Local community is also the primary constituency for the project, and their input is vital to making the project a success. The advisory committee should formulate initial concept plans before approaching local stakeholders for project support so that the community has concrete options to respond to. Effectively communicate the "who, what, where, when and how" of the project to develop transparency and increased trust amongst the public. Determine what other public and or private agencies are developing programs and projects in the area. Identify and build partnerships with the leadership of these agencies who can serve as potential allies in the collaborative planning process. Seek out public input to better understand the wants and needs of the facility's consumer base. Community input is essential information for further refining priorities, for choosing a site, and deciding on a design for the facility.

Institutional Partners

Identify partners who are willing to commit technical assistance, financial resources and political capital to the planning process. Partners may include representatives from licensing and other government agencies, housing developers, program or facility operators, as well as development and design firms. A common perception of institutional partners is that they are outsiders to community, which can create a fear that they will impose their views or goals on the local community. To prevent these tensions from arising, institutional partners have to be able to listen to the community and incorporate public input into the design and development of the facility. Partnering with a local institution that already has established credibility with residents is particularly useful to creating positive relationships in the community.

Phase II: Implementing a Master Plan

A thorough planning process leads into implementation of the master plan for the joint-use site and construction of the campus. Actual implementation involves refining the design, formalizing space allocation, creating publicity around the project, submitting applications for site approval, finalizing a project budget and financing, as well as land acquisition and construction. Throughout the implementation phase, project leaders must ensure that the community receives continual updates and feedback about the project progress and impact.

Process of Site Approval and Site Acquisition

Site acquisition is heavily regulated, and it typically requires a school district or independent consultant to oversee the process.[12] Depending on the site and jurisdiction, some steps to consider include but are not limited to:

- Ordinary due diligence investigation requirements
- State department of education requirements
- State toxic substances control requirements
- State environmental quality requirements
- Local agency notice and coordination

This process could take up to one year, particularly in cases involving parcel assemblages, and it requires environmental and land use consultants to conduct studies and prepare documents, such as environmental impact reports.

Licensing and Environmental Certification

Depending on the services to be offered at the joint-use site, licensing for day care/preschool and clinic operators, approval of school/daycare/preschool design from the department of state architect, and approval of housing developments from the local planning commission as well as clinics from appropriate healthcare agencies may be necessary.

Lessons Learned

The collaborative master planning process of joint use projects is most effective when the parties involved communicate consistently, invest the time and resources to coordinate the process, are willing to work within each other's limitations and are committed to a shared goal, role and responsibility. One of the challenges that may arise in the planning process is a lack of clarity around roles. In particular, designating responsibility for maintenance and liability concerns can be a challenge due to jurisdictional boundaries and differing timeframes. Stakeholder participation levels are governed by different time frames. For school districts, time requirements for financing mechanisms, such as grants and loan commitments, often vary from the constraints guiding public and private. In order to move forward with the project, stakeholders need coordination of funding cycles and reassurance that differing time frames will not jeopardize the progress of the project.

Because of the open, communal nature of the process, conflicting goals among stakeholders

[12] www.cashnet.org/resource-center/browse.esiml?sid=2

will arise, but an effective planning process that focuses on the overall goal will channel those conflicts into positive compromises and new ideas. Some suggestions for resolving these concerns include seeking professional advice; obtaining support of the joint use project and the formal agreement (i.e. MOU) by policy makers; identifying specific benefits and relative value of the project to each party; determining governance of the joint use facility up front and documenting it in the agreement; as well as outlining a process to resolve inter-jurisdictional conflicts in the formal agreement.

Best Practices

Soliciting the advice of professional consultants, such as urban planning or architecture firms familiar with public projects, is highly recommended in order to prepare for potential institutional and regulatory barriers that may arise as a result of the complicated political costs, funding limitations, land use regulations and site acquisition process. For instance, environmental impacts, relocations, or demolitions as a result of the joint-use need to be communicated effectively to the public in order to decrease the chances of escalating political costs of project completion.

Integrated Pest Management:

Using the Precautionary Principle

I. Overview

The Los Angeles Unified School District (LAUSD) practices Integrated Pest Management (IPM) to control environmental hazards without dangerous pesticides or chemicals. The policy was the first in the United States to embrace the Precautionary Principle, the concept that no chemical is free from harm, unless proven so, and Parents Right to Know.

IPM is defined by the following:

- A system utilizing multiple methods
- A decision-making process
- A risk reduction system
- Information intensive
- Biologically based
- Cost effective, and
- Site specific

Alternatives to toxic chemicals, such as scrupulous cleaning of food scraps (to eliminate attractions to insects and rodents) are part of IPM. The education and involvement of students, teacher, Administrators, custodians, cafeteria staff, and craftspersons is also part of this practice. Another element of IPM involves using beneficial plants and insects as an alternative form of control against undesirable insects.

The preamble to the LA Unified IPM policy states:

"Pesticides pose risks to human health and the environment, with special risks to children. It is recognized that pesticides cause adverse health effects in humans such as cancer, neurological disruption, birth defects, genetic alteration, reproductive harm, immune system dysfunction, endocrine disruption and acute poisoning. Pests will be controlled to protect the health and safety of students and staff, maintain a productive learning environment and maintain the integrity of school buildings and grounds. Pesticides will not be used to control pests for aesthetic reasons alone. The safety and health of students, staff and the environment will be paramount.

Further, it is the goal of the District to provide for the safest and lowest risk approach to control pest problems while protecting people, the environment and property. The District's IPM Policy incorporates focusing on long-term prevention and will give non-chemical methods first consideration when selecting appropriate pest control techniques. The District will strive to ultimately eliminate the use of all chemical controls.

The "Precautionary Principle" is the long-term objective of the District. The principle recognizes that:

a) No pesticide product is free from risk or threat to human health, and

b) Industrial producers should be required to prove that their pesticide products demonstrate an absence of the risks rather than requiring that the government or the public prove that human health is being harmed.

This policy realizes that full implementation of the Precautionary Principle is not possible at this time and may not be for decades. However, the District commits itself to full implementation as soon as verifiable scientific data enabling this becomes available."

II. Background/Author's Role

In March of 1998, a group of school children, about to begin their day at Sherman Oaks Elementary School, encountered a gardener in a hazardous materials suit employed by the (LAUSD) which administers Sherman Oaks Elementary among its 800 schools.
The gardener, unaware students were present, sprayed the herbicide Princep creating a cloud of pesticide mist that students were forced to walk through in order to reach their classrooms.

Several parents who had dropped off their children at the school were alarmed to witness this event. One of them was the author, Robina Suwol, whose sons, aged six and ten, walked directly through the cloud. That night, her youngest son, Nicholas, whose asthma had been under control, experienced a severe asthma attack. Suwol's research on a pest management web site sponsored by Cornell University revealed that a single exposure to Princep could cause tremors, convulsions, paralysis, and other symptoms.

Parents of the exposed children decided to investigate. They learned that LAUSD, the nation's second-largest school district, relied on an industrial approach to pest control. They learned that training for pesticide appliers at schools was uneven, and that mixtures surpassing recommended safety levels were not unknown at LAUSD. They learned that many chemical pesticides commonly used in schools have a high risk factor for growing children, with risks of cancer and learning disabilities. Because LAUSD cares for more than 800,000 students, the issue of pesticide safety at school became evident as long overdue for parent and community attention.

The parents, led by single mother Robina Suwol, found support in existing parent and toxics-safety groups. California Safe Schools officially began when these parents realized that no organization existed to protect student's health while keeping their school environments toxic-free. A coalition of existing organizations, including the PTA, United Teachers Los Angeles, groups and individuals joined in common cause with the parents of Sherman Oaks Elementary School.

Fortified by coalition members well versed in the hazards of pesticides and knowledgeable about alternatives to them, the parents met with LAUSD staff and school board members. LAUSD School Board member Julie Korenstein insisted a working group of parents, medical experts, environmentalists, community members and scientists work together with LAUSD staff to create a policy that would ensure health and safety for students, teachers and staff. One year to the day after Suwol's son Nicholas became ill, LAUSD adopted the most stringent pesticide policy in the nation for schools. The policy is known as Integrated Pest Management (IPM).

When the IPM policy was officially adopted for its more than 800 schools (which comprise 28 cities and 704 square miles), it was considered a great accomplishment by both California Safe Schools and by LAUSD. Today the policy has become the model for the nation with many school districts and communities throughout the United States creating similar programs.

The District's IPM program is all-inclusive, and its pest management department is a versatile and diversified unit that is dedicated

to addressing ALL pest problems on District properties. The scope and breadth of the District's current challenges can best be put in proper perspective by the following statistics.

- Enrollment: 877,010 (second largest in the nation)
- 1,131 schools, centers, offices, etc. spread over 710 square miles
- 12,000 buildings with 68 million square feet
- Serves over 500,000 student meals daily
- Over 77,000 employees

With a geographical area extending from the ocean, to the desert, mountains and everything in between, LAUSD's territory includes diversified plant and animal communities and habitats ranging from dense urban to ravine, foothill, canyon, and mountainous areas. The pests addressed under the IPM program include, but are not limited to rodents, cockroaches, ants, pigeons, sparrows, starlings, sea gulls, crows, mosquitoes, feral cats and dogs, fleas, spiders, honey bees (including Africanized), wasps, ground squirrels, gophers, skunks, coyotes, raccoons, opossum, venomous snakes, weeds, pests of trees and shrubs, turf-grass pests, drywood and subterranean termites, other wood destroying organisms, flies, bats, and dead animals of various species.

Innovative Posters created by California Safe Schools and "Pest of the Month" publications have been developed and issued as resources to schools in preventing and elminating pest problems through IPM technologies. Public service announcements and other IPM-related programming has been developed and broadcast on the District's public access television channel. Special IPM-related events and Workshops produced by California Safe School are conducted in Los Angeles-area schools, and nationally. The IPM Team has presented information for the past several years to thousands of parents at the District's annual Parent Summit regarding the benefits of IPM in the schools, and their workplaces. In addition to in-house training, California Safe Schools and LAUSD staff has conducted training for other school districts, public agencies, and pest control applications throughout California and responds to inquiries from school districts nationwide.

The success of LAUSD's IPM program was the impetus for the State of California's Healthy Schools Act of 2000. In recognition of its pioneering IPM program, California Safe Schools and LAUSD have received national and international recognition for their leadership and creativity in advancing risk-reduction techniques for pest management in schools.

III. Case Studies

Mosquito Control

As the West Nile Virus progressed westward from the East Coast, LAUSD staff developed plans for avoiding conditions conducive to mosquito breeding. In accordance with the District's IPM policy, mosquito concerns were addressed from the perspective of source reduction. Simply put, if you can eliminate standing water, you will eliminate mosquito-breeding sites. Training, as well as periodic written communications and posters created by California Safe Schools were provided to school staff. Where mosquito-breeding sources, such as permanent ponds etc., could not be eliminated, the District used mosquito fish, Gambusia affinis, to deal with the problem. LAUSD also developed and broadcast public service announcements on its pubic access television station regarding West Nile Virus and IPM methodologies to avoid and control mosquito breeding at school, work, or home. LAUSD staff worked very closely with the local vector control agencies to ensure that conditions conducive to mosquito breeding on properties adjacent to schools were addressed. As a result, the District has not experienced any cases of West Nile Virus, nor has it had to use any pesticides for mosquito control on its properties. This has benefited not only the students and staff at LAUSD schools, but the neighboring communities as well.

Africanized Honey Bees

Again, LAUSD staff has monitored the progression of Africanized honeybees into Southern California. These bees have integrated with regular honeybees, and as a result, the latter have become more aggressive. During 2004 and 2005, LAUSD schools submitted over 1,100 service requests each year pertaining to honey bees. In response to this problem, LAUSD staff devised a honeybee swarm trap using a cellulose nursery plant pot and a plywood cover cut to specifications by the District's Wood Shop. Swarms and absconding Africanized honey bees are drawn to these traps with packets of queen pheromones in them which are placed in strategic locations away from student learning and play areas. Heavy-duty trash bags are slipped over these swarm traps when the bees are not active and the top of the bags are tied off. These bags are left out in direct sunlight, which kills the bees inside by solarization. No pesticide is used to dispose of the bees in the traps. By utilizing this technique, the swarm traps can be cleaned and reused.

This technique for dealing with Africanized honeybees has been disseminated to the pest management community and other school districts by LAUSD staff at various workshops throughout southern California. Despite the large number of calls received regarding Africanized honey bees, there has not been a mass stinging incident of District site employees, students, pest management technicians, or any other persons (such as contractors) on District property. Again, this has benefited the users of LAUSD campuses, as well as the surrounding communities.

Red Imported Fire Ants

Red imported fire ants have been found on various District properties and athletic fields. Although local regulatory agencies wanted to use high-risk pesticides to control the fire ants, LAUSD staff was able to convince them to let them successfully handle the fire ant management through the use of reduced-risk granular ant baits. Again, the users of LAUSD facilities and the surrounding communities benefit from this proactive IPM strategy.

IV. Best Practices

Identify and collect data that supports the use of IPM at your school or in your district. If full data isn't available, use the Precautionary Principle to guide decision making. The education of the goals and recommended strategies of IPM for students, teacher, Administrators, custodians, cafeteria staff, and tradespeople is critical. Each of these groups can employ one or more the following IPM methodologies in an effort to manage pests.

a) Monitoring (tracking paths of movement and shelter, trapping)

b) Exclusion (installation of door sweeps, caulking cracks and crevices, repairing holes, installation of 45-degree angles on Ledges or netting to deter birds)

c) Sanitation (eliminating availability of food and water to pests)

d) Habitat modification (storage of food in classrooms in metal containers, disposal of food and trash in closed trash receptacles, removal of paper and other clutter)

V. Lessons Learned

No food, no water, no shelter, no pests!

Utilizing Sustainable Design as a Teaching Tool

I. Overview

This guide illustrates how sustainable design practices in schools and buildings can be used as an educational tool. In addition, this guide will explore how signs can be utilized to further illustrate the significance of sustainable design in any type of project.

Using both public and private facilities as case study examples, this guide provides a clear and understandable message both architecturally and graphically, about the importance of

sustainable and environmental design within the very environments in which we live, work, learn and play.

II. Author's Role

LPA is a multi-disciplinary design firm with over 40 years of experience in a wide range of public and private project types. LPA specializes in a holistic, environmental approach to design regardless of scope or budget. With architecture, interior architecture, landscape architecture, planning and graphic and signage capabilities, LPA has the unique ability to apply smart, sustainable design practices to all visible aspects of a wide variety of project types.

Richard D'Amato has been with LPA for almost 19 years and is currently in the role of senior design principal. He is a LEED Accredited Professional responsible for the design of many sustainable projects in both the public and private realm.

LPA is responsible for the design of the Cesar Chavez Elementary School in Long Beach California, which embraces sustainability and utilizes environmental principals as a design statement to the students as well as the community. Cesar Chavez Elementary meets the criteria of both the Savings by Design program and the Collaborative for High Performance Schools (CHPS).

The goal of CHPS is to facilitate the design of high performance schools: environments that are not only energy efficient, but also healthy, comfortable, well lit, and containing the amenities needed for a quality education. Savings by Design helps organizations maximize energy performance from the buildings they occupy.

LPA was also responsible for the design of two recently completed experimental green Wal-Mart stores in Texas and Colorado. Each store implements various sustainable design strategies in an attempt to discover the most effective and appropriate solutions to be implemented in the design for future store prototypes. The Wal-Mart facilities integrate specific signage and graphic programs that compliment and strengthen the educational aspects of the environmental designs.

III. Case Studies

Cesar Chavez Elementary School, Long Beach California

Cesar Chavez Elementary School was an opportunity to change the negative emphasis of the local neighborhood by providing a sense of pride and accomplishment. Environmental design was conceived as a tool, which could potentially provide a unique sense of responsibility to the solution. The school was seen as a potential showcase for the district and in that way the district would emphasize a sense of value to this downtown neighborhood. Cesar Chavez School was destined to become the centerpiece of the district and a chance to potentially change the way in which future schools within the city were conceived and built.

From the initial interview with the Long Beach Unified School District, aspects of sustainability and environmental responsibility began to shape the design solution for the new downtown elementary school. When "Savings By Design" and CHPS were introduced as an approach to the design solution, the district began to shift the emphasis of the environmental features. The goal was to express the sustainable features as obviously as necessary to solicit curiosity and questions. The design began to clearly showcase smart design strategies and solutions in an effort to create a "learning laboratory" for sustainable design. All design decisions, while reflecting a responsible, environmental attitude, simultaneously provided lower operating and maintenance costs to the district.

The school utilizes many sustainable strategies and materials not typically found within most public school facilities. Cesar Chavez is one of the first modern schools within the Long Beach Unified School district that utilizes operable windows within most of the classroom and public spaces. Natural, renewable materials have been substituted whenever possible

to provide improved indoor air quality and reduce maintenance. Classrooms as well as corridors and public spaces substitute standard materials such as carpet and VCT with natural linoleum, while the gymnasium is floored with a synthetic, long lasting surface rather than wood which requires almost constant maintenance. The kindergarten playground incorporates a recycled rubber surface below the playground equipment. The majority of the public spaces are naturally lit and used effective dimming systems, which reduce energy consumption. Additionally, natural daylight is contains to light the internal corridors of the school through an effective system of clerestories and light shelves. The landscape utilizes drought tolerant plant species and effective watering systems that greatly reduce the schools water consumption as compared to other school's within the district of similar size. An effective and efficient central plant provides heating and cooling for the school and lowers maintenance and energy costs for the district.

As the budget began to rise and money became tight, the educational graphics system was in jeopardy. The project team had worked tirelessly throughout the process to integrally link the environmental features of the campus to the design and performance of the school. Therefore, few, if any sustainable elements were lost to value engineering. Alternative plant, material and systems decisions were proven to be more economical for the district to maintain and implement. However, the signage and graphics program was unfortunately considered dispensable.

While the environmental features were always conceived as apparent and obvious, the elimination of the educational signage system emphasized the need to strengthen the obvious nature of the systems employed. The school no longer relied on a detailed narrative to highlight the environmental nature of the design. Instead, the structure, the site, and the selected materials began to almost speak for themselves. It was envisioned that the teachers within the new school would provide the missing narratives in the form of environmental discussions and lesson plans. The school was therefore seen as an instructional tool, a "learning laboratory."

Healthier indoor environments, lower operating costs, and easily maintainable materials, landscape and finishes have prompted the district as well as the city to begin to implement more sustainable strategies as part of all future public development. Additionally, the school has been recognized with eight design and environmental awards including Southern California Edison's Savings By Design Award as well as recognition by the Coalition for High Performance Schools.

Wal-Mart Experimental Stores

With a desire to change public perception, reduce operating costs and limit damaging effects to the environment, Wal-Mart conceived the idea of creating two experimental green stores. Located in two varied climactic conditions, they provide a working study for smart, sustainable design practices that can be tested and then applied to new stores depending on the results of the study. The green features of each store were to be tested for a three-year period. After the end of the three years, the stores will be adjusted

depending on the most effective solutions and then those solutions will be applied to future store construction.

The stores implement a wide variety of sustainable concepts and vary for each store depending on the specific climates. The Wal-Mart site design features include: Bioswales through the parking lots, reduced heat islands through the use of mature trees, shade structures and light colored pavement, porous paving which allows rain water to filter directly to the soil below, 95% water conservation from a typical store which includes an on site wetland and retention pond, a wildflower meadow featuring native species to both locations, wind turbines which provide 5% of the stores' total power needs and xeriscape utilizing native pant species and drought tolerant plants.

Integration of the Environment at Wal-Mart

The stores themselves feature many innovative and experimental sustainable strategies including: waste oil boilers which burn used motor and cooking oil to generate heat, reduced building heights from a typical store which reduces materials and interior conditioned space, solar power in the form of 4 different types of photovoltaic systems, natural daylight and dimming systems which reduce energy consumption by over 20%, alternative freezer/ cooler refrigeration units which save enough energy to power 65 single family homes for one year, displacement ventilation systems which utilize fabric duct systems and save enough energy to power 70 single family homes per year, passive cooling which takes advantage of natural breezes, recycled food waste which is separated and processed to create compost, LED lights in grocery cases utilizing less energy and creating less heat gain and collection of air conditioning condensation water to be stored and used for on site landscape irrigation.

Currently an additional experimental Wal-Mart store is being designed in Arizona, which will address the specific climactic influences of the desert.

A significant component to the design was the aspect of public education. Since one of the goals for the projects was to alter public perception, it was extremely important that the stores provide the public with a clear understanding of each stores environmental nature. The signs and graphics were conceived to educate the local communities about the sustainable strategies employed and the specific effectiveness of the components not only to the stores themselves, but also to the communities in which they serve.

Clear, distinct and dynamic graphics greet the visitor to each location and summarize the experimental nature of the designs. The entry graphic is meant to boldly address the differences between the experimental Wal-Mart and the typical Wal-Mart store. The idea of public education is important if smart environmental design is to be considered mainstream design. The nature of the experimental stores is to showcase the importance of sustainability as a design tool and as a partner in the intelligent development of communities.

IV. Lessons Learned

The early integration of green strategies reduces the risk of the removal of sustainable elements due to value engineering or aesthetic whims since the components are integral to the building design and performance. The most effective sustainable strategy for schools or private developments is to be aligned with a design partner such as Savings By Design, CHPS, or LEED. A sustainable design direction streamlines the decision making process by limiting the product, material, and systems decisions. Long-term maintenance should be an integral component to any design. Any system that requires constant maintenance, repair or replacement will probably not become a long-term component of the design.

Public education is vital to encouraging the proliferation of green design strategies. Strong signage and graphics programs will teach communities about less apparent green strategies, such as drought tolerant planting

or more efficient building systems. By utilizing clear and simple narratives, the user is more equipped to understand and to integrate green design strategies within their everyday life. Unfortunately, while physical educational graphic systems can be extremely effective, they also tend to be the most vulnerable when projects are faced with value engineering. It is important to integrate these strategies early in the development process to avoid losing them if budgets become tight.

Green design can become an effective sales tool for both public and private developments. Healthier indoor environments, lower operating costs and simpler, more cost effective maintenance programs are all strong incentives for sustainable design. Higher initial costs should always be offset by dramatically lower life cycle costs. Nevertheless, some green design strategies can provide lower up front costs as well. For instance, a four sided curtain wall structure can cost almost 30% more then a structure which utilizes a more sustainable solid wall and protected opening approach on exposed east and west facades.

Using green design to assist in the "sale" of a project tends to guarantee their inclusion within the final built project as well. A solid sustainable approach is also an approach that is looked upon favorably by civic leaders as well as community groups. Sales, education and program incentives can all be valuable tools to ensure the inclusion of smart green strategies in both public and private facilities. By creating an irrefutable energy and cost savings strategy early in the design phase, environmental design becomes an integral component to the process.

V. Best Practices

Don't rely on signage and graphics to tell the story, as there is a good chance that it will not be accommodated within the project budget. Green strategies that create a noticeable difference within the user's environment are the most effective at engaging the community. Bringing daylight into spaces that are typically dark or artificially lit, utilizing natural breezes instead of air conditioning systems, filtering daylight through protected openings uses less energy and resources and is less costly to operate and maintain. Healthy and natural material alternatives which reduce off gassing and the need for excessive maintenance programs all contribute to a more pleasant, productive, and healthier environment.

Educational graphics are effective strategy in the proliferation and encouragement of good green practices. It is imperative that the message is clear, strong and simple. Ideas and concepts that are complex or abstract will disengage the user. Green information should also be timeless and universal. Avoid specific, detailed numbers and calculations. Percentages and comparisons tend to be more easily remembered and therefore more effective. Cost should always be considered in the design and installation of such systems as well. The higher the cost of the system, the stronger chance it will be lost to value engineering.

Green education is imperative to the development of a society that embraces smart, sustainable design and environmental awareness. An educated person is most likely to become an advocate and supporter of good green practices. It is the supporters of such a movement that will help to strengthen the effort and create a more sustainable world to be enjoyed by generations to come.

Reference Guide to Draft a Green School Resolution

Resolution on Sustainability and the Design and Construction of Healthy, High Performing School Buildings

_____ School District

Board of Education

Date Adopted _____

WHEREAS, Students and staff are entitled to a safe and healthy school environment,

and studies have indicated that student achievement is greater and attendance is higher, and teacher and staff retention is improved, when the learning environment is naturally lit, comfortable and well maintained;

WHEREAS, Schools should employ design, construction and operation strategies that minimize operating costs, in particular for energy and water use as studies show that new facility energy costs, for example, can be reduced by 25 percent or more;

WHEREAS, Schools that follow sustainable design principals can contribute to our community's environment by minimizing waste as well as air and water pollution;

WHEREAS, the District.'s program to build new schools and renovate existing ones provides a unique opportunity to move beyond standard designs;

WHEREAS, Schools designed to be Healthy, High Performing Schools incorporate environmental features that provide a context for learning; now, therefore, be it:

RESOLVED, That the _____ School District Board of Education recognizes the progress already made by the District.'s staff and design teams to incorporate sustainable design criteria into the District.'s school construction program; and,

RESOLVED further, That the Board directs staff to expand this effort to ensure that every new school and modernization project, from the beginning of the design process, incorporates healthy, high performing design recommendations to the extent feasible; and that the focus be on criteria in the following priority areas:

(Select priorities that meet your district.'s needs and location. Examples include:

1) Student performance and staff health through measures such as daylighting, the use of non toxic-emitting materials and sound insulation or isolation to minimize noise and enhance classroom acoustical quality;
2) Operating cost minimization, through resource efficiency;
3) Minimizing the impact of District operations on the environment
4) Taking advantage of financial incentive programs; and,

RESOLVED further, That the Board of Education directs staff to follow recommendations in the Illinois Resource Guide for Healthy High Performing Schools Buildings; and,

RESOLVED further, That the Board of Education endorses District participation in and directs staff to pursue partnerships that further the goal of high performance schools, including Federal, State and utility programs that provide sustainable design financial incentives; and,

RESOLVED further, That the Board of Education directs staff, during the design phase of the remaining projects in the current construction and modernization program and all such future projects, to require architects and staff to verify that their District project(s) have striven to achieve energy efficiency and healthy construction objectives; and,

RESOLVED further, That the Board of Education directs staff to report to the Board, within _____ days of the passage of this resolution, on the District.'s plan to comply with this Resolution; and,

RESOLVED, That the Board of Education directs staff to report to the Board annually on the progress of this program, and provide quarterly summary statistics on the number of new schools and modernization projects designed and the percentage which have incorporated Healthy, High Performing design criteria, and other statistics useful in assessing the progress of this effort.

For a downloadable version of this resolution, visit www.healthyhighperformingschools.org or download directly from http://www.chps.net/manual/documents/060920_District_Resolutionsample-1.doc

Global Green USA is a non-profit organization
that is promoting the use of resource efficient
and healthy practices in the design, construction,
and operations of schools through its Green Schools Initiative.

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