GREEN SCHOOLS INVESTMENT GUIDE:
for healthy, efficient and inspiring learning spaces

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ABOUT OUR ORGANIZATIONS

architecture for humanity

Architecture for Humanity is a nonprofit design services firm founded in 1999. We are building a more sustainable future through the power of professional design.

By tapping a network of more than 50,000 professionals willing to lend time and expertise to help those who would not otherwise be able to afford their services, we bring design, construction and development services where they are most critically needed.

Design is important to every aspect of our lives. It informs the places in which we live, work, learn, heal and gather. We engage all stakeholders in the design process. We believe our clients are designers in their own right.

THE CENTER FOR GREEN SCHOOLS

The Center for Green Schools at the U.S. Green Building Council is making sure every student has the opportunity to attend a green school within this generation. From kindergarten to college and beyond, the Center works directly with staff, teachers, facilities, students, ambassadors, elected officials and communities to drive the transformation of all schools into sustainable places to live and learn, work and play.

The U.S. Green Building Council (USGBC) is a nonprofit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green buildings. USGBC works toward its mission of market transformation through its LEED green building certification program, robust educational offerings, a nationwide network of chapters and affiliates and advocacy in support of public policy that encourages and enables green buildings and communities.

WELCOME: WHERE WE LEARN MATTERS

RACHEL GUTTER

DIRECTOR,
THE CENTER FOR
GREEN SCHOOLS
AT USGBC

Each year, I have the pleasure of meeting thousands of leaders and dedicated champions like you who lead the movement to promote amazing learning environments across the country and around the world. We designed the *Green Schools Investment Guide* with advocates like you in mind, who are working tirelessly to make our schools healthy, safe and efficient, ensuring that every student has the opportunity to learn in a green school within this generation.

Parents, taxpayers and voters spend so much time spinning their wheels over how to fix the *who* and the *what* of education, and more often than not, we completely ignore all that needs to be done to fix the *where*. You and I know that quality learning environments are critical for delivering quality education and, when done right, can do much to enhance it.

In our recently released *State of our Schools* report, we estimated that it will take approximately $271 billion to bring public school buildings up to working order and comply with laws. If we add to that modernization costs to ensure that our school facilities meet today's education, safety and health standards, the total jumps to a jaw-dropping $542 billion. We know that the places where our children learn have a direct impact on their health, well-being and performance, and that it's going to take a lot of brawn, a lot of creativity and a lot of collaboration to ensure that all students have the opportunity to learn in schools that are healthy, safe and support their dreams for a brighter future.

The good news is that there's a growing body of scientific evidence that affirms the importance of schools buildings that enhance education instead of get in the way of it. A recent UK study determined that classroom design influences learning outcomes by an average of 25 percent over the course of an academic year.

In today's cash-strapped environment, energy efficiency measures represent one of the best and perhaps one of the *only* opportunities to put money back into the classroom where it belongs. In fact, a 2008 report from the Environmental Protection Agency stated that basic energy improvements and education for building occupants could save a school an average of 25 percent, or $2 billion per year, nationally.

That's why the Center for Green Schools at USGBC has teamed up with Architecture for Humanity to equip and deploy champions in communities across the country to renovate, retrofit and rebuild inadequate, deteriorating school facilities. We created this guide in order to support your efforts to recruit fellow champions to make the case for change and ensure that this critical work gets done. As an advocate, it's important to have a degree of fluency around the financing of school improvements in order to lead an effective outcomes-focused conversation within your community.

High-performing schools are within our reach. Throughout this guide, we outline how you can team up with schools and districts to design and implement comprehensive strategies that simultaneously improve the wellness of students and staff, enhance learning conditions and set strong examples of sustainability for our communities.

I want to thank you for your commitment to providing exceptional learning environments to support our future. We look forward to working with you to deliver on this promise.

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i INTRODUCTION

A VISION FOR OUR SCHOOLS

At the heart of every healthy, thriving community, we see a green school: a healthy, safe, inspiring and resource-efficient place for learning and leadership. We believe that every school can serve as a center for community life and an engine of renewal. We believe that where we learn matters.

Today, the opportunity for a child to attend a green school is the exception, rather than the rule. Too many of our school buildings have air unfit to breathe and dwindling maintenance budgets. And too often, school leaders are ill-equipped or unsupported in their efforts to challenge the status quo. The result: each term, one in three students begins their education in a classroom in urgent need of improvement. Every day, our schools' building needs diminish the potential of students and school staff across the country.[1]

Although every school will require maintenance over their lifetime, too often, we hear that there isn't the money or technical know-how to implement building improvements. We created the *Green Schools Investment Guide* to support community members – including school administrators and elected officials, staff and students, parents and businesses – in their efforts to work together to identify and implement right-sized building improvements in their schools. Throughout this guide, we offer a series of ideas and opportunities - some modest, others large in scale - that you can seize to initiate an inclusive, action-oriented conversation about the benefits of improving our existing school buildings.

We believe that green building improvements can transform our schools in powerful ways and help communities seize interconnected opportunities. Building directly on your input from the *2012 School Stakeholder Survey*,[2] we created this guide to help your community to:

IMPROVE STUDENT AND STAFF WELLBEING

The physical condition of our school facilities affects the performance, comfort and stress levels of students and teachers alike. A wide body of research[1, 3] illuminates the relationships between the physical and human performance of our schools, including the links between:

- indoor air quality and rates of absenteeism and asthma
- lighting quality and student concentration
- classroom acoustics and student attention
- access to physical activity and healthy cognitive development
- the design and condition of facilities and academic achievement
- the quality of school buildings and long-term staff and teacher retention

Building on this research, we point out how particular building systems impact students and staff and provide both big ideas and small-scale tools for improving these systems in the context of a school's values, priorities and available resources.

CONSERVE RESOURCES AND ENHANCE LEARNING ENVIRONMENTS

School energy and maintenance costs are the greatest expenses for schools after personnel costs. For the 2008-2009 school year, schools spent an estimated $50 billion on building operations, including some $8 billion on energy alone.[4] As school budgets dwindle and energy costs continue to rise, fewer resources are dedicated to school operations and maintenance. As a result, the health and performance of our school buildings - and our students - suffers. Building improvements shouldn't be seen as an additional expense. Instead, we need to understand them as integral to the operations of our schools.

Beyond their health benefits, many building improvements also save energy and free up funds that can be used for other priorities, like instructional support and opportunities for projects themselves. The resulting improvements can function as a teaching tool for imparting lessons of sustainability, including STEM learning, environmental literacy and green career pathways. This guide identifies how, when and where building improvements can save scarce resources. We also explore how schools can overcome their greatest barriers to implementing building improvements by leveraging these savings to creatively unlock new finance opportunities and to reinvest in other school needs.

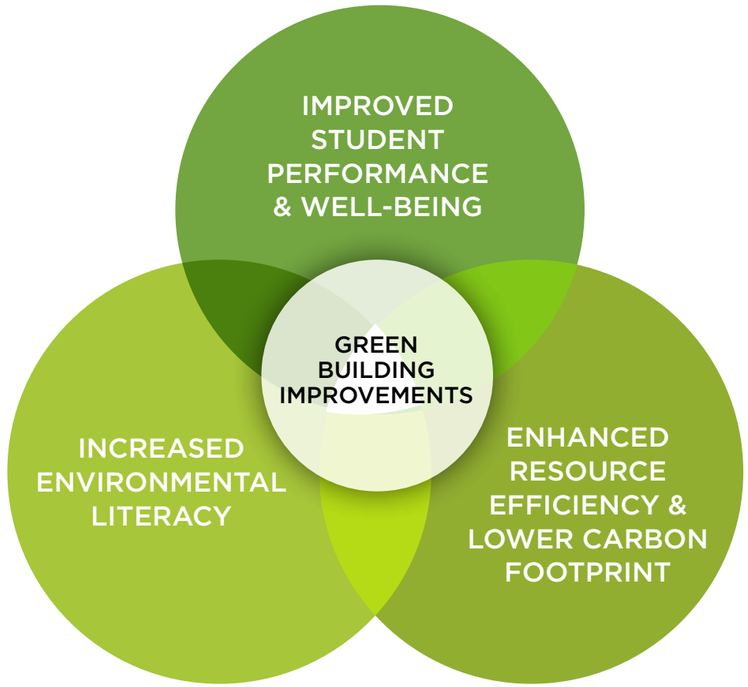
FOSTER THRIVING AND SUSTAINABLE COMMUNITIES

There is a tremendous opportunity to leverage building improvements to turn our schools into models for sustainable living and learning. In the United States, inefficient buildings consume 40% of all energy and emit 40% of all greenhouse gases. Investing in our school facilities can play a key role in mitigating our environmental footprint: recent studies suggest that improving the performance of our school buildings can offset up to 30 million tons of carbon dioxide emissions[5] - that's the equivalent of taking 6 million cars off the road for a year.

It would take an estimated $542 billion of investment over the next ten years just to modernize our existing school buildings.[1] Research demonstrates that thousands of local, skilled jobs could be created by investing in simple energy efficiency improvements in our schools.[5] Throughout this guide, we identify opportunities for you to engage your community in this important conversation around the sustainability of our schools and cities.

Today we're equipped with the shared vision, determination and resources we need to transform our nation's existing school facilities into healthy, resource-efficient and inspiring places of learning. Finding solutions that meet our diverse school needs nevertheless requires incredible creativity and resolve. We hope that this guide puts your community on a path that ensures every student attends a green school.

THE GREEN SCHOOLS APPROACH



Investments in our school buildings are a "triple win" for communities. This guide builds the case for a range of strategic school building improvements that can help communities address the greatest challenges facing our school facilities in cross-cutting fashion. We define opportunities and strategies that all communities can leverage to build a case for real change in their schools.

OUR METHODOLOGY

Our approach builds on the insights and ideas you shared in the *2012 School Stakeholder Survey*,[2] which polled over 250 school staff, teachers, parents, students and members of the business community, and builds on the shared expertise and experience of our Green Schools Advisory Team. We use the word "school" to represent individual schools, schools that comprise several buildings on a single campus, or a whole school district. This resource is designed to have a broad application to a range of schools, from large to small, public or independent. When necessary, we call out instances where the application of certain strategies may be of greater relevance to the unique circumstances of particular school types. Our focus on green building improvements includes upgrades, retrofits and renovations to existing school facilities and grounds, ranging from Heating, Ventilation and Air Conditioning System (HVAC) upgrades to plumbing updates.

OUR CORE VALUES

In order to address our school needs, we must be equal parts visionary and practical.

Many of us share the vision that our schools can be healthy, resource-efficient centers of community life. Yet we have differing levels of the technical knowledge needed to make meaningful investments in our school buildings. We designed this guide to level the playing field and show how and where big ideas and practical considerations for making change in our schools intersect.

Ideas and action should always be in conversation.

Throughout this guide, we shift between ideas for inspiration and ideas for action.
Our intent: To help you gain an action-oriented understanding of how, where, and when you can help your school implement building improvements, no matter your level of expertise. We hope that you'll keep these ideas and actions in conversation as you use this guide and build the case for improving your school buildings.

We see opportunities - small and large - as building blocks for change in our schools.

There are no "one size fits all" solutions to our school building needs. Nevertheless, we believe that all schools can seize opportunities to better their facilities by threading together high-impact building improvements with the appropriate finance and implementation strategies. We hope this way of thinking helps your school to identify and leverage new and existing resources to make change.

REFERENCES

1. The Center for Green Schools 2013 State of Our Schools Report. The Center for Green Schools
2. 2012 School Stakeholder Survey. Architecture for Humanity & The Center for Green Schools
3. The Impact of School Buildings on Student Health and Performance. The Center for Green Schools and McGraw Hill Construction
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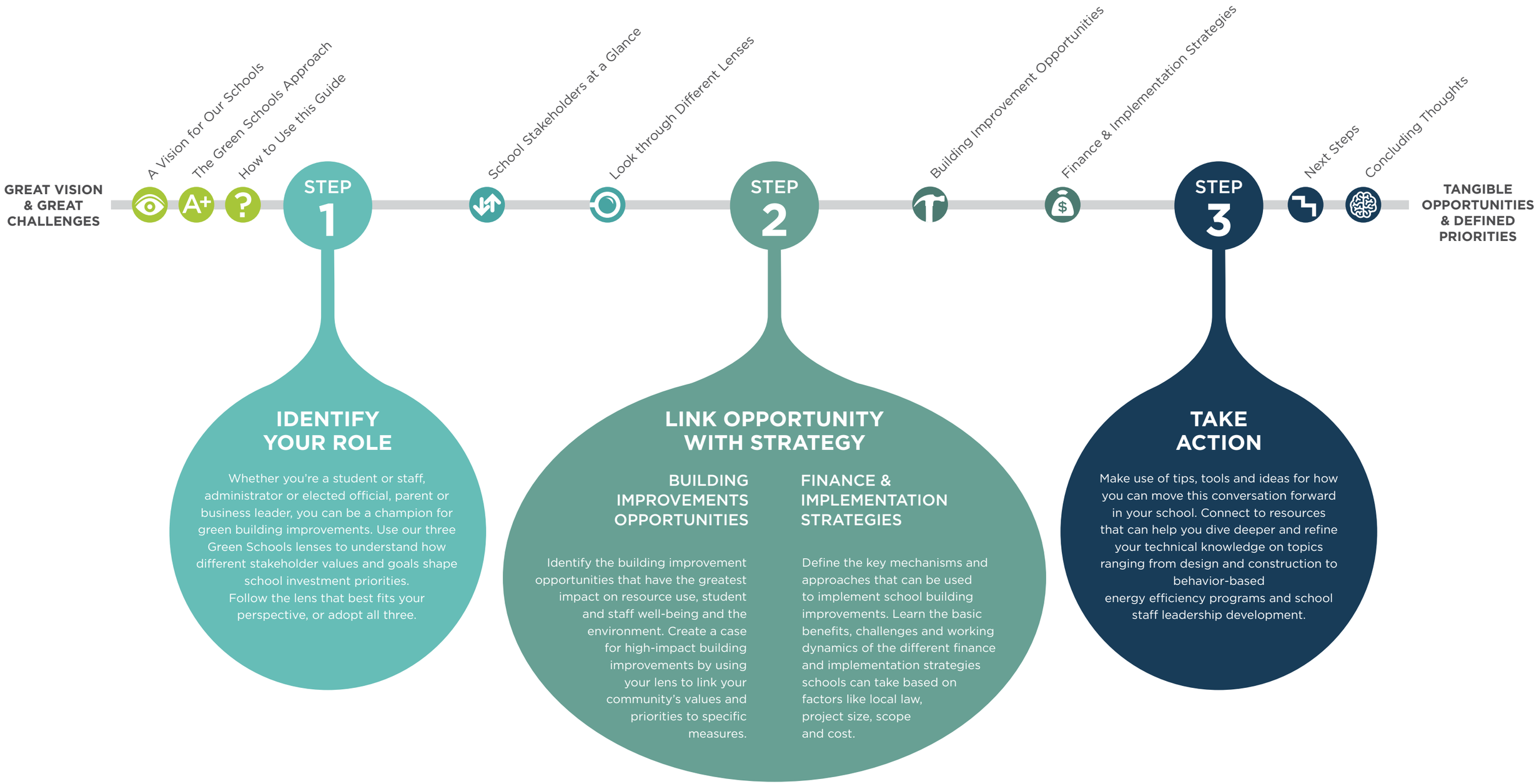
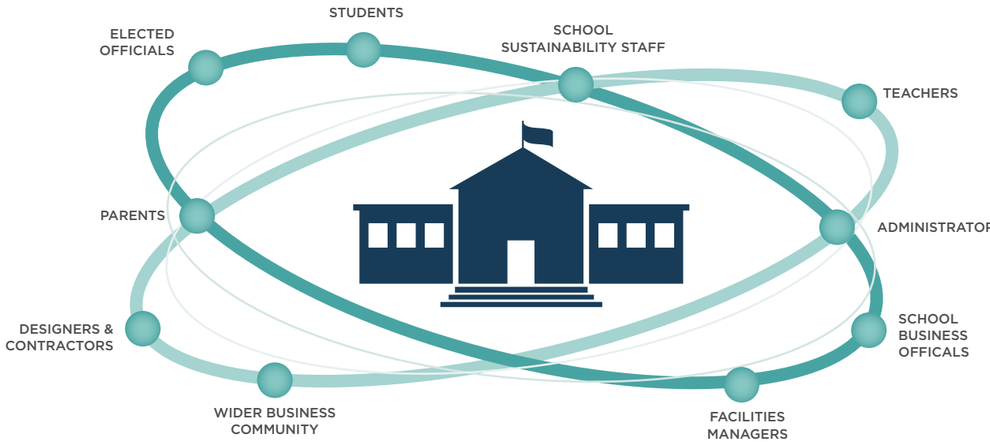
HOW TO USE THIS GUIDE



STEP 1

IDENTIFY YOUR ROLE

SCHOOL STAKEHOLDERS AT A GLANCE



As part of the *2012 School Stakeholder Survey*, we asked community members to identify the single greatest champion of building improvements in their schools. The responses were decidedly split amongst all groups, with individuals identifying school staff and leaders, designers, parents and students as champions in nearly equal measure. Yet when asked about their top reason for pursuing building improvements, the overwhelming consensus was clear: improving student performance comes first.

While many of us agree that clean, safe and resource-efficient facilities are essential to the health and performance of our students, we noted key differences in how different school stakeholders identified their school investment priorities and responsibilities. To clearly represent this important diversity, we distilled these nuances into three thematic Green Schools lenses: Decision Makers, Educators and Other Advocates.

Throughout the Guide, you'll find references to the Green Schools lenses defined on page 8. Use these tools to help gain insight into how different stakeholder motivations and values shape school investment priorities, and to suggest how these values can be addressed in your school's building improvement strategy. Consider the stakeholder groups you need to engage in the conversation and use the following chart to link value propositions for each improvement opportunity to your target audience.

LOOK THROUGH DIFFERENT LENSES

	TOP GREEN SCHOOL OBSTACLES	TOP GREEN SCHOOLS GOALS
DECISION MAKERS		
A decision maker's primary goal is to ensure the educational excellence of the school by balancing building operations and performance with instructional quality and academic success.	1 Budgetary constraints and cost-cutting	1 Resource savings, meaning more funds for instruction and school operations
	2 High up-front costs of improvements	2 Implementation approaches that minimize risks and put improvements within reach
	3 Lack of leadership buy-in and staff knowledge to support improvements	3 Demonstrated wins that build stronger institutional support and capacity to address improvements
EDUCATORS		
An educator's primary goal is to provide students with high quality learning and leadership opportunities by ensuring their access to resources and educational environments that enable their best performance and well-being.	1 Poorly designed or equipped learning environment	1 Learning environment designed to optimize student concentration and focus
	2 Poor indoor air quality and high incidences of asthma and absenteeism	2 Improved indoor air quality, heath and comfort
	3 Lack of resources for sustainability and project-based learning opportunities	3 Learning opportunities linked to the performance of school facilities
OTHER ADVOCATES		
Many advocates seek to promote their school as a model of environmental sustainability and resource efficiency as well as an engine of opportunity in their community.	1 Costly or harmful school energy and resource use	1 Reduced energy and resource consumption
	2 Lack of local institutional support for community sustainability	2 Institutional support rallied through case studies & proven benefits
	3 Lack of broader community involvement around sustainability and health issues	3 Community events and opportunities designed to foster involvement with sustainability

STEP 2

LINK OPPORTUNITY WITH STRATEGY

BUILDING IMPROVEMENT OPPORTUNITIES

SECTION AT A GLANCE

The *Building Improvement Opportunities* section identifies the school building retrofits that have the greatest impact on resource use, student and staff well-being and the environment. Use this section to create a case for high-impact building improvements by linking your community's values and priorities to specific building improvement opportunities.

THIS SECTION PROVIDES AN OVERVIEW OF THE FOLLOWING:

A basic introduction to the key building systems that shape the quality of our learning environments and to the highest impact opportunities to improve the performance of these systems.

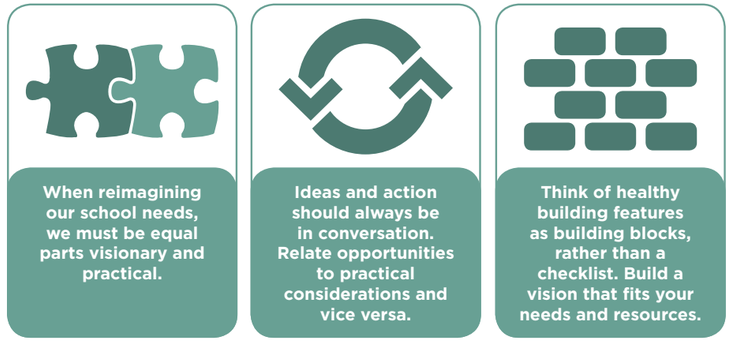
Guidance for linking your values and priorities to these building systems and improvement opportunities.

An implementation-oriented introduction to basic considerations to take into account when exploring building improvements, including financial terms we can use to understand the relative costs associated with specific improvement measures.

An introduction to the benefits of "bundling" school building improvements. Bundling improvements can help schools to creatively unlock funding for and maximize the impact of building improvements.

HOW TO USE THE *BUILDING IMPROVEMENT OPPORTUNITIES* SECTION

To help you link key building systems and improvement needs to your school's facility needs and priorities, we've designed this section to help you understand how, where and when schools can implement building improvements. When writing this section, we kept a few principles in mind that we hope can help you to better understand and build the case for high-impact investments in your school buildings.



The *Building Improvement Opportunities* section introduces these dynamics through two complementary discussions. We share basic considerations that apply to nearly all school improvement scenarios before defining key school building systems and specific improvement opportunities. We build on these insights in greater detail in the *Finance & Implementation Strategies* section.

1. BASIC CONSIDERATIONS

TOPICS COVERED:

- Your Improvement Priorities
- Basic Improvement Considerations
- Linking Your Priorities to Opportunities
- The Relative Costs of Improvements
- The Rationale for Bundling Improvements
- Linking Improvements to Finance & Implementation Approaches

2. KEY FINANCE APPROACHES & MECHANISMS

TOPICS COVERED:

- HVAC Systems
- Lighting Systems
- Water Systems
- Building Envelopes
- Renewable Energy
- Site Design
- Additional Considerations

BASIC CONSIDERATIONS

IDENTIFY YOUR BUILDING IMPROVEMENT PRIORITIES

In order to help schools translate high-level visions for their schools into actionable building improvement opportunities, we asked stakeholders to define their top school building priorities in the *2012 School Stakeholder Survey*. Answers to the two key questions helped to define the tips, tools and resources we've included in the *Building Improvement Opportunities* section:

TABLE 2.1: SCHOOL STAKEHOLDER SURVEY RESULTS

PRIMARY MOTIVATIONS

When asked to identify their primary motivations for implementing building improvements in their schools, respondents identified the following as their top drivers for change:

1. Improved student academic performance
2. Improved staff and student happiness
3. Improved finance performance and budgetary savings
4. Healthier learning environments with reduced asthma incidences and absenteeism
5. More opportunities for community involvement in school life

IMPORTANT TRAITS OR GOALS

When asked to define the most important traits or goals of an improved school facility, respondents indicated that an improved school building should:

1. Provide a more comfortable learning environment
2. Engage students in sustainability learning
3. Help students focus more on learning
4. Save energy
5. Support recycling, compost, re-use and other sustainable habits

The *Building Improvement Opportunities* section focuses on how we can leverage physical improvements in our school buildings to take advantage of these cross-cutting motivations and shared goals.

LINKING YOUR PRIORITIES TO BUILDING IMPROVEMENT IDEAS & OPPORTUNITIES

Throughout this section, you can locate indicators that correspond to the top three school building improvement benefits that we associated with each stakeholder lens in *Step One: identify Your Role*. These indicators are designed to draw your attention to the improvement measures that are closely associated with these building improvement benefits and to suggest how to connect diverse stakeholders to school building insights that resonate with them. We hope that this approach sparks new insights as to how improvements can address school priorities in cross-cutting fashion and help you to better prioritize areas for deeper learning and conservation.

The example below demonstrates how you can locate your priorities and other key considerations as you move through the section.

EXAMPLE: BUILDING AUTOMATION SYSTEMS (BAS)

STAKEHOLDER CONSIDERATIONS Indicators that correspond to stakeholder lenses and benefits

FINANCE & IMPLEMENTATION CONSIDERATIONS Key variables in determining how improvements are implemented

BUILDING SYSTEM Controls & Monitoring

BUILDING IMPROVEMENT OPPORTUNITY Building Automation Systems Controls & Monitoring

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A CONTROLS & MONITORING		
Building Automation Systems (BAS) help school staff to optimize the energy consumption and performance parameters of HVAC systems and other building features, like lighting systems. BAS allows temperatures to be controlled centrally, according to pre-set thermal zones, or at every classroom. BAS retrofits are particularly cost effective in older buildings without digital or hybrid HVAC system controls.	1 2 3 1 2 3 1 2 3	VARIES

TABLE 2.2: POTENTIAL BAS BENEFITS & STAKEHOLDER CONNECTIONS

By right-sizing HVAC system energy consumption and performance, facility managers can use the BAS to reduce energy use and unnecessary wear and tear on mechanical systems.	1 2 3 1
The BAS can generate concrete performance data that school staff can use to measure and verify the performance of their HVAC system.	2
The energy savings data generated by the BAS can be shared as a "proof point" with school stakeholders.	3 2 3
The BAS can help to adapt HVAC system performance to keep classroom temperatures comfortable and can help facility managers monitor the performance of the systems.	1 2
School staff can use BAS data to teach students about energy efficiency and building mechanics or for behavior-based energy efficiency programs.	3 3

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

BASIC BUILDING IMPROVEMENT CONSIDERATIONS

Regardless of the scale or scope of your school building improvement approach, these basic considerations will shape the appropriateness and application of measures in your community. While the answers to these questions will vary tremendously according to the school context and may take specialized knowledge to answer, it's important to develop a working understanding of how school decision makers typically prioritize opportunities.

TABLE 2.3: BASIC CONSIDERATIONS

GENERAL SCHOOL BUILDING CONSIDERATIONS

Leadership & Staff Buy-In

Can our team clearly define and agree upon the value and impact of potential building improvements?

Schedule & Building Access

Can our school implement improvements while school is in session or only during summer recess?

Access to Capital & Cash Flow

Can our school afford to make investments now, given what funding options, implementation approaches and other resources are currently available?

Condition of Existing Facilities & Building Design

Are our existing facilities in good enough condition to support retrofits, or are larger renovations required? Can the physical design of our building safely accommodate new features?

Climate & Site Context

What design features and improvements are appropriate given my local climate? How might the orientation of school buildings impact the performance of certain improvement measures?

IMPROVEMENT-SPECIFIC CONSIDERATIONS

Initial Costs Versus Lifecycle Costs

Will lower lifecycle costs or other material benefits justify the initial expense and opportunity cost of the improvement?

Performance Verification & Valuation

How can we ensure the improvement will perform as intended?

Staff Expertise & Training

How can we ensure our maintenance and facilities team have the knowledge and resources needed to effectively commission and operate new features and systems?

Energy Efficiency & Cost Savings

Does this improvement save energy or resources in a measurable way? Do we have the ability to measure this efficiency gain in terms of long-term cost savings?

System Demands & Load Sizing

How do these improvement opportunities relate to larger and interconnected building systems, given that the appropriate "sizing" of specific improvements may vary significantly depending on how other improvements are made?

THE RELATIVE COSTS OF BUILDING IMPROVEMENTS

We can agree: a school building's main mission is to provide the best environment for teaching and learning. Consider the recent uptick in technology resources in classrooms: investments in these resources are not based on payback or cost savings, but instead on the ability of the investment to provide the best teaching and environment for learning. We must consider our buildings and classrooms in a similar light.

It's important to understand the vocabulary that school business officials, vendors and finance partners use to identify the relative costs of building improvements. Understanding costs is particularly important when we think about different approaches for funding improvement projects, many of which are determined by the projected cost savings or payback.

The relative costs associated with particular building improvements vary greatly from school to school. A number of key measurements of cost are critical in helping decision makers prioritize investments. We define a few of the most common terms used to describe these costs in Table 2.4.

Note that these terms are based solely on a financial analysis of the performance of improvements, so they often fail to fully account for the other benefits like classroom learning or student and staff health. These terms tend to paint a more favorable picture for improvements with measurable cost savings, like energy efficiency upgrades. Given that there is no simple metric that can fully capture the value of an improved learning environment, schools must incorporate their own analysis of the full range of anticipated benefits from building improvements. Perhaps the most comprehensive analysis of the costs - and benefits - of improvement opportunities is one that links a deep understanding of how health, academic performance and resource efficiency relate to your community's existing resources, values and priorities. Further guidance on how to build this kind of analysis is provided in the *Finance & Implementation* section.

Throughout the *Building Improvement Opportunities* section, we list the **RELATIVE UP-FRONT** and **LIFECYCLE COSTS** of each improvement opportunity to provide a general sense of scale. Please remember that actual costs vary greatly by region, building condition and according to the availability of different funding mechanisms for schools.

TABLE 2.4: KEY TERMS RELATED TO BUILDING IMPROVEMENT COSTS

UPFRONT COST	The sum of the initial costs incurred to implement and commission an improvement
RECURRING COST	A cost incurred on a regular basis over the useful life[1] of an improvement (e.g. maintenance costs, energy costs)
ANNUAL COST SAVINGS	The recurring savings generated by an improvement (e.g. maintenance savings, energy savings) measured on a yearly basis
LIFECYCLE COST	The sum of all one-time and recurring costs over the useful life of an improvement, or *total cost*
SIMPLE PAYBACK PERIOD	The time required to recover the initial cost of an improvement through cost savings. This number is the inverse of the *return on investment*.
RETURN ON INVESTMENT	A measure of profitability calculated as such: $\frac{\text{Gain (Total Cost Savings) - Lifecycle Cost (Initial Cost + Recurring Costs)}}{\text{Lifecycle Cost}}$

1. Useful life refers to the period time for which an improvement will be useful for a school. The useful life for an improvement varies according to the frequency use, environmental conditions, technical improvements, changes in local laws and regulations, among other variables.

THE RATIONALE FOR BUNDLING BUILDING IMPROVEMENTS

Bundling refers to an approach where schools finance and implement a group of improvements as part of one package or portfolio of projects, rather than on an individual or one-off basis. According to the Department of Energy, K-12 school improvement projects typically have a longer payback period than other government and institutional projects. This is because schools tend to bundle projects with longer-term paybacks with those with shorter-term paybacks, so as to gain access to financing that wouldn't otherwise be available for projects with longer-term paybacks only.[1] Whether or not a school takes a bundled approach depends on the scale and scope of the improvement projects and the availability of resources, including capital and the staff time and expertise to oversee project implementation.

THE FINANCIAL RATIONALE FOR BUNDLING

The table below compares the financial performance of three improvement measures as individual projects and as a single project bundle. In many contexts, schools are challenged to justify investments or secure attractive third party finance for improvement projects with longer-term or no paybacks (*Example Measures B and C*), particularly when "quick win" improvement opportunities are available and easily financed (*Example Measure A*). When bundled, note that these projects have an overall Simple Payback of 7 years, only marginally longer than the anticipated Simple Payback for *Example Measure A*. Not only does this approach help projects pencil out, but it also helps avoid "cream skimming:" once fast retrofits are implemented, schools often become poor candidates for more extensive retrofits. Cream skimming can make these deeper retrofits uneconomical for years.[2]

AS INDIVIDUAL PROJECTS	AS A PROJECT BUNDLE
EXAMPLE MEASURE A: UPGRADE LIGHTING SYSTEM	**EXAMPLE BUNDLE: MEASURES A+B+C**
• Initial (Capital) Cost: $125,000 • Annual (Net) Savings: $20,800 • Simple Payback: 6 Years	• Total Initial (Capital) Cost: $154,000 • Total Annual (Net) Savings: $21,900 • Simple Payback: 7 Years
EXAMPLE MEASURE B: UPGRADE WATER FIXTURES	
• Initial (Capital) Cost: $20,000 • Annual (Net) Savings: $1,600 • Simple Payback: 12.5 Years	
EXAMPLE MEASURE C: BUILD STUDENT GARDEN	
• Initial (Capital) Cost: $9,000 • Annual (Net) Savings: -$500 (Upkeep) • Simple Payback: None	

THE TECHNICAL RATIONALE FOR BUNDLING

The performance of building features often strongly correlates to the performance of other building systems. Bundling serves as a project implementation approach where the design, finance and implementation of these improvements are weighed jointly. In a hypothetical scenario where a school is considering HVAC system retrofits, facilities managers need to consider how the heat transfer from lighting systems and other building equipment may impact the load sizing of the HVAC system. In this case, efficiency gains in the lighting system may lower the load sizing requirements of HVAC system components. By designing and right-sizing components in relational fashion, schools often generate greater long-term operational and energy efficiency savings.

LINKING IMPROVEMENTS TO FINANCE & IMPLEMENTATION APPROACHES

The extent to which building improvements are cost saving not only shapes opportunities for comprehensive "bundling" approaches, but also informs what project finance and implementation strategies are available to schools. For example, schools may opt to take a paid-from-savings approach* in scenarios where the projected cost savings from building improvements act as a main source for repaying the debt used to implement them, because schools can track cost savings through their energy bills or through a vendor performance contract. Similarly, the scale, scope and efficiency of a building improvement bundle can help schools decide which finance strategy to use given the highest and best use of resources, be it money from the general fund, third party finance or other sources.

The key is to recognize how the overall costs of building improvements informs the value propositions of various project implementation and finance approaches. Table 2.5 shows a three-step approach to help you link improvement opportunities to project implementation considerations. Keep these variables in mind as you assess improvement opportunities throughout the remainder of this section.

TABLE 2.5: Linking Improvements with Project Implementation and Finance Approaches

A BUNDLE IMPROVEMENTS ACCORDING TO YOUR SCHOOL'S NEEDS & PRIORITIES

IMPROVEMENTS WITH DIRECT COST SAVINGS	IMPROVEMENTS WITHOUT DIRECT COST SAVINGS
EXAMPLES: • Upgrades to Light-Emitting Diode (LED) lighting • High efficiency boiler conversions • Building Automation System (BAS) installations	**EXAMPLES:** • School garden installations • Safe Routes to Schools programs • Live shading and indigenous planting

B SELECT THE RIGHT PROJECT IMPLEMENTATION APPROACH

Schools can use any number of approaches to implement building improvements depending on the scale and scope of the work and their internal resources. Schools can rely on internal staff and technical experts to identify and implement work, or partner with third party design professionals, vendors and energy services companies. Vendors offer services that range from technical consulations to turnkey solutions. Each school has its own project implementation approach, but can use frameworks like the LEED Green Building System to guide discussions, outline plans, identify and implement practical and measurable green building solutions.

Why LEED?

LEED provides third party verification of green buildings, measuring how well a building performs according to several metrics: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality and stewardship of resources. In school terms, LEED is like a report card for buildings, demonstrating to the community that a facility is built and/or operated in a way that supports the health and well-being of occupants and saves energy, resources and money.

Thousands of schools have utilized LEED for Schools for new construction and major renovations. The LEED for Existing Buildings: O&M rating system[3] contains performance standards for the sustainable, ongoing operation of existing buildings - the types of retrofits addressed in this guide. For many schools and school districts, O&M best practices and sustainable policies that contribute toward a facility's LEED certification will be established through district-wide policies, programs and plans. In this way, the certification of an individual school facility can result in operational improvements that extend throughout the entire campus or school district.

C EXPLORE FINANCE & IMPLEMENTATION STRATEGIES

Depending on the scale and scope of the improvement project, existing resources and local regulations, schools can leverage any number and combination of self-finance and debt finance approaches to finance and implement projects. The *Finance & Implementation* section explores these mechanisms in greater detail.

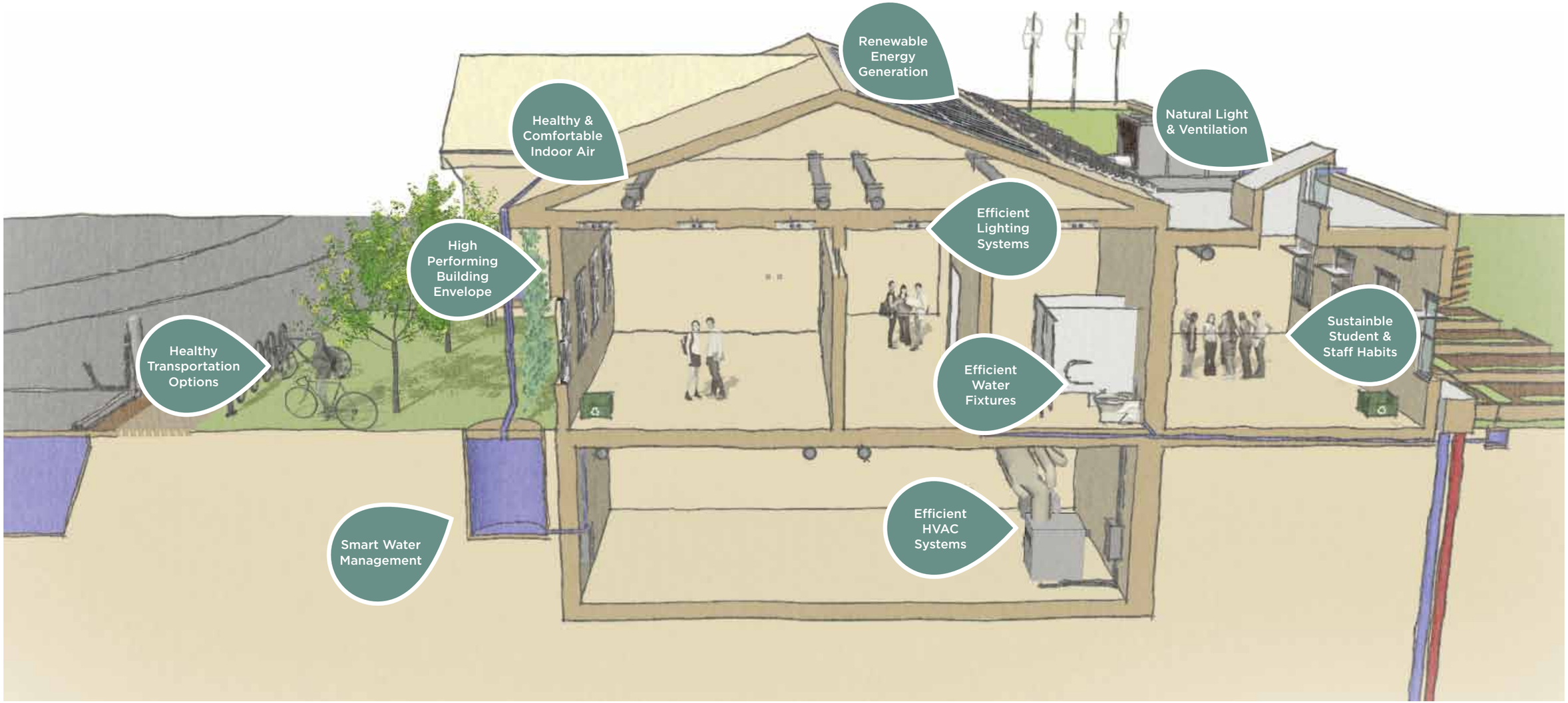
* The paid-from-savings approach is a financing strategy to green existing buildings. It leverages the savings generated from building system upgrades to pay for a comprehensive greening project within a defined pay-back period. We discuss the paid-from-savings approach in greater detail in the *Finance & Implementation Strategies* section (page 37).

REFERENCES

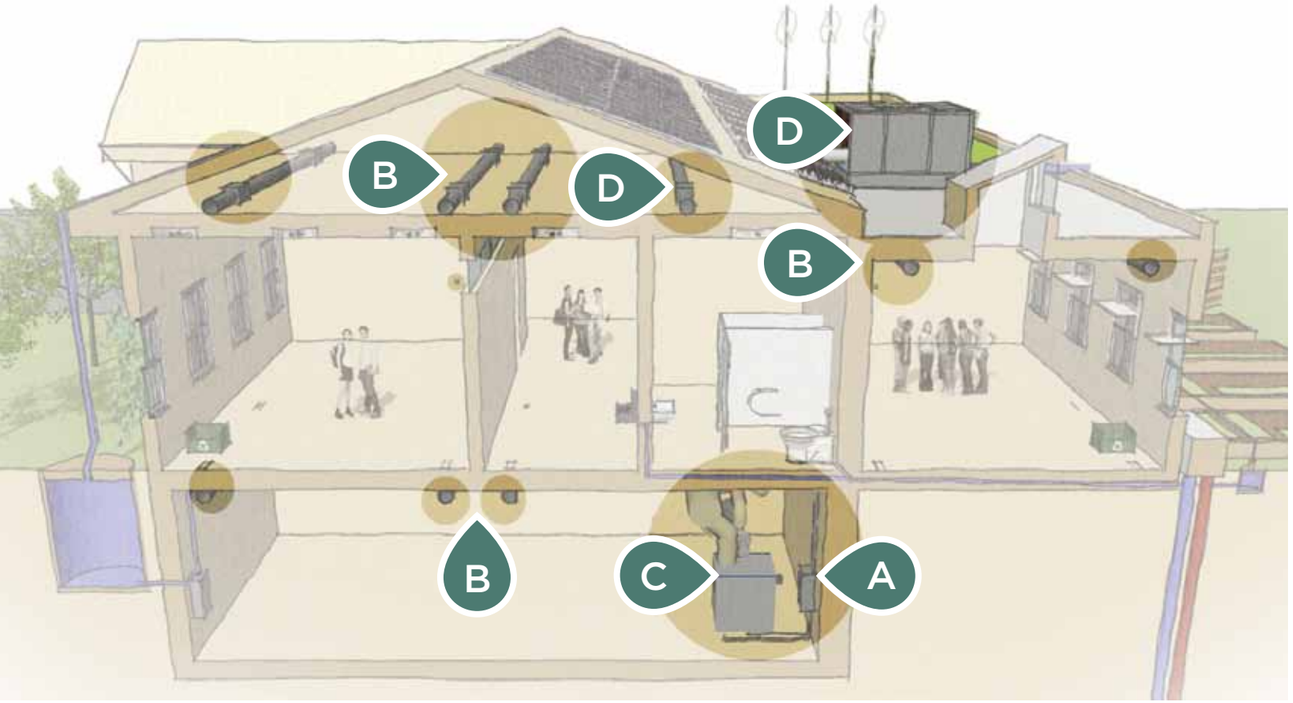
1. Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance. Lawrence Berkeley National Laboratory
2. Greening Our Built World: Costs, Benefits and Strategies. Greg Kats
3. LEED 2009 for Existing Buildings: Operations & Maintenance Rating System. U.S. Green Building Council

A GREEN SCHOOL BUILDING AT A GLANCE

We believe that all schools can implement healthy and resource efficient building improvements. Nevertheless, there's no "one size fits all" solution for our school facilities. Below, we note some of the key building systems and features where we can make the greatest change in the performance of our existing schools buildings. Throughout the following section, you'll find definitions of the building systems and features that represent opportunities to improve student health and learning, energy efficiency or resource use, along with ideas and opportunities to help you advocate for improvements. Our goal is to equip you with the basic knowledge and talking points you need to identify how and where school building improvements can transform our communities for the better.



KEY BUILDING SYSTEMS & OPPORTUNITIES



HVAC SYSTEM: AT A GLANCE

The HVAC system - that's short for Heating, Ventilation and Air Conditioning system - regulates the temperature and quality of atmosphere in our schools.

Research demonstrates that the health and performance of students and staff corresponds directly with the performance of the HVAC system.[1] A high performing system can not only limit the presence of airborne toxins and mold-causing dampness, but may also help to maintain classrooms at temperatures optimal for comfort and focused learning. Given that a typical HVAC system can consume upwards of two thirds of the energy used in a school, there are also opportunities to substantially reduce your energy costs by improving the efficiency of the system's components.[2]

Maintaining a healthy HVAC system is about more than just installing the latest equipment. While a high performing air handling system can significantly improve air quality and ventilation rates, regular maintenance inspections, performance monitoring and calibrations will ensure that the system continues to work effectively.

When weighing HVAC system improvements, one needs to remember that HVAC systems are dynamic: the design and performance of individual components can greatly impact that of others. The design of your school's ideal HVAC system will be informed by regional climate differences, the age and physical design of school buildings, the total scope of your improvement plan (including the design of other improvements, like better windows and insulation) and the availability of various finance opportunities in your region.

IDEAS & OPPORTUNITIES

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A CONTROLS & MONITORING		
Building Automation Systems (BAS) help to optimize the energy consumption and performance parameters of HVAC systems and other building features, like lighting systems. The BAS allows temperatures to be controlled centrally, according to pre-set thermal zones, or at every classroom. While BAS retrofits can be costly in older buildings, they can help school staff to generate substantial energy savings throughout the HVAC system.[3]	1 2 3 1 2 3 1 2 3	VARY
Programmable thermostats and **occupant sensors** can be networked to a BAS and help eliminate energy waste by maintaining consistent temperatures according to occupant behavior and climate changes. They are typically easy to install and have a quick payback.	1 2 3 1 2 3 1	LOW / LOW
Submeters monitor specific end uses, like heating, cooling and plug loads. Schools can use this data for benchmarking and performance monitoring, providing data to benchmark and monitor how particular end uses are contributing to their total energy consumption.	1 2 3 3 1 2	HIGH / LOW
Energy Performance Displays can share real time building energy use with staff and students in accessible ways, creating opportunities to link learning programs into energy use reduction strategies.	2 3 3 1	MEDIUM / LOW
B AIR HANDLING & DELIVERY		
Air Handling Units (AHU) circulate conditioned (warm and cool) air throughout the building through ducts. Many schools are under-ventilated (that is, there is a lack sufficient outside air flow), which has been shown to negatively impact occupant comfort and performance. Alternatively, some schools may be over-ventilated, meaning that their HVAC systems are conditioning an excess of outside air. Schools can use ASHRAE 62.1 to identify the appropriate ventilation rate for their buildings, which can help to right-size their HVAC system performance and lower energy costs. AHUs are located either inside or outside on the roof, and may include a number of components.[2]		
Tips to improve AHU performance: i. **Adjust performance based on load demands.** Convert to a variable speed fan/blower and install a Variable Flow Drive. Install Variable Air Volume Boxes (VAV) to regulate the flow of air into rooms or zones.	1 2 3 1 2 3 1	MEDIUM / LOW
ii. **Properly maintain delivery systems.** Prevent mold-causing moisture from entering ducts by repairing water leaks, maintaining cooling coils and properly sealing and insulating ducts in areas that aren't conditioned. Replace filters every three months to prevent air contamination and maintain an optimal clean air flow.	1 3 1 2	MEDIUM / HIGH
iii. **Right-size components.** Replace oversized blowers, fans and drives to reduce energy consumption, system wear and tear, noise and drafts.	2	MEDIUM / LOW
iv. **Add or improve filtration on air intakes.** Schools can potentially improve indoor air quality by adding or improving the quality of the filters installed on their outdoor intakes. Note that additional filters may increase the demand on the AHU, which can increase energy costs.	1 2	LOW / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

IDEAS & OPPORTUNITIES (continued)

C

HEATING

Most school buildings are heated with boilers. Boilers generate heated steam or high pressure vapor through combustion. Steam or vapor is moved across ducts, which heats passing air. The most energy efficient boiler is a complete condensing boiler, which should operate at above 90% efficiency. For comparison, typical oil burners operate at effiencies of 60-70%.

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
INCREMENTAL IMPROVEMENTS[4]		
Consider converting your burner to natural gas. Natural gas is often less expensive and burns cleaner than other common fuel sources.[5]	1 / 3 / 1	MEDIUM / MEDIUM
Install **vent dampers** to prevent chimney loss. Remember to close boiler vents when furnace burners are not firing.	1 / 1	LOW / MEDIUM
Add an **intermittent ignition device** to the burner to turn off the pilot light when it's not in use.	1 / 1	LOW / MEDIUM
When applicable, consider adding a **modulating aquastat** to your hot water boiler. This will regulate and stabilize the internal temperature within the boiler and help to conserve fuel.	1 / 1 / 3	LOW / MEDIUM
Help prevent heat dissipation by insulating your pipes with **heat resistant insulation**.	1 / 1	MEDIUM / MEDIUM
Install an **economizer** to trap lost heat as it is first sent through the pipes. Economizers divert this captured heat to the boiler, keeping the average temperature in the boiler high and consistent.	1 / 1	MEDIUM / MEDIUM
Add a **time delay relay**. When heat is not requested the delay will retard the firing of the burners, preventing fuel waste.	1 / 1	LOW / MEDIUM
HEATING SYSTEM REPLACEMENTS		
In instances where your heating system is near the end of its useful life, a replacement may be in order. The most efficient choice is usually a **fully condensing system**, which will include the above features and a heat pump for preheating water.	1 2 / 1 / 1 2	HIGH / HIGH
When applicable, install a new and high performing **heat pump**. There are two types that can help reduce energy costs. • A **ground source heat pump**, which uses the earth as a heat source and transfers heat to or from the ground. • An **electric heat pump**, which uses heat transference to move hot air in or out of a space.	1 / 1 3 / 1 2 3	MEDIUM / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

IDEAS & OPPORTUNITIES (continued)

D

COOLING

Like all other buildings, school facilities are subject to heat gains from external and internal loads, like the sun and outside air temperature, and people and equipment, respectively. The majority of existing school buildings use a chiller plant to offset these loads and keep the building interior comfortable. Chiller plants generate cooled water centrally. This water is piped to an Air Handling Unit, where it cools passing air that is distributed throughout the building.[6]

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
INCREMENTAL IMPROVEMENTS		
Install **variable frequency drives** (VFD) to control the speed efficiency of fans within the cooling towers of your chiller plant. This allows the cooling tower to maintain the correct temperature and pressure for the required load.[7]	1 2 / 1 / 1 2	MEDIUM / MEDIUM
Install **variable air volume** (VAV) boxes to better regulate the temperature and amount of air distributed throughout the school building. VAV boxes are installed directly in ducts and allow facilities staff to regulate temperature by zones or according to user demands.	1 2 3 / 1 / 1 2 3	MEDIUM / HIGH
Set up a **sidestream filtration system**, which uses a rapid sand filter or high efficiency cartridge filter to collect and recycle graywater and rainwater adjacent to cooling equipment, thereby conserving water.	1 / 1 / 3	LOW / LOW
Install **cavers**, or sunscreens, to block direct sunlight from hitting the chiller and other outdoor equipment. This can help to reduce organic growth on the equipment (which can lower the efficiency of the cooling system) and help to avoid maintenance costs.	1 / 3	LOW / LOW
Add **variable speed drives** (VSD) to the chiller compressor to enable it to run at a pace commensurate with demand. This can help to lower the energy used by the compressor and reduce wear and tear.	1 / 1	MEDIUM / MEDIUM
Increase pipe diameter and specify low friction values to reduce flow resistance for the chiller water, thereby curbing water consumption.	1 / 1	MEDIUM / LOW

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

HVAC SYSTEMS – REFERENCES

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2. EPA Indoor Air Quality Design Tools for Schools: HVAC Systems
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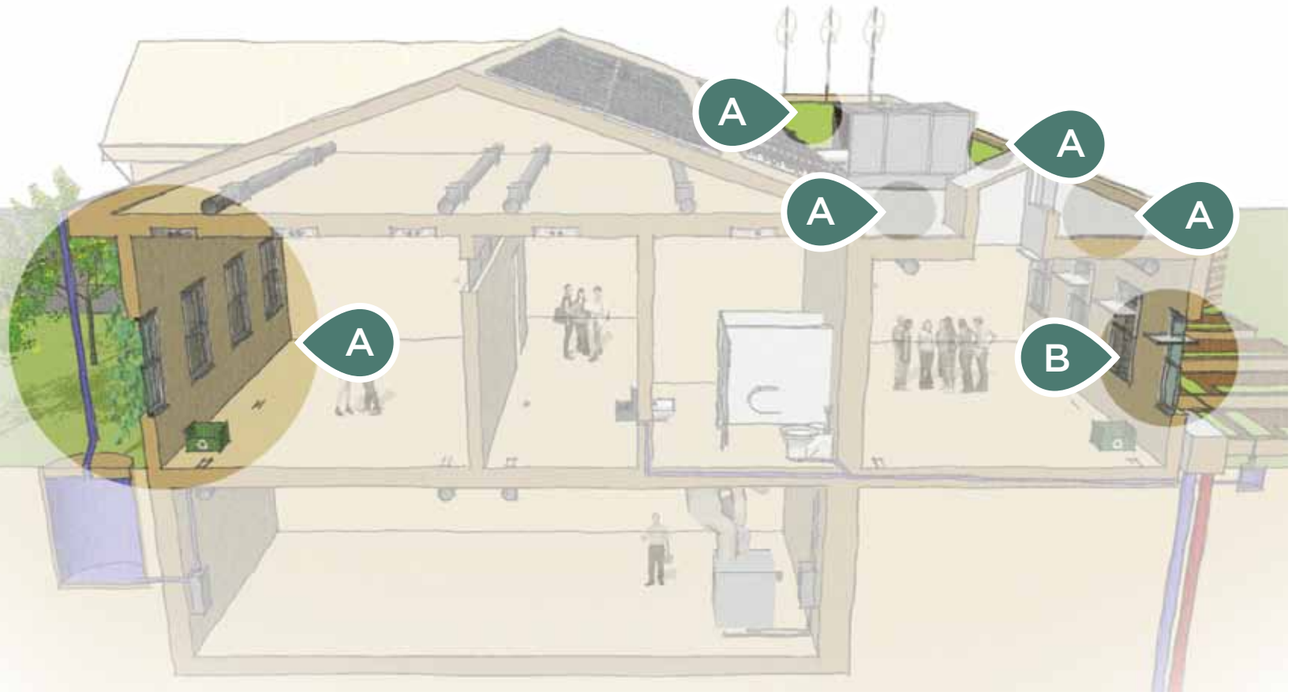
4. Boiler Retrofit vs. Replacement. Heating/Piping/Air Conditioning Engineering
5. Gas-Fired Boilers and Furnaces. U.S. Department of Energy
6. Chiller Plant Efficiency. Energy Design Resources

ADDITIONAL RESOURCES

1. Air Conditioning & Ventillation. Energy Design Resources
2. ASHRAE Standards & Guidelines



BUILDING ENVELOPE: AT A GLANCE

The building envelope is the physical barrier that separates the interior and exterior environments of a building. It includes all exterior walls, the roof and foundation, and glazing (or windows). The building envelope serves to keep conditioned air inside the building. A few of the most common contributors to envelope inefficiency include a lack of insulation and inefficient single pane windows, which allow conditioned air to escape, and dark, "heat sinking" roofs, which can generate an unwanted solar heat gain that counters the efficiency of building cooling systems.[1]

Maintaining a high performing building envelope can drastically improve your school's operational costs, most clearly in the form of energy cost savings and avoided maintenance expenses. Research on the efficiency gains made from window retrofits alone suggests a solid financial case for building envelope improvements.[2] Building envelope performance also has a strong impact on the quality and comfort of learning environments: a number of studies correlate student academic performance and concentration to room temperature and quality of natural light in our classrooms.[3]

Remember that even modest retrofits, like the addition of weather stripping, will impact the heat load of the building, which directly informs the sizing and operational standards of the school HVAC system. As the face of our schools, building envelopes also provide a prominent space to demonstrate other sustainability features (like rainwater harvesting systems) to the wider community.

BUILDING ENVELOPE REFERENCES

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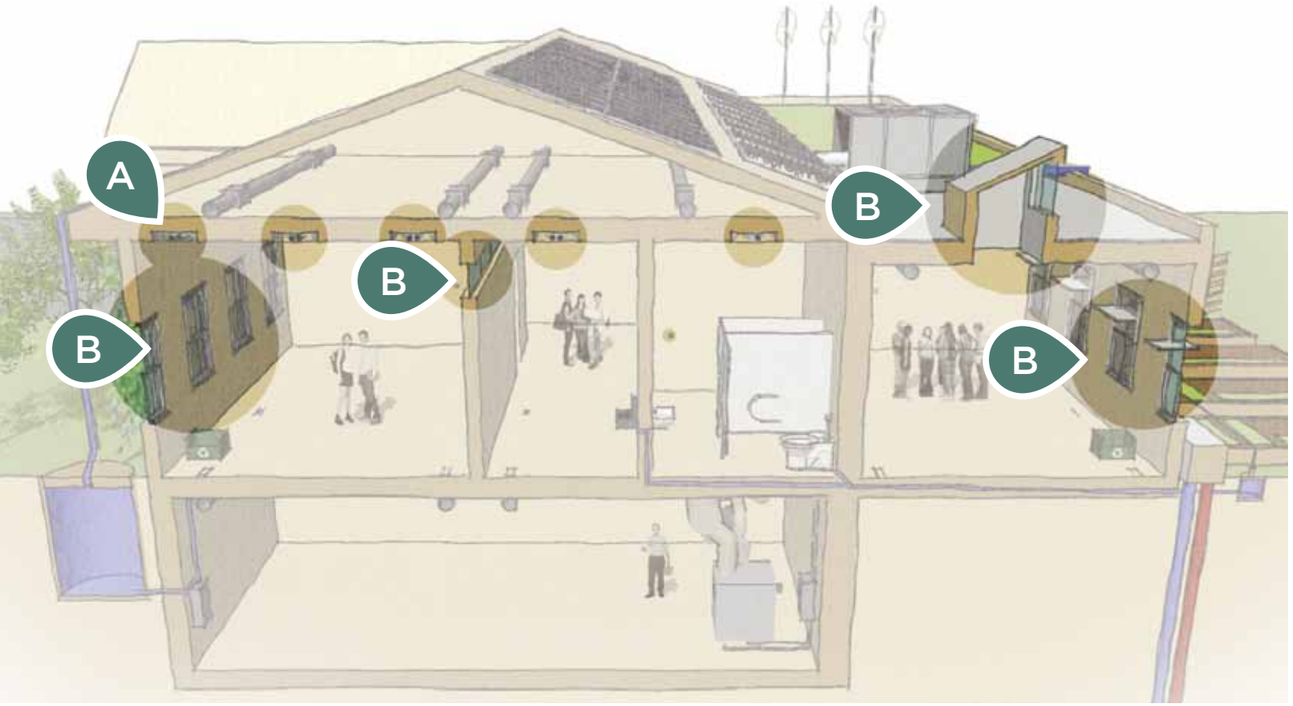
2. Saving Money, Saving Windows: Evaluating the Energy Efficiency of Window Retrofits & Replacements. National Trust for Historic Preservation
3. The Impact of School Buildings on Student Health and Performance. 2012. The Center for Green Schools and McGraw Hill Construction
4. Cool Roofs. Energy Design Resources

IDEAS & OPPORTUNITIES

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A INSULATION		
Good insulation techniques keep a building in a desirable thermal state. Insulation reduces cooling and heating loads, improves occupant comfort, reduces noise transmittance and increases the building's overall durability. Before adding new insulation, it is important to identify and manage moisture problems. Tips and ideas for improving the insulation in your school building:		
Add insulation to the roof and ceiling, which are common areas for heat and cooling loss in school buildings. The relative accessibility of these areas makes them a good starting place for improvement.[4]	1 2 / 2 / 1	MEDIUM / HIGH
Look for opportunities to add or replace outdated insulation in wall cavities.	1 2 3 / 1 2 3 / 1	HIGH / HIGH
Always insulate mechanical equipment, ducts and piping to decrease unwanted heat dissipation and improve the efficiency of your heating and cooling systems.	1 / 1	MEDIUM / MEDIUM
Consider adding a single ply **cool roof membrane**, which deflects radiant heat from the sun and helps to maintain a stable internal building temperature.	1 / 1	MEDIUM / MEDIUM
Install a **green roof** with natural vegitation to help insulate the building and reduce any heat island effect.	1 3 / 3 / 1 2 3	HIGH / MEDIUM
B GLAZING		
Glazing refers to the glass elements of a window or wall. Glazing affects the quality of the learning environment in a range of ways, from the quality of natural light to noise transfer and room temperature. Tips and ideas for improving the glazing on your school building:		
Consider replacing your windows with new **high performance windows**. While up-front costs can be high, new windows can help to better insulate classrooms, reduce unwanted solar heat gain, reduce glare and prevent harmful UV rays from entering the space.[1]	1 2 3 / 1 2 3 / 1	HIGH / HIGH
Retrofits to existing windows can provide a more cost-effective method for improving existing conditions. i. Install **weather stripping** to improve air tightness, prevent drafts and maintain consistent conditioning ii. Strategically apply interior **surface films** to manage solar gain and glare and reduce heat loss iii. Install new **cellular shading devices** (blinds) to improve thermal performance, reduce drafts and control daylight levels iv. Swap glass panes in existing window frames with more efficient, **laminated multi-pane options**	1 / 1 2 3 / 1	LOW / LOW
When added to the interior of a window, **light shelves** can help to decrease unwanted glare and solar heat gains and can deliver natural light further into the space.	1 / 1 2 3 / 1	MEDIUM / LOW
Install exterior overhangs or vertical louvers over windows to reduce direct light, thermal heat gain and glare. The components of these additions can be solid or perforated, and may be manual or automated using a BAS. Typically, an overhang shelters southern light, while vertical louvers shade direct light from the east and the west. Because the north facade does not typically receive direct sunlight, overhangs and louvers do not need to be installed.	1 3 / 1 2 3 / 1	MEDIUM / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*



LIGHTING SYSTEMS: AT A GLANCE

Electric lighting is one of the largest consumers of energy in commercial and educational facilities, responsible for about one third of the energy used.[1] Although many new products improve the efficiency of electrical lighting systems, it's important to consider how to maximize the use of natural light to decrease energy use and improve the comfort and quality of our learning environments.

Thinking about lighting goes beyond straight forward energy costs. Electrical systems generate heat, which impacts the load demands placed on the HVAC system. Similarly, too much natural light can make our classrooms uncomfortably warm. Like other major building systems, we have to think about the design of our lighting systems as part of a larger and dynamic network.

Lighting systems also have a tremendous impact on our students and other school staff. Studies have determined the link between the presence of daylight and physical and mental wellness of building users, as well as the concentration and academic performance of students.[2] In addition, many have argued that well-placed views to natural settings help students to focus on their work.[3]

LIGHTING SYSTEMS – REFERENCES

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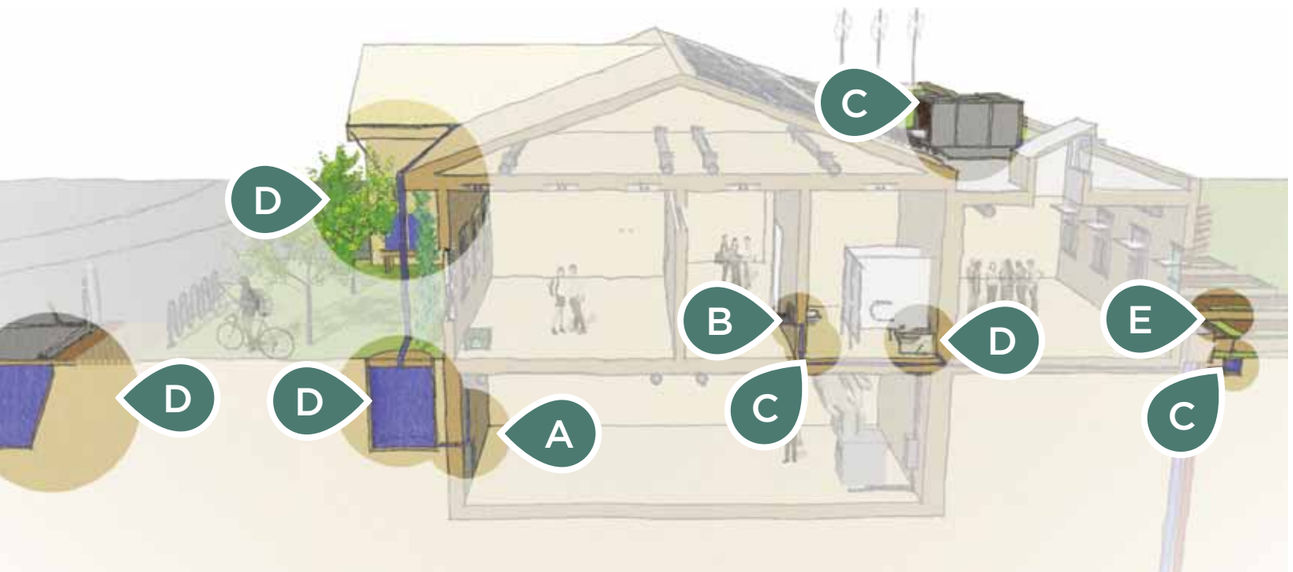
2. The Impact of School Buildings on Student Health and Performance. 2012. The Center for Green Schools and McGraw Hill Construction
3. Understanding Daylighting Metrics. Energy Design Resources Design Briefs
4. Daylighting. Energy Design Resources Design Briefs

IDEAS & OPPORTUNITIES

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A ELECTRICAL LIGHTING		
Building Automation Systems (BAS) can optimize the energy consumption and performance parameters of lighting systems through central controls and remote room sensors.[1] i. Install **occupancy sensors**, which automatically turn off lights when the room is not in use. Sensors can be designed to signal the HVAC system to adjust the amount of conditioned air flowing to the space, as lights will no longer be generating radiant heat. ii. Install **photo sensors**, which monitor the foot-candle level (the amount of daylight) in the room. These can be connected to dimmer switches, which moderate the amount of artificial light necessary to achieve the optimal light balance in a space.	1 2 3 3 1 3	MEDIUM/MEDIUM
Establish **lighting zones** with manual controls in each classroom, allowing room users to select the most appropriate level of lighting in the space (e.g. full, half, off lighting settings)	1 2 3 1	LOW / MEDIUM
Install **dimmer switches** to allow staff to control the amount of artificial light needed, potentially reducing daytime energy use.	1 2 3 1	LOW / MEDIUM
Change old florescent ballasts from magnetic to **electrical ballasts** to reduce long term energy costs and eliminate the buzzing and flickering typical of old systems.	1 1	LOW / LOW
Install **LED (light emitting diodes) light fixtures**. LEDs are the most efficient system with an average lifespan of up to 50,000 hours. As a comparison, typical incandescent bulbs have an average lifespan of 1,000 hours.	1 3 1	LOW / MEDIUM
B PASSIVE DAYLIGHTING		
Passive daylight refers to the use of natural light for the purposes of illuminating interior spaces, often with the intent of reducing dependence on electical lighting.[4] There are a number of building modifications that schools can use to increase the use of daylighting in classrooms: i. Build **light monitors**, which are similar to skylights in that they bring in daylight from above. Monitors are built on the roof with the glazing oriented in the optimal solar direction. Because this light is indirect, the surface color of the monitor is an important factor in determining how light is diffused throughout the space. Lighter colors or white surfaces work best. ii. Install **skylights** to deliver daylight into a space and reduce the need for artificial lighting during the day. iii. Install **clerestory windows** to allow daylight in while minimizing unwanted noise transfer. Clerestory windows can be installed in interior spaces to deliver light further into interior spaces like halls.	1 2 3 1	HIGH / LOW

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*



WATER MANAGEMENT: AT A GLANCE

From bathroom facilities to kitchens, sports fields to HVAC systems, our school facilities consume a tremendous amount of water every day.[1] As water costs and environmental sensisiblities grow, our schools can take a leading role in being better stewards of this precious resource.

Water use is as much about the physical infrastracture of our buildings as it is about effective resource management. The Federal Energy Management Program outlines six steps schools and other organizations can take to understand how much water they use. By conducting facility audits and reviewing water bills, schools can gauge their water balanace (the total amount of water being used on the site) and begin to understand how to better manage their resources: "This basic level of understanding is crucial. Once you have a good understanding of water use and how much you are using for each purpose, you will have a solid basis to identify potential water saving opportunities."[2]

Our focus on the physical infrastructure underpinning good school water management intends to complement a strong campus commitment to tackling water use through planning and programs that engage school stakeholders around their use of water.[3] As we argue throughout this guide, thoughtful resource management programs that encourage sustainable habits are critical to ensuring that school infrastructure performs well. This section provides an overview of physical improvements schools can implement to more effectively use water on campus, including ideas about how controls and monitoring systems, our fixtures and water recycling systems can be improved to support effective water management programs.

IDEAS & OPPORTUNITIES

	OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A	**CONTROLS AND MONITORING**		
	Building Automation Systems (BAS) can help school staff to monitor and optimize certain water systems. Meters and submeters collect data on water consumption and help staff to identify overuse and leaks.[1]	2, 3	VARIES
B	**FIXTURES**		
	High efficiency fixtures save thousands of gallons of water annually.[4] i. Ensure fixtures have features like **built-in aerators** and **flow restrictors**. ii. Install fixtures with **gravity assisted components**, which use pressure- and vacuum-assisted mechanisms to increase suction and lower the amount of water required to remove waste. iii. Install **motion sensors**, which use an object sensor to open and close a solenoid valve. Motion sensors have been shown to save upwards of 70% of the water used by a non-modified fixture.[1]	1, 2, 3, 3, 1	VARIES
	You can incorporate these features in a number of ways: a. Replace older model toilets that use up to 3 gallons per flush (gpf) with newer **low flow toilets** that use 1.28 gpf or less. 1. Install **dual flush models**, which offer low flush and high flush options for liquid and solid waste, respectively. 2. Consider **composting toilets**, which require no water but involve chemicals and significantly more maintenance.[5] 3. When applicable, install **waterless urinals** in men's rooms.	1, 3, 3, 1	MEDIUM / MEDIUM
	b. Faucets and showers can also be retrofitted to save water. 1. Install **aerators**, which add air to the flowing water to maintain a heavy stream. 2. Install **flow restrictors**: small pipe additions on existing fixtures that reduce the water consumption rate.	1, 3, 3, 1	LOW / LOW
	c. Install **hydration stations** to provide students and staff with easy access to filtered water and to encourage the adoption of reusable bottles.	3, 1	MEDIUM / MEDIUM
	d. Install efficient drinking fountains with energy efficient refrigeration components.	3, 1	MEDIUM / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

IDEAS & OPPORTUNITIES (continued)

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
C GRAYWATER		
Graywater refers to all building and grounds wastewater (except that used in toilets). Upwards of three fourths of all wastewater can be repurposed for other uses by collecting and channeling it to a central location, where it can be filtered, stored and reused.[6]		
i. Irrigate ornamental landscaping, sports fields, and gardens with a carefully planned collection and redistribution system.[7]	1 3 1 2	MEDIUM / MEDIUM
ii. Use graywater in conjunction with a **sidestream filtration system** to supply the cooling tower of the chiller plant. The source of graywater can be condensated from the chiller or from other sources, and then filtered and pumped to the cooling tower for circulation, substantially reducing water consumption.	1 3 1	LOW / MEDIUM
D RAINWATER		
Rainwater can be harvested and collected in temporary storage in cisterns or bins and is most commonly used for landscaping and garden irrigation.[8]		
Consider implementing the following improvements to capture rainwater: i. Modify roof drains and gutters to actively **harvest rainwater** into a collection bin or orient drains to divert runoff into a rain garden or underground cistern.	1 3 3 1	MEDIUM / MEDIUM
ii. Incoporate **permeabile surfaces** on your site. Install permeable surface playground beds for underground water collection and child safety. Expand or renovate drives and walkways using permeable pavers or porous asphalt that drain water into planting beds.	3 1	MEDIUM / MEDIUM
E IRRIGATION		
Upwards of 50% of the water used for irrigation can be wasted due to combined forces like evaporation, poor irrigation system design, and a lack of maintenance. Consolidate your rainwater and graywater collection systems to greatly reduce the amount of water your school uses to irrigate lawns, sports fields, and landscaping.		
Consider incorporating the following features on your school site: i. Choose **drought-resistant plants** to decrease the amount of irrigation necessary.	3 1	LOW / LOW
ii. Construct a **micro-irrigation system** by burying slow drip tubes at root level. This will lower evaporation rates and the amount of energy needed to pump water throughout a field.[6]	1 3	MEDIUM / MEDIUM
ii. Install **weather-based controllers** and **moisture-based sensor systems**, which can help reduce redundant watering.	1 3	MEDIUM / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

WATER MANAGEMENT – REFERENCES

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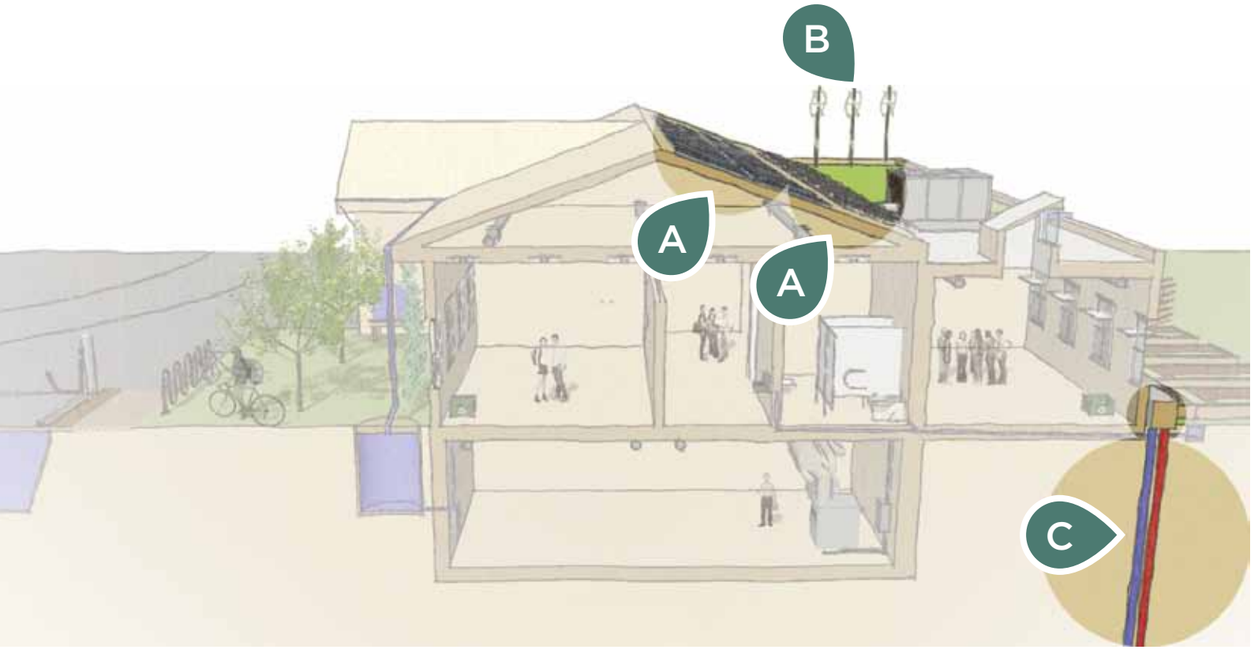
3. Save Water in Schools (Tips for District Officials, Teachers and Students). Cool California
4. Water Fixtures and Conservation. Chapter 10. Green Building Operations & Maintenance Manual. Green Seal
5. High Efficiency Toilets. University of Minnesota Center for Sustainable Building Research
6. Alternative Water Sources: Supply-Side Solutions for Green Buildings. Environmental Building News
7. Graywater Irrigation. SustainableResources.com
8. Rainwater Harvesting. Texas A & M University

LEARN MORE

1. Water Efficiency & LEED. Energy Design Resources
2. Water Conservation in Schools (Tips & Tools). Environmental Protection Agency



RENEWABLE ENERGY: AT A GLANCE

A "net zero" building is one with zero net energy consumption and zero carbon emissions.[1] While most net zero buildings will be new construction, it's important to recognize that our existing school facilities can - and should - become less energy dependent. While net zero buildings incorporate many of the design features covered in this guide, a unique feature and opportunity lies in their renewable energy facilities, or building systems that generate energy from replenishable sources like sunlight, wind and geothermal heat. Schools can help communities reduce dependence on unhealthy fossil fuels by investing in proven renewable technologies like solar powered systems, wind turbines and geothermal heat pumps.

Beyond the environmental imperative, the initial costs and potential lifecycle savings from renewable technology varies widely by climate region and by state, where certain incentives and regulations promote these clean technologies. In some states, for example, schools can invest in solar power and be cash flow positive from day one thanks to the availability of innovative finance tools.

Steps towards energy independence can be big and small. Renewable systems can be set up to apply to a specific meter or to "feed back" into the utility grid. Many schools partner with energy services companies to lease roof or grounds for renewables as a unique way to generate revenue that can be invested in other campus needs. Learn more about this opportunity in the *Efficiency Services Agreements* discussion in the *Finance and Implementation* section.

IDEAS & OPPORTUNITIES

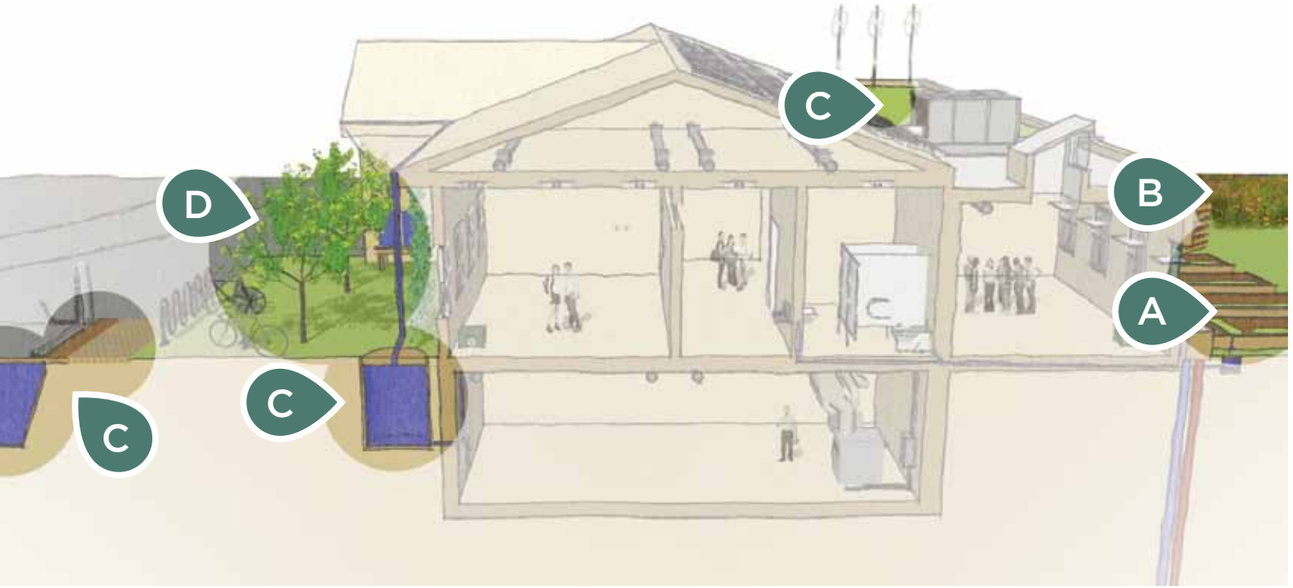
OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A SOLAR SYSTEMS		
There are three common forms of solar technology: Photovoltaic cells (PV), solar thermal technology and passive solar heating.[2] These systems can be installed and maintained by the school or by a third party energy services company. We explore these arrangements in greater detail in the **Efficiency Services Agreements** section of the *Finance & Implementation Strategies* chapter. Given that passive solar heating is usually too cost prohibitive to be used on existing school buildings, we avoid detailed discussion of it here.		
Install **PV cells**, which capture photons from the sun's light. This creates an electrical current which can be tranferred into a useable form.	1 2 3 3 1 3	VARIES
Install **solar thermal technology**, which collects and focuses the sun's heat with reflective surfaces. Thermal collectors that are used to heat water are extremely efficient and typically easy to integrate with existing building technologies.	1 3 3 1	VARIES
B WIND POWER		
Wind turbines harness the kinetic energy of air. In turn, wind lifts large turbine blades which mobilize a generator. The generator converts the energy to a current that can be used to power building systems. Schools are most likely to install wind turbines for demonstration purposes, but the technology can be adapted to a much larger scale.[3]	1 2 3 3 1 3	VARIES
C GEOTHERMAL HEAT PUMPS		
Geothermal heat pumps operate by pumping water or refrigerants through underground pipes, where the ground remains at a relatively constant temperature of 50 - 60°F.[4] In cold months, the water absorbs heat from the ground, which is then circulated back into the building. In warm months, conversely, the system runs in reverse by using the ground as a **heat sink** to keep water cool as it circulates through the air conditioning system.	1 2 3 3 1	HIGH / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

RENEWABLE ENERGY – REFERENCES

1. Net Zero Buildings. Whole Building Design Guide
2. Solar Thermal: The Sun is at Your Service. Energy Design Resources e news. 79
3. Wind for Schools Project. U.S. Department of Energy - Energy Efficiency & Renewable Energy
4. Ground Source Heat Pumps Using Earth's Energy to Cut Heating and Cooling Costs. Energy Design Resources e news. 73



SITE CONSIDERATIONS: AT A GLANCE

The site refers to the plot of land where the school building is located. Our stewardship of this land can yield a bounty of benefits, ranging from cost savings and community image enhacement to opportunity for student learning and leadership. Schools should recognize these symbiotic reationships and take a proactive approach to site management when implementing other building improvements.[1]

Schools can plant indigenous and drought resistant plants, which can help maintain water table levels, manage and mitigate stormwater pollution and save money on irrigation costs. Many choose to eliminate turf from campuses except for use on sports fields. Schools can also enhance the performance, durability and efficiency of building systems by shading buildings with deciduous trees, which can help to regulate a facility's annual solar gain.

Learning doesn't end when students leave our school buildings. Similarly, the potential to make our schools healthier and more resource efficient shouldn't stop with our buildings. Our schools can exemplify health and sustainability principles through visible site improvements - be they related to landscaping, student gardening, water collection or renewable energy. For example, sustainable stormwater management practices often benefit the wider community as much as the school. When made visible through signage and other forms of promotion, these management practices can demonstrate the important role of our schools in fostering resilient communities.

SITE CONSIDERATIONS – REFERENCES

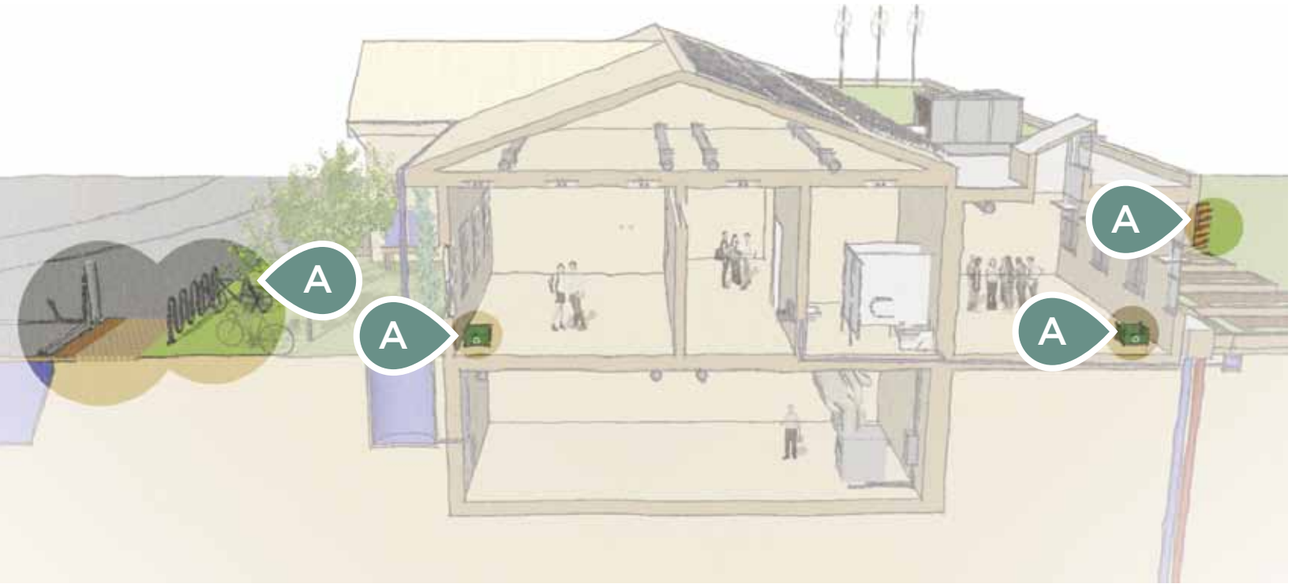
1. The Case for Sustainable Landscapes. The Sustainable Sites Initiative
2. Garden-Based Learning. U.C. Davis Center for Nutrition in Schools
3. Guidelines and Performance Benchmarks. The Sustainable Sites Initiative

IDEAS & OPPORTUNITIES

OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A SCHOOL GARDENS		
Encourage students to plant and tend to fruit and vegetable gardens. Using nature as a teacher fosters student awareness and understanding of the environment and builds a sense of teamwork. Several free gardening programs incorporate project-based learning principles and connections to both Common Core STEM curriculum and basic health and nutrition learning.[2] The size of a school garden can range from a few pots to a greenhouse or large raised beds.	3 1 2 3	MEDIUM / MEDIUM
B INDIGENOUS LANDSCAPING		
Indigenous plants are flora native to a region. Indigenous plants typically require less maintenance and watering given their strong tolerance to local conditions and usually have a higher survival rate than non-native flora.[3]	3 1 3	MEDIUM / LOW
C STORMWATER RUNOFF		
Too often, we build large and impermeable surfaces (like parking lots and walkways) on our school sites, which force stormwater into drains. This interrupts a natural stormwater management process called soil infilatration, the consequences of which contribute to downstream erosion, water table decline and the pollution of our rivers and lakes. Given that these problems are most commonly felt off site, too few schools invest in sustainable stormwater management infrastructure.[3]		
Schools can incorporate a number of physical site features to more responsibly manage stormwater runoff: i. Install **temporary detainment systems** using cisterns (underground catchment basins) or above ground retention ponds, which slow runoff and drastically reduce the harmful effects of runoff.	3 1 3	MEDIUM / MEDIUM
ii. Install bio filtration structures and natural filtration systems like **bioswales**, which rely on local flora to treat rainwater before it moves through the drainage system. These natural treatments can help to remove pollutants and contaminants.	3 1 3	MEDIUM / MEDIUM
iii. Install **porous pavement** to provide a pathway for water to infiltrate the ground. Storage areas can also be constructed under these porous surfaces to better manage any local flooding.	3 1 3	HIGH / MEDIUM
iv. Install **green roofs**, which can also collect and partially treat stormwater.	1 3 3 1 2 3	HIGH / MEDIUM
D LIVE SHADING		
Live shading refers to the use of natural vegitation to reduce the loads placed on building systems, improve thermal comfort and to reduce glare in building interiors.[3]		
Strategically plant foliage or trees in front of windows and adjacent to external building equipment to decrease the demands placed on HVAC systems. Deciduous trees in colder climates will enable sunlight to heat rooms in the winter while providing shade in the summer months, while coniferous trees can provide shade year round in a warmer climate. Green walls and vines can have a similar effect.	1 3 1 3	LOW / MEDIUM

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*



COMMUNITY HABITS: AT A GLANCE

There are a number of ways to improve our schools by transforming how community members engage with our school buildings before, during and after school. Preliminary studies and anecdotal evidence suggests that demonstration and learning programs that help change the behavior of individuals can save organizations up to 30% on their annual energy bills.[1] Similarly, school recycling programs have been shown to save thousands of dollars each year on solid waste disposal costs. Other schools have had tremendous success in encouraging students and staff to use alternative forms of transportation to schools in a range of low cost ways, from participation in the Safe Routes to School initiative to opening up student-led bike clinics on campus.

We also know that Joint Use Agreements can provide an effective institutional approach to sharing the use and management of our school and community facilities for the benefit of the entire community. Many of these improvements require little up-front cost and, when effectively implemented, can yield tremendous learning and resource efficiency benefits for the school. At the heart of these considerations is a simple principle: we can begin to transform our schools into healthier and more inspiring places in low cost, high-impact fashion when we incorporate sustainable building and operations practices into everyday learning and life.

IDEAS & OPPORTUNITIES

	OVERVIEW	KEY CONSIDERATIONS	RELATIVE COST (UP-FRONT / LIFECYCLE)
A	**BEHAVIOR-BASED PROGRAMS**		
	Use improvements as **demonstration and learning tools** as a way to make health and sustainability principles tangible. Connect building features to curricula on STEM and environmental leadership, to in-house energy reduction competitions or awareness-raising programs.[2]	3 1 3	LOW / LOW
	Enter local, national or international school design and resource reduction **competitions** to raise awareness. Take the time to have students and community members assess and develop a vision for your school buildings, and use this to raise in-kind and monetary support for school improvements.	1 2 3 3 1	LOW / LOW
	Advocate for **alternative transportation** methods. Provide charging stations for electric cars, support schoolwide bike sharing programs and advocate for the use of Safe Routes to School (SR2S) programs. Encourage staff to cycle to work and showcase the benefits of public transit to community members. i. Initiate **bike Incentives** like shared bike programs, add additional bike racks and hold bicycle classes to encourage students to take ownership of their commute. Bicycle building and repair programs teach students technical and practical leadership skills ii. Participate in **SR2S** programs to create safe ways for students to walk, ride or roll to school and stay active.[3]	3 1 2 3	LOW / MEDIUM
	Initiate and support **solid waste composting and recyling programs** to help reduce waste, provide hands-on learning experience and save money. Recycling programs are very simple to implement and only require a collection system, bins or drops and a pickup service. Such programs have been shown to help schools save thousands of dollars on their annual solid waste bills.[4]	3 1 3	LOW / MEDIUM
B	**JOINT USE AGREEMENTS**		
	Sign **Joint Use Agreements** between your school and other local government institutions to enable community members to take advantage of school facilities when they would otherwise be vacant. This can provide supplemental revenue for schools, help agencies share the costs of managing community facilities and provide a way for all members of the community to enjoy the use of school facilities.[5]	3 1 2 3	LOW / LOW

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

COMMUNITY HABITS – REFERENCES

1. People are People: Energy Efficient Behaviors and Decisions at Home and at Work. PECI.org
2. Instructional Tools. The Center for Ecoliteracy
3. Safe Routes to Schools National Program
4. Start a School Recycling Program. DoSomething.org
5. Model Joint Use Agreement Resources. ChangeLab Solutions

FINANCE & IMPLEMENTATION STRATEGIES

SECTION AT A GLANCE

The *Finance & Implementation Strategies* section introduces a few of the mechanisms and approaches that schools can use to implement healthy and resource efficient building improvements. We focus on how schools can finance a range of bundled improvement measures and, when possible, reinvest the savings from these measures into other campus needs, like instruction or maintenance. We cover a number of proven approaches and innovative strategies that can help schools to finance improvements that range from one-off demonstration projects to comprehensive building overhauls.

KEY COMPONENTS OF THIS SECTION INCLUDE:

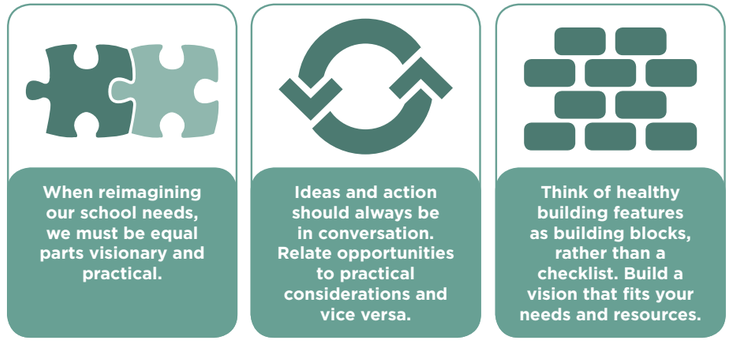
A simple framework for implementing healthy and resource efficient building improvements, from project planning to construction, monitoring and ongoing commissioning.

An introduction to the "Paid-From-Savings" approach to project implementation, including tips on how to apply it to your school improvement projects.

An introduction to the key finance mechanisms available for schools to implement healthy and resource efficient building improvements, including debt finance and self-finance tools.

HOW TO USE THE *FINANCE & IMPLEMENTATION STRATEGIES* SECTION

We've designed this section to help turn your understanding of school building improvement opportunities into actionable improvement strategies. When writing this section, we kept a few principles in mind that we hope give you a sense of how different approaches can help your school turn great financial and technical barriers into opportunities.



The *Finance & Implementation Strategies* section introduces these dynamics through two complementary discussions. For those without deep experience in facilities and capital improvements, we share a quick overview of the mechanics of project implementation and economics. For more experienced readers, we provide suggestions to improve on existing project implementation practices and an introduction to innovative finance strategies.

1. BASIC CONSIDERATIONS

TOPICS COVERED:

- Your Finance & Implementation Priorities
- Project Implementation
- Project Economics
- The Paid-from-Savings Approach

2. KEY FINANCE APPROACHES & MECHANISMS

TOPICS COVERED:

- Bond Measures
- Lease Agreements
- On-Bill Finance
- Budget Allocations
- Green Revolving Funds
- Grants
- Rebates & Incentives
- Efficiency Services Agreements

BASIC CONSIDERATIONS

YOUR FINANCE & IMPLEMENTATION PRIORITIES

As part of the *2012 School Stakeholder Survey*, we asked individuals to identify the greatest barriers to implementing healthy and resource efficient building improvements in their schools. The most popular responses identified two types of concerns: financial obstacles and barriers to effective leadership.

Budgetary constraints, cost-cutting and the up-front costs of building improvements were identified as the greatest financial obstacles, while a lack of leadership support, technical knowledge and staff time were noted as the greatest barriers to effective leadership.

As we outline finance and implementation approaches available to schools, we keep your considerations at the heart of the discussion. We consider the opportunities and challenges associated with these unique strategies by:

- providing guidance as to how to use these approaches to build on the existing practices, policies and expertise in your school community
- suggesting ways to engage stakeholders in your school to gain community buy-in and maximize opportunities to incorporate student learning and leadership into the school building improvement process.

Use your stakeholder lens to interpret this discussion and to identify where you might apply these tools to help your school recognize building improvements that are in keeping with your community's values and priorities.

TABLE 2.6: WAYS TO LINK YOUR PRIORITIES TO FINANCE & IMPLEMENTATION OPPORTUNITIES

Consider how paid-from-savings approaches can limit risk and help finance and implement a bundle of school building improvements.	2 1 1 2
Think about how different finance mechanisms help to address the greatest financial barriers facing school improvement financing, including up-front costs, cash flow considerations and budgetary and regulatory constraints.	1 2
Rethink how project costs and savings are monitored and accounted for. Consider how revolving funds and other budgetary approaches can help you to reinvest project savings in instruction, school operations, or other capital needs.	1 2 1
Try to link different finance and implementation approaches to existing student project-based learning resources, leadership programs and improvements.	3 3 3
Look for ways to build in community buy-in and shared project ownership. Stakeholder engagement fosters long-term community support for our schools and for school building improvements.	3 2 3 2

DECISION MAKERS EDUCATORS OTHER ADVOCATES

Refer to Step One: Identify Your Role *(page 8) for full indicator definitions.*

PROJECT IMPLEMENTATION

While school communities implement building improvements in a variety of ways, the chart below reflects a basic project implementation process. Table 2.7 on the following page outlines a more detailed project implementation approach, including tips and tools intended to help school decision makers build upon and improve their existing implementation approaches. We suggest how and where school decision makers can institutionalize stakeholder participation, opportunities for student learning and leadership, and best practices related to project planning and management into the school building improvement process.

PROJECT IMPLEMENTATION PROCESS

TABLE 2.7: SAMPLE SCHOOL IMPROVEMENT IMPLEMENTATION APPROACH

GOALS & TASKS	OUTCOMES & DELIVERABLES
A PROJECT PLANNING (PRE-DESIGN)	
Goal 1: Establish the Need[1, 2]	**Outcome 1: Balanced understanding of building user needs and physical building needs**
• **Benchmark** school performance using free tools like the EPA's Portfolio Manager • **Conduct** an internal building assessment • **Identify** building user needs through surveys or workshops • **Host** a community forum on the state of your schools • **Synthesize** and prioritize school building needs	• **Deliverable:** school building needs assessment
Goal 2: Establish a Shared Vision[1]	**Outcome 2: Institutionalized stakeholder buy-in for improvements**
• **Facilitate** visioning exercises with school stakeholders • **Host** community forum to discuss potential improvement strategies; consider using LEED as a framework • **Synthesize** and prioritize school building values and improvements	• **Deliverable:** school building improvement vision, stakeholder advisory committee and/or action plan
B PROJECT DEVELOPMENT	
Goal 1: Build a Project Implementation Team[2]	**Outcome 1: Defined roles and responsibilities for improvement implementation team**
• **Enlist** the support of key technical stakeholders • **Establish** protocol for incorporating non-technical stakeholder input • **Consider** how to engage students in the implementation process	• **Deliverable:** school building improvement staffing plan
Goal 2: Identify Implementation Partner(s)[2]	**Outcome 2: Implementation partner(s) selected**
• **Develop** Request for Proposals/Qualifications (RFP/Q) to identify third party companies (e.g. vendors and energy services company (ESCOs)), if applicable • **Evaluate** the financial strength and capability of the partner: will they be in business and able to honor any warranties in 5, 10 or 20 years? Do they bring the experience and capacity needed to accomplish work on time? • **Assess** vendor experience working on similarly scaled projects, with local and state regulators and in leveraging rebates and incentives to lower project costs	• **Deliverable:** public RFP/Q
Goal 3: Conduct Investment Grade Building Needs Assessment[2]	**Outcome 3: Case and strategy for improvements backed by data on performance and resource use of existing building systems**
• **Collect** building performance data with third party audit • **Leverage** data for the basis of project development plan	• **Deliverable:** investment grade building assessment
Goal 4: Complete School Building Improvement Plan[2]	**Outcome 4: Comprehensive improvement schedule, ESCO/contractor scope of work and payment plan**
• **Bundle** cost savings opportunities with other critical building needs • **Finalize** building improvement scope and schedule	• **Deliverable:** school building improvement plan

PROJECT IMPLEMENTATION – REFERENCES

1. For Generations to Come: A Leadership Guide to Renewing Public School Buildings. 21st Century School Fund
2. Green Existing Schools Project Management Guide. The Center for Green Schools at USGBC

TABLE 2.7: SAMPLE SCHOOL IMPROVEMENT IMPLEMENTATION APPROACH (CONTINUED)

GOALS & TASKS	OUTCOMES & DELIVERABLES
Goal 5: Complete Measurement & Verification Plan[3]	**Outcome 5: Comprehensive training, staffing and performance monitoring plan**
Clarify and stipulate project specifics in Measurement & Verification (M&V) Plan: • **Document** and agree on all baseline measurements and data sources • **Stipulate** what will be verified, by whom and when • **Stipulate** and define all risk and savings uncertainities and remedies • **Define** reporting requirements, formats and terms	• **Deliverable:** Measurement & Verification Plan
Goal 6: Finalize Project Contracts & Agreements[3]	**Outcome 6: Project ready for implementation**
• **Finalize** legal and fiduciary responsibilities of school and partners	• **Deliverable:** signed contracts
C PROJECT IMPLEMENTATION	
Goal 1: Include School Stakeholders in the Construction Process[1]	**Outcome 1: Authentic community participation in school improvement process**
• **Leverage** the construction process as a teaching, apprenticeship and workforce development tool when possible by leveraging existing STEM learning models, design competitions or by tapping local community college students • **Convene** regular meetings with stakeholder advisory committee to maintain feedback loops with building users • **Share** regular updates on the progress of building improvements in your school newsletter	• **Deliverable:** student projects on building improvements, energy efficiency or related topics • **Deliverable:** regular forums and updates on improvement process and progress
D OPERATIONS & ONGOING COMMISSIONING	
Goal 1: Monitor & Calibrate Building Performance[4]	**Outcome 1: High performing building systems**
• **Incorporate** analyses of building system performance into regular maintenance schedules • **Conduct** ongoing staff trainings and invest in continuing education programs	• **Deliverable:** ongoing commissioning plan • **Deliverable:** dedicated resources for continuing education
Goal 2: Include School Stakeholders in Shared Governance of Facilities[2]	**Outcome 2: Continued community buy-in and support for school building investments**
• **Facilitate** continued forums for school stakeholders to provide feedback on building performance • **Maintain** behavior-based energy efficiency programs and other project-based learning programs that use the physical school building as a teaching tool	• **Deliverable:** active school stakeholder advisory comittee and living school building action plan
Goal 3: Incorporate Sustainable Policies in Operations[4]	**Outcome 3: Green policies at heart of school operations**
• **Institutionalize** resource efficiency in school operations • **Revise** procurement standards to reflect sustainability best practices • **Dedicate** and distribute special funds for sustainability innovation and resource efficiency through your annual school budget	• **Deliverable:** hire Sustainability/Energy Manager • **Deliverable:** incorporate sustainability standards in procurement standards • **Deliverable:** establish a Green Revolving Fund for healthy building projects

Recommendations intended to supplement existing school practices, which vary according to local contexts.

PROJECT IMPLEMENTATION – REFERENCES (CONTINUED)

3. Measurement & Verification of Energy Efficiency Projects. EPC Watch
4. LEED for Existing Buildings: Operations and Maintenance. U.S. Green Building Council

PROJECT ECONOMICS

Table 2.8 reflects a simple budget for a school project bundle, including the direct and indirect costs associated with building improvements. This example builds on the discussion of project bundling and the relative costs of building improvements in the *Building Improvement Opportunities* section by demonstrating how both direct and indirect costs and savings shape the financial performance of improvement projects. Below, we provide definitions of a few of the different types of costs and savings school improvement projects are likely to generate.

TYPES OF COSTS & SAVINGS

PROJECT PLANNING COSTS

Project planning costs are expenses incurred to develop an understanding of school building needs and to develop an improvement strategy. They generally reflect the costs associated with staff time, stakeholder surveys and building assessments. As such, most project planning costs are typically one-time.

The savings realized through comprehensive project planning are typically indirect in nature or reflect an avoided cost (like future maintenance).

DESIGN & CONSTRUCTION COSTS

Design and construction costs are expenses incurred to develop and implement improvement projects. They generally reflect the costs of new equipment and materials, staff and contractor time and labor, permitting and planning fees and construction equipment rentals. For most large improvement projects, expenses are reflected in the form of initial (capital) costs. Some improvement measures may include recurring costs (e.g. landscaping, where regular replanting may be required).

Recurring savings are usually linked to the resource efficiency of improvement measures, which can be guaranteed through instruments like a performance contract or vendor warranty and verified through a monitoring and verification plan. There are many indirect savings associated with building improvements, ranging from improved staff and student productivity and lower rates of absenteeism to avoided capital expenses. Because these costs cannot be directly linked to the performance of specific improvement measures, they are not included here.

ONGOING COMMISSIONING

Ongoing commissioning refers to systematic processes that ensure building systems perform optimally over the long term. Ongoing commissioning can take many forms, ranging from continuing education for school facilities staff to procedures and processes for calibrating the resource use and performance of specific building features. While we highlight ongoing commissioning as a post-improvement "upkeep" process, it can be thought of as a continual effort to incorporate facilities best practices into school operations and to save resources by maximizing the performance of existing systems and resources.

Many of the planning-related expenses of ongoing commissioning are incurred as one-time costs, while training and maintenance-related expenses are recurring in nature. Effective ongoing commissioning can generate substantial recurring savings, typically in the form of avoided maintenance and resource costs.

TABLE 2.8: SAMPLE SCHOOL IMPROVEMENT PROJECT BUDGET

OVERVIEW	INITIAL (CAPITAL) COST	ANNUAL OPERATIONS BUDGET		
		One-Time Costs	Recurring Costs	Recurring Savings
A PROJECT PLANNING COSTS				
IN-HOUSE SCHOOL USER SURVEY		$250		
THIRD PARTY INVESTMENT GRADE AUDIT		$18,700		
B DESIGN & CONSTRUCTION COSTS				
HVAC SYSTEM IMPROVEMENTS • Upgrade old controls with new Building Automation System • Install Variable Frequency Drives (VFDs) in air handling units • Install new fully condensing boiler	$311,450			$33,820
LIGHTING SYSTEM IMPROVEMENTS • Upgrade to LED lighting and replace ballasts • Install occupancy sensors throughout school	$80,060			$29,400
WATER FIXTURE IMPROVEMENTS • Install faucet aerators • Install new dual flush toilets	$32,700			$2,070
BUILDING ENVELOPE IMPROVEMENTS • Replace roof	$87,430			$2,300
SITE IMPROVEMENTS • Plant drought resistant native species • Install student vegetable garden		$16,240	$520	$330
C OPERATIONS & ONGOING COMMISSIONING				
ONGOING COMMISSIONING • Program & monitor Building Automation System • Adjust outside air dampers • Install, monitor & calibrate sensors for system monitoring • Set up & conduct staff trainings on system controls		$18,500	$1,940	$8,810
DEVELOP LANDSCAPE MANAGEMENT PLAN & CONDUCT TRAINING		$2,180		
ESTABLISH CAMPUS RECYCLING & COMPOSTING PROGRAM		$6,200	$1,140	$2,370
ESTABLISH DEDICATED STUDENT BEHAVIOR-BASED ENERGY EFFICIENCY PROGRAM		$7,120	$650	$5,300
HIRE ON-SITE SUSTAINABILITY COORDINATOR/ ENERGY MANAGER (.25 FTE)			$18,400	
PROJECT TOTALS	**$511,640**	**$69,190**	**$22,650**	**$85,100**
TOTAL PROJECT COSTS (CAPITAL COSTS + ONE-TIME COSTS)	**$580,830**			
NET ANNUAL SAVINGS (RECURRING SAVINGS - RECURRING COSTS)	**$62,450**			
TOTAL PROJECT RETURN ON INVESTMENT	**10.75%**			
SIMPLE PAYBACK PERIOD	**9.3 Years**			

Adapted from *The Paid-From-Savings Guide to Green Existing Buildings* (2009)
These estimates do not account for the Net Present Value of the investment and are intended to serve for learning purposes only. Actual project costs may vary from estimates provided here.

ADDITIONAL PROJECT BUDGET – REFERENCES

1. Guide to Financing Energy Upgrades for K-12 School Districts. Department of Energy

THE PAID-FROM-SAVINGS APPROACH

The paid-from-savings approach leverages cost savings generated from building system upgrades to pay for comprehensive school upgrades within a defined payback period. This approach is highly flexible and can complement a school's existing project implementation process. Schools can use the paid-from-savings approach in conjunction with any combination of self-finance and debt-finance mechanisms.[1] Below, we provide a brief overview of **Performance contracting** - a project delivery approach - and **Green Revolving Funds** - a project finance approach - that are often utilized for paid-from-savings projects.

PERFORMANCE CONTRACTING

Performance contracting is a project delivery approach to school modernization where vendors and schools partner to implement, monitor and guarantee the efficiency performance of building improvements.

Under this model, schools can work either internally or with an external partner to identify, model and secure funding for building improvements. Given that energy costs account for the largest share of a school's operations budget after personnel costs, schools often target energy conservation measures to yield substantial cost savings. Energy cost savings are most often defined as

Energy Savings = Baseline Energy Use - Post-Retrofit Energy Use +/- Adjustments

where adjustments act as a margin of error for projecting energy savings given uncertainties like weather variations, changes in operational hours or the addition of other loads not included in the initial calculation.

Schools can leverage these anticipated energy and cost savings to access other attractive finance strategies that can help pay for a range of needed repair and renewal projects. A performance contracting approach can help schools reduce the risk and uncertainty they face when deciding whether or not to implement major building improvements in both clarifying and verifying the stipulated and actual performance of improvement measures.

FYI

ENSURING RESOURCE SAVINGS

The International Performance Measurement and Verification Protocol's Measurement & Verification of Energy Efficiency Projects Guidelines define industry-standard practices and terms for vendors and clients using performance contracting.[2]

The most successful performance contracts require a great deal of due diligence on behalf of schools and partners. Schools should recognize that many vendors are only incentivized to highlight high payback, "quick win" improvement opportunities.[3] Note that by only implementing high payback improvements, schools run the risk of making it difficult to address the "deep dive" improvements with a longer term payback that could otherwise be bundled with other finance approaches. Schools should also require their third party partners to demonstrate their core energy efficiency competencies, track record and role in monitoring and verifying the performance of improvements over five, ten or even twenty years, depending on the contract.

GREEN REVOLVING FUNDS

A Green Revolving Fund (GRF) is a special account dedicated to energy efficiency, resource waste reduction projects and other sustainability inprovements. Schools can use GRFs as a way to self-finance paid-from-savings projects. Like other forms of self-finance, the GRF acts as a centrally-managed source of capital from which funds can be "loaned" to help cover the costs of building improvement projects. Capital from the GRF is typically reserved for investment in improvement projects that generate cost savings, although some funds are structured to provide funding for demonstration projects and other improvements with less measurable cost savings. The resource savings generated by a building improvement can be used to repay the loan to the GRF, freeing up capital for investment in other improvement projects. The fund revolves in that it provides a recurring source of capital for building improvement projects.

GREEN REVOLVING FUND MECHANICS. The GRF can be any size and can be managed from a central office or at a district level through a *Request for Proposal* (RFP) process, although there are examples of small institutions independently managing successful GRFs. Applicant schools can identify candidate GRF projects through comprehensive building assessments and facility audits, which can be conducted in-house or through a third party. In most cases, GRF projects will need to demonstrate a measurable return on investment and have a dedicated payback source, like energy savings. As such, GRF users can take a performance contracting approach to track the cost savings and performance of the improvement project. Research by the Sustainable Endowments Institute suggests that institutions using GRFs have expanded their project approval and monitoring criteria to track educational and environmental benefits in addition to basic financial indicators like payback and risk.[4]

FYI

GREEN REVOLVING FUND PERFORMANCE

In a 2011 study, the Sustainable Endowments Institute found that institutional GRFs had an impressive median annual return on investment of 32%, with average simple paybacks from projects ranging between 2 and 5 years.[4]

ESTABLISHING A GREEN REVOLVING FUND. A school GRF can be structured to be large or small depending on the purpose of the fund. Today, successful institutional GRFs range in size from a few thousand dollars to several million dollars. Most GRFs are currently being used by higher education institutions and independent schools. The speed at which a fund "revolves" depends on the terms of the loan, including the length and size of the loan and whether or not any interest or administrative fees are collected. Institutions can establish their fund by making a one-time allocation from their administrative budgets, through community fundraising or through other grants and endowments. Schools can grow the size of their GRF by charging interest on the loan, which increases the amount of capital available to lend, or by making an annual dedication to the GRF in the operating budget. Others can elect to maintain the size of their GRF but charge a small administrative fee in order to recoup any costs associated with maintaining the fund, like accounting staff time.

PAID-FROM-SAVINGS – REFERENCES

1. The Paid-From-Savings Guide to Green Existing Buildings. U.S. Green Building Council
2. Measurement & Verfication of Energy Efficiency Projects. Guidelines. EPC Watch
3. Stipulations in Performance Contracting M&V: The Good, the Bad, and the Ugly. Proceedings of the First International Conference for Enhanced Building Operations
4. Greening the Bottom Line: The Trend toward Green Revolving Funds on Campus. Sustainable Endowments Institute

KEY FINANCE APPROACHES & MECHANISMS

BOND MEASURES

A bond measure is a ballot initiative that allows schools to issue and market bonds to finance large scale school improvement projects. Upon voter approval, bonds are issued by the school in a public offering and purchased by "holders," who act as creditors and receive interest payments from the school (the "issuer") over the term of the bond. The ways in which the school repays the interest and principal of the bond vary according to the type of the bond.

Although a bond measure can hypothetically be of any size, they tend to be several mllion dollars in size given the costs of structuring the terms of the bond and to gain voter approval for the measure. Bond money is typically used to cover the capital costs of major building renovations and other capital projects. Depending on the state, bond measures can appear on local and state ballots and may require anywhere from a simple majority to a super-majority of the popular vote for approval.

BENEFITS & OPPORTUNITIES

Bond measures can authorize a substantial source of capital – often tens or hundreds of millions of dollars – which schools can draw from as needed to partially or fully fund the costs of school improvement projects. In comparison to other debt finance strategies, bonds are often relatively low cost and simple to manage after voter approval, though terms vary given the credit worthiness of a school or district. Schools typically have the ability to determine how and when to fund improvement projects, although certain state and federal bond programs often stipulate specific uses for the funds.

CHALLENGES

The voter approval process and the debt limitations facing most schools pose the single two greatest barriers to using bond money for building improvements. Because bond measures ask communities to self-impose a new tax or liability, it's crucial to obtain community buy-in by articulating a clear value proposition for improvements. It often takes a substantial amount of time for schools to access bond money: six to nine months is usually required to structure, approve and sell the bond. The application of local, state and federal approval processes and regulations will also vary by bond type and add complexity to the process. With proper counsel and strong community support, all of these barriers can be navigated.

NEXT STEPS

Sample Timetables and Implementation Schedules for Bond Measures and related debt financing tools can be found in *The XYZs of California School District Debt Financing*.[1] Although this resource is based on California procedures applying to public school districts, it provides a good starting point for understanding what elements are typically incorporated during the six to nine month measure approval process.

TYPES OF BONDS FOR SCHOOL IMPROVEMENTS

1. GENERAL OBLIGATION BONDS are a common type of municipal bond where a public authority – in this case, a school – leverages their ability to collect taxes to secure low interest rates from financial institutions. The public authority then markets the bond to investors. The interest on general obligation bonds is repaid by a community through their property taxes, typically in the form of a line item *school debt service levy* that is tied to the assessed value of the property. The interest income earned by municipal bond holders is usually tax exempt, making bonds attractive to investors. In most states, any public authority has the power to authorize and propose a bond measure for voter approval. Because most schools face debt limitations and because of the lengthy public approval process, general obligation (G.O.) bonds are typically reserved for major capital projects, although many schools regularly use bond money for smaller-scale improvements.[1]

2. CAPITAL LEASE REVENUE BONDS AND ENERGY EFFICIENCY REVENUE BONDS are types of municipal bonds where the energy and cost savings from building improvements are used to repay a portion of the bond. In many states, revenue bonds do not require voter approval because they are *self-liquidating*, or repaid through the revenue generated by the capital project. Typically, a performance contract between the school and a third party conducting the building improvement is used to measure and verify the energy and cost savings, potentially reducing investment risk. While regulations vary by state, Capital Lease Revenue bond measures are usually structured by individual public authorities. Energy Efficiency Revenue Bonds, which typically benefit from an interest rate subsidy, are approved through application to state energy offices. California and New Mexico currently have pilot Energy Efficiency Revenue Bond programs.[2]

3. TAX CREDIT BONDS are a taxable type of municipal bond, where the federal and/or state governments offer a direct subsidy to the issuing public authority to lower the cost of the taxable interest owed to the holder. The issuer commits to paying the principal and interest and uses the subsidy (either a federal tax credit or direct cash payment) to pay the interest. There is a great potential cost savings from the use of a subsidized tax credit given that interest payments can make up to half of the cost of a similarly sized unsubsidized bond. The federal government typically allocates funding for special tax credit bond programs to state energy offices. Public schools usually apply for open tax credit bond programs through their state energy office and should structure the bond in consultation with their bond counsel. As of 2013, the three largest tax credit bond programs dedicated to school construction and energy efficiency uses include:

A. QUALIFIED ENERGY CONSERVATION BONDS (QECBs) are a type of tax credit bond that schools can use to finance building improvement projects that reduce energy consumption by an average of at least 20%. Accordingly, successful QECB-funded projects have a measurable energy efficiency impact. More than a quarter of over 100 QECB-funded projects have been for school improvements. Since 2008, the federal government has allocated over $3.2 billion for QECBs to states. As of 2012, the availability of QECB funding varies by state.[3]

(CONTINUED)

TYPES OF BONDS FOR SCHOOL IMPROVEMENTS (CONTINUED)

B. QUALIFIED ZONE ACADEMY BONDS (QZABs) are a type of tax credit bond that schools serving disadvantaged communities can use for major building renovations and equipment purchases. Schools are eligible if 35% or more of their students qualify for free or reduced-fee lunch. Schools must also create a Zone Academy - that is, dedicated curriculum and leadership programs that increase student graduation rates and generate opportunities for post-graduation employment – and secure a private sector funding match equal to at least 10% of the capital project's budget. Many resources exist to help schools develop qualifying QZAB Academy programs. The private sector match may be secured through any combination of cash, equipment and in-kind donations from local partners.[4]

C. QUALIFIED SCHOOL CONSTRUCTION BONDS (QSCBs) are a type of tax credit bond available to help schools finance building construction projects, including land acquisition, new construction and renovations. State governments have the authority to define the specific terms of use when allocating QSCBs. As of 2012, the availability of QSCB funding varies by state.

OTHER TIPS & TOOLS

TAX AND REVENUE ANTICIPATION NOTES (TRANs) are a short term revenue source that can be used as a form of bridge financing for school improvement projects. TRANs essentially act as an "advance" in allowing schools to borrow against anticipated revenue. Due to state and federal tax laws, TRANs come to maturity after a period of no more than 13 months. TRANs are typically easy to structure and issue and do not require voter approval.

BOND ANTICIPATION NOTES work similarly in that they are used to generate capital over the short term in situations where income from a bond issue is expected. These bridge financing techniques can be helpful when schools do not otherwise have access to the capital they need to complete preparatory work or to bridge cash flow gaps for projects where funding is pending.

BOND MEASURES - REFERENCES

1. The XYZs of California School District Debt Financing. Orrick, Harrington, & Sutcliffe LLP
2. Energy Efficiency Revenue Bonds. California Energy Commission
3. Qualified Energy Conservation Bonds. Database of State Incentives for Renewable Incentives
4. Qualified Zone Academy Bonds. National Education Foundation

ON-BILL FINANCE

On-bill finance refers to a low-interest loan that many utility companies offer to encourage their clients to implement energy efficiency improvements. According to the on-bill approach, the projected cost savings from improvements are used to repay the loan, which appears as a line item on the loan recipient's energy bill. On-bill loans are attractive for schools facing debt limitations because they are not legally classified as debt and therefore do not require voter approval. On-bill loans are repaid through the school's operating budget and are secured by the school's annual appropriation for energy costs. On-bill agreements are typically signed between the school, the utility company (or their third party finance provider) and a third party energy services company (ESCO), which agrees to guarantee the cost savings of the financed projects.[1,2]

BENEFITS & OPPORTUNITIES

On-bill loans are relatively low risk and low cost: under the terms of many programs, the utility or the third party lender will not provide financing unless the loan recipient's energy bill is less than or equal to their current bill. Utility companies often bundle on-bill loans with other rebates and incentives for equipment and energy use reduction, respectively, and often provide free school building energy audits.

CHALLENGES

The on-bill approach requires schools to dedicate the up-front staff time and resources to commission building assessments and negotiate the terms of the building improvement with an ESCO. ESCOs will conduct their own investment grade assessment to identify the costs and performance of the improvement measures, while utilities typically wish to verify the ESCO's proposed improvement plan with their own building performance audit. Given that discrepancies between audits are not uncommon, schools will need to dedicate staff time and resources to reconcile the assessments and negotiate the terms of the loan, including the monitoring and verification terms.

Because most on-bill loan loans are shorter term (typically no more than five years), they are optimal for high payback, "quick win" improvements. Note that by only implementing high payback building improvements, schools run the risk of making it difficult to address the "deep dive" improvements with a longer term payback that could otherwise be bundled with other finance approaches.

NEXT STEPS

Schools interested in on-bill finance opportunities should consult their local utility to see what opportunities currently exist in their region.

ON-BILL FINANCE - REFERENCES

1. On-Bill Financing for Energy Efficiency Improvements: A Review of Current Program Challenges, Opportunities, and Best Practices. American Council for an Energy Efficient Economy
2. On-Bill Repayment Programs. U.S. Department of Energy - Energy Efficiency & Renewable Energy

LEASE AGREEMENTS

Leases are commonly used to finance the costs to purchase any type of real property, where a *lessee* pays a *lessor* the capital cost of the property plus interest in installments over a given term. At the end of the term, the lessee usually assumes ownership of the property. Schools typically rely on two types of leases to pay for building improvement projects: *direct leases* and *finance leases*. Although a lease can theoretically be used to finance any type of building improvement, upgrades with a proven energy efficiency payback will likely secure the best financing terms because they can generate measurable cost savings that can be used to pay back the lease.[1, 2]

Schools typically repay leases through their operating budget, although green revolving funds and other special purpose funds may be used to manage dollars earmarked for debt service. As such, leases are an attractive and flexible finance tool for schools facing debt limitations because they are not legally classified as debt and therefore do not require voter approval. Leases may not be classified as debt when schools incorporate one of two common escape clauses into the agreement: (i) a requirement that the lease be renewed by school authorities on an annual basis or (ii) a requirement that the use and condition of the leased property (the school facility or equipment) remains uninterrupted and acceptable. Leases are nevertheless often securitized, usually through a covenant or another agreement that stipulates that the lease payment be appropriated in the school operating budget on a recurring basis.

BENEFITS & OPPORTUNITIES

Leases provide a flexible way to implement capital projects by allowing schools to use a "borrow now, pay later" approach to financing building improvement projects. Direct leases are a common financing tool with a wide range of applications.

CHALLENGES

Leases are relatively expensive, with interest costs often higher than those for similarly-sized commercial loans. While some lease agreements are flexible, many large scale finance lease arrangements are complex and require significant planning, technical expertise and due diligence to establish. Leases are only efficient if the financed equipment or property performs as expected over the term of the agreement. These direct risks can be mitigated by using performance contracting to guarantee improvement performance payback or, in the case of finance leasing, by creating special purpose entities to finance longer-term or higher-cost improvement projects.

NEXT STEPS

Next steps will depend on which lease is appropriate for your school. While vendors and ESCOs will generally have a strong level of familiarity with all lease options, as a rule of thumb their knowledge tends to be more specialized towards direct leases for the equipment they sell and install. Third party financial advisors may be most familiar with the mechanics of the types of financial leases used in your state, particularly with regards to Certificates of Participation and other agreements involving special purpose entities and the transfer of property ownership.

THE MECHANICS OF LEASES FOR SCHOOL IMPROVEMENTS

1. DIRECT LEASES can be used to finance small- to medium-scale building improvement projects, as in scenarios where schools purchase energy efficient equipment or fixtures. In such a scenario, the school typically enters into a **PERFORMANCE CONTRACT** with an energy services company (ESCO). The ESCO identifies, implements and guarantees the performance of the building improvement. The school repays the ESCO through installments that include tax-exempt interest payments. The ESCO's services can be financed in part or fully through leases for the equipment, which may include a single component or a bundle of components. Given the varying lifespans of equipment and the costs associated with servicing the agreement, most direct leases are short- to medium-term agreements lasting anywhere from 5 to 10 years, or the useful life of the equipment.

Today, schools use lease agreements to finance a diversity of capital expenditures, ranging in scale from portable classrooms and HVAC systems to computers and textbooks.[1]

2. FINANCE LEASES can be used to finance large-scale building projects, including major renovations or additions to school campuses. Under a typical finance lease, the school sells and leases back an asset (typically, the building to be renovated or to be constructed) to a *special purpose entity* – usually a non-profit organization or joint powers authority created for or by a school authority to facilitate the lease. The school commits a lease payment for the facility to the special purpose entity, which in turn shares an agreement with and assigns the payment to a designated trustee. The trustee – typically a financial institution – sells *Certificates of Participation* (COP) to investors, the proceeds of which go to the special purpose entity to finance the capital improvement. The school lease payment is therefore structured so as to service the debt owed to the COP holders. In this case, the lease agreement is typically *triple net*, meaning that the lessee remains responsible for utility costs and all relevant insurance and tax obligations.

This arrangement does not effectively change the day to day operations of the school, and is instead intended to provide a legal way for schools to access capital through an intermediate entity.[1, 2]

FYI

CERTIFICATES OF PARTICIPATION (COP)

Much like a bond, a COP entitles the holder to a proportionate amount of the school's payments over a specific term. The COP is attractive to investors because the interest earned from the lease payment is tax exempt.[2]

LEASE AGREEMENTS – REFERENCES

1. An Introduction to Municipal Lease Financing: Frequently Asked Questions. Association for Governmental Leasing & Financing
2. Lease-backed Financing & Certificates of Participation. Fidelity Capital Markets

SELF-FINANCE

Self-finance broadly refers to the various strategies where schools pay for building improvements through internal accounting procedures, operating budgets and special funds. Given that upwards of half of the cost of most improvement projects can be attributed to debt service (the interest costs of leases and bonds), self-finance approaches can avoid significant expenses. Nevertheless, school budgetary processes are usually highly regulated and funds for building improvements are often scarce or otherwise restricted in their use. For schools with strict debt limits, creative self-finance may provide the single greatest source of capital for improvement projects.

BENEFITS & OPPORTUNITIES

Self-finance approaches can yield costs savings in the form of avoided debt service expenses, particularly on small- and medium-sized projects where it may be cost prohibitive or impractical to take on debt. Many self-finance approaches offer a great opportunity to institutionalize line-item funding for energy efficiency, student environmental leadership or other priority areas that might be at the core of any building improvement strategy. For example, a Green Revolving Fund can provide a centrally managed and potentially self-sustaining source of funds for a range of building improvement projects. Internal budgets and funds can also be used as a flexible source of short-term bridge capital.

CHALLENGES

Self-finance may not represent the best use of scarce on-hand cash. Because many school budgetary procedures limit internal loan periods to one calendar year, self-finance may only be an option for short-term or small-scale "quick win" projects. By only implementing high payback building improvements, schools run the risk of making it difficult to address the "deep dive" improvements with longer term paybacks that could otherwise be bundled into alternative finance approaches. Alternatively, debt financing allows an "act now, pay later" approach, which can be useful when schools are faced with certain debt limitations or when accounting procedures discourage the medium- and long-term investment of internal funds.

NEXT STEPS

Initiate a conversation in your school about Green Revolving Funds and other innovative approaches to prioritizing and self-funding school building improvement projects. These specialized accounting approaches can provide an institutional base of support for continued investment in school buildings.

THE MECHANICS OF SCHOOL BUDGETS

FYI

SCHOOL BUDGET 101

According to the American Association of School Administrators (AASA), 80-85% of the average school budget is dedicated to personnel costs – that's more than double the average for a typical private business. Spending for the remaining 15% is dedicated to operations and support services. The use of this 15% is subject to a wide range of local, state and federal mandates. On average, roughly 90% of school funding is contributed evenly by state (47.6%) and local (43.9%) governments, with the federal government contributing less than ten percent.[1]

FUND SOURCES. When schools elect to self-finance improvement projects, funds usually come from a few key budgets. While the names and purposes of these budgets vary from school to school, their role in financing building improvement projects can be generally distinguished as follows:

- Funds from the operating budget, including the facilities or energy budgets. *Facilities budgets* are usually dedicated to maintenance and upkeep, although they may include a line item for small- to medium-scale capital expenditures. *Energy budgets* include line items for various heating, water and waste disposal costs, and may be a good source of funding for energy efficiency projects.
- Funds from the capital budget, which is typically dedicated to large-scale building improvement projects but can theoretically be used for any capital expenditure. Because large-scale expenditures are often financed with externally-sourced capital, schools usually dedicate an independent *Debt Service* fund to repaying loans, bonds and other finance mechanisms. Appropriations for the Debt Service fund are tied to the specific terms of the debt mechanism and usually have a dedicated external revenue stream, like a local property tax levy.
- Funds from Special Funds, which often take the form of *rainy day accounts, emergency reserves*, or dedicated *sustainability and energy efficiency funds*. Green Revolving Funds, described in greater detail on the next page, are one such example of a special fund.[2]

(CONTINUED)

THE MECHANICS OF SCHOOL BUDGETS (CONTINUED)

FUND PAYMENTS. Once an annual school budget is approved, specific expense allocations are fixed in the sense that spending cannot rise unless it is matched through new income or transferred from another part of the budget. Schools generally rely on two related approaches to allocate funds for improvement projects (and to recoup any potential cost savings): the *loan model* and the *accounting model*. The decision as to which approach is most effective may depend on the local regulatory context, the fiduciary relationship between individual schools and larger bodies like a district office, and specific billing and budgetary controls and reporting requirements.

- According to the *loan model*, a district or other central office can provide a loan from a central account to a school for a building improvement project, usually through a *budget transfer*. The loan is repaid through terms mutually agreed upon by both offices and may include a minimal service cost (e.g. to cover administrative expenses, to compensate for the lost time-value of money or, in the case of a central **GREEN REVOLVING FUND**, to help grow the size of the fund for other improvement projects). This approach typically works best in scenarios where the loan recipient has control over the budgets from which the loan will be repaid or wherein any potential cost savings will be realized, like the Facilities and Energy budgets. This loan may be able to act as a form of *bridge capital* by enabling schools to self-finance the up-front costs of a project through their regular line item maintenance budget.
- The *accounting model* is similar except that disbursement and repayment typically occur through a budget transfer at the beginning or end of the year. This approach is favored in situations where budgets are managed centrally rather than locally (for example, in scenarios where a school district has a single negotiated utility account, rather than separate accounts for each school).

SELF-FINANCE – REFERENCES

1. School Budgets 101. American Association of School Administrators
2. Greening the Bottom Line: The Trend toward Green Revolving Funds on Campus. Sustainable Endowments Institute

GRANTS

Grants are funds that are awarded on a competitive basis for a wide variety of projects intended to help meet defined and measurable outcomes. Grants can help schools supplement funding for building improvements. Schools can apply for both public and private grants:

PRIVATE GRANTS come from foundations – non-profit organizations that make charitable contributions focused around particular program areas or goals – or from other private entities, including businesses and individuals. Except in cases where private entities are directly supporting a capital campaign – a fundraiser for a major building project – most non-profits do not award grants for capital projects like building improvements. Nevertheless, schools can leverage private grants for a range of campus improvement efforts. Potential areas for support could include funding for demonstrations and pilot projects, staff and student environmental leadership development, or resource conservation initiatives.

PUBLIC GRANTS come from federal, state and local governments. Most public grant programs are dedicated to energy efficiency or renewable energy investments, although schools should look for applicable deferred maintenance and learning grants for funds that may support a larger building improvement strategy. For example, state grants for environmental literacy, STEM-learning and for other innovations in project-based learning might be used to fund building improvements that can double as demonstration projects.

BENEFITS & OPPORTUNITIES

Grants can act as the primary funding source for small- and medium-scale improvement projects that that bolster student, staff and community leadership and engagement in the improvement and management of school buildings. Grants are a particularly good source of funding for projects without a clear cost savings dimension or that otherwise fall outside of the scope of third party finance strategies.

CHALLENGES

Smaller schools may lack the administrative support or staff expertise required to apply for, track and report on grants. In schools without such support, it may be hard to justify such an investment of administrative resources given the restricted use of grant money, particularly with regards to most building improvement needs.

NEXT STEPS

Dedicate the staff resources to initiate a search for grants for potential improvement projects in your school or district. The Foundation Center offers a comprehensive online database of current and past private grant opportunities that can be easily searched by region, amount, and theme or program area.[1] Similarily, the Database of State Incentives for Renewables and Efficiency regularly updates public grant opportunities relevant to building improvement.[2]

GRANTS – REFERENCES

1. Get Started. The Foundation Center
2. The Database of State Incentives for Renewables and Efficiency

REBATES & INCENTIVES

Rebates and incentives are financing tools that can be used to partially offset the costs associated with building improvements. The terms rebate and incentive are often used interchangeably to refer to a variety of discounts available to help schools implement building improvements. Most are geared towards energy efficiency retrofits, waste reduction projects and on-site renewable energy production, like solar installations. They are available for improvements that range from small- to medium-scale retrofits to large-scale system installations, and can be issued by any number of actors, including federal, state and local governments, utilities, and the energy services companies (ESCOs) that manufacture or install building features and systems. The terms and use of most rebates and incentives depend on the type and efficiency of the improved building feature or system relative to the performance of the existing system. Accordingly, schools must typically gain pre-approval before they receive the rebate and verify the performance of the improvement after implementation. Targeted facility audits and assessments are usually employed for the purposes of approval and verification. In many states, third party ESCOs are legally obligated to include available rebates and incentives in their estimates and scope of work.

FYI

REBATES AND INCENTIVES CAN HELP LOWER THE LIFETIME COSTS OF BUILDING IMPROVEMENTS IN TWO KEY WAYS:

1. **By reducing up-front costs. Direct discounts are often provided on a percentage basis of either the total improvement cost or the projected savings of an improvement.**
2. **By reducing operating costs. Most tariff-based rebates (also called feed-in tariffs) provide discounts on a school's energy bills based on the energy savings generated by the building improvement (most commonly, solar installations).**

BENEFITS & OPPORTUNITIES

Rebates and incentives can significantly lower the lifetime costs associated with school building improvements. Efficiency Services Agreements and other innovative partnerships with third party ESCOs and contractors can also help schools to tap a range of incentives – including tax credits – in new ways.

CHALLENGES

Rebates and incentives vary widely from state to state. While they may help to lower the overall costs of improvements, they must be leveraged in tandem with other finance strategies.

NEXT STEPS

Contact your local utility company to see what rebates, incentives or pro-bono services are currently available to incentivize building improvements. Similarly, many local, regional and state agencies and non-profits often offer free building assessments and in-kind services to encourage improvements.[1] The Database of State Incentives for Renewables and Efficiency regularly updates federal, state and local rebate and incentive opportunities relevant to building improvement.[2] Finally, vendors and energy services companies are usually well-informed about opportunities related to the products and services they offer.

REBATES & INCENTIVES – REFERENCES

1. Example: California Clean Energy Rebates
2. Rebates Summary. The Database of State Incentives for Renewables and Efficiency

EFFICIENCY SERVICES AGREEMENTS

Efficiency Services Agreements (ESAs) form the contractual basis of an innovative strategy where a school, energy services company (ESCO) and investor enter into a collective agreement to finance improvement projects. In the school context, ESA approaches are typically used to finance renewable energy projects, like solar power. The Efficiency Services Agreement also refers to the specific contractual agreement shared between schools and special purpose entities established to finance improvements.

According to most ESA approaches, a school, investor and ESCO jointly agree to create a special purpose entity through which capital improvements can be financed. In this case, the special purpose entity serves to help distribute the benefits and risks of the capital investment given the special constraints placed on school debt finance. Under this model, investors agree to provide the up-front capital for the school improvement project.

FYI

THE SPECIAL PURPOSE ENTITY HOLDS THESE FUNDS AND ENTERS INTO TWO DISTINCT AGREEMENTS:

1. **The Performance Contract with the ESCO to implement building improvements.**
2. **The Efficiency Services Agreement with the school, to determine the terms of repayment for the up-front capital investment.**

While these agreements are legally distinct, their interdependence is critical: the operational benefits of the building improvement (whether it is in terms of cost savings or new revenue generation) are leveraged to help repay the up-front capital investment made by investors. This arrangement allows the ESCO to take advantage of tax benefits and other incentives that the school would be otherwise unable to benefit from as a tax-exempt entity.[1]

BENEFITS & OPPORTUNITIES

ESA-backed projects have the unique potential to act as a direct revenue generator for schools. In the example of solar systems, schools typically receive an installation with no up-front costs, no long-term maintenance or ownership liabilities and a guarantee for lower energy costs. Here, the lower energy costs act as rent for the solar vendor, who owns and operates the equipment on the school site and sells the energy generated to the building user or to a utility. Schools can use these energy cost savings however they choose. At the end of the ESA agreement, schools can either assume full ownership of the asset or have it removed at no cost.[2]

CHALLENGES

ESAs act as an indirect source of potential revenue for schools. Accordingly, it may be difficult to explain the complex financial mechanics of these agreements to a wider group of school stakeholders. The availability of ESAs is also limited to states where adequate rebtes, incentives and enabling legislation exist for renewable energy investment.[2]

NEXT STEPS

Schools interested in implementing targeted improvements using ESAs should ask vendors offering energy efficiency services if they are available in their jurisdiction.

EFFICIENCY SERVICES AGREEMENTS – REFERENCES

1. Show Me the Money: Energy Efficiency Financing Barriers & Opportunities. Environmental Defense Fund
2. Efficiency Services Agrements. Financing Sustainability Projects on Campus

STEP 3

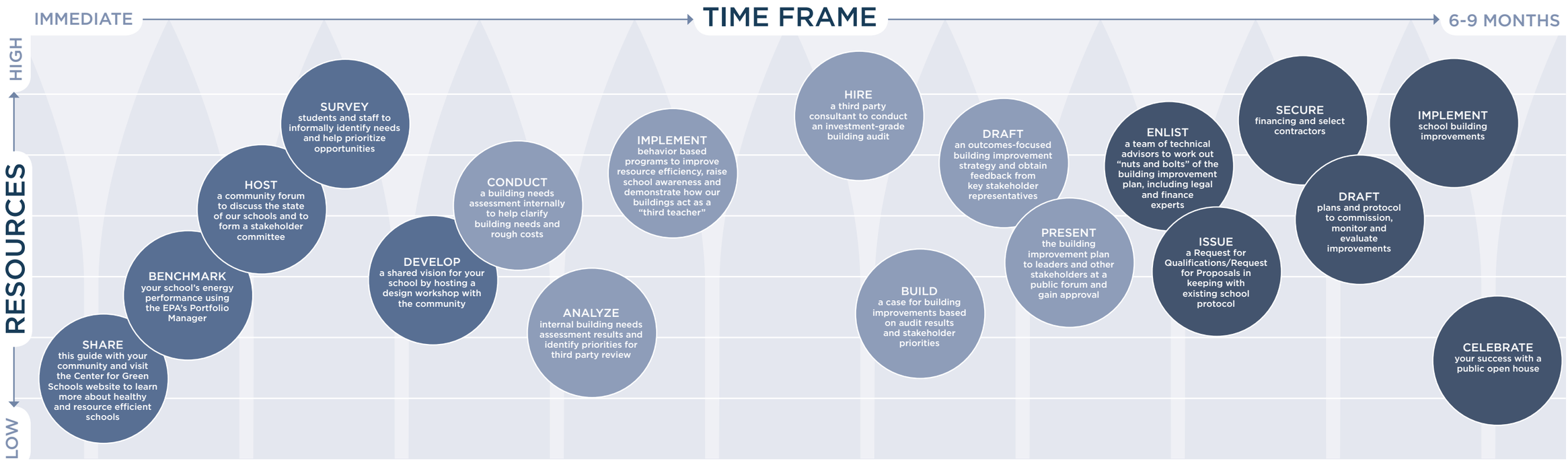
TAKE ACTION

NEXT STEPS

IDEAS FOR ACTION

How do we translate these insights into our school building needs into a concrete set of next steps? Below, you'll find a series of ideas and opportunities - some modest, others large in scale - that you can seize to initiate an inclusive, outcomes-focused conversation about the benefits of green school buildings in your community and how the work gets done.

In the Appendix, we also provide links to a few of our favorite resources to help you build the case and implement school building improvements. These resources cover topics ranging from innovative project-based learning and behavior-based energy efficiency programs to technical guidelines on building improvement finance and implementation.



CONCLUDING THOUGHTS

While our school needs may be great, there can be no "one size fits all" solution for renewing our schools. The most transformative ideas will continue to come from local champions like you, who help to rally the shared vision and resources needed to make a real difference in the quality of our learning environments. To this end, we hope that this guide has equipped you with tools and ideas that lay a robust foundation for great change in your school and your community.

We invite you to share your stories, ideas and inspiration with us online, and look forward to continuing this important work together!

architecture for humanity | THE CENTER FOR GREEN SCHOOLS

ADDITIONAL RESOURCES

LEADERSHIP DEVELOPMENT | ONLINE TOOLS & PROGRAMS | PAPERS & REFERENCES

FRAMING THE NEED FOR SCHOOL BUILDING IMPROVEMENTS

STATE OF OUR SCHOOLS - Released in 2013, this report highlights the critical need to modernize school facilities to meet current health, safety and educational standards. The report states that schools are currently facing a $271 billion deferred maintenance bill just to bring the buildings up to working order – approximately $5,450 per student. http://centerforgreenschools.org/stateofschools

UNITED STATES BUILDING ENERGY EFFICIENCY RETROFITS: MARKET SIZING AND FINANCING MODELS - This research study examines the potential size and investment opportunity of upgrading and replacing energy-consuming equipment across the United States. http://www.rockefellerfoundation.org/news/publications/united-states-building-energy-efficiency

TOOLS FOR IDENTIFYING OPPORTUNITIES IN SCHOOLS

PAID FROM SAVINGS GUIDE TO GREEN EXISTING BUILDINGS – A guide to help building facilities managers and ESCOs leverage utility cost savings to fund comprehensive green building retrofits. The resource provides detailed information on how to aggregate green improvement measures to optimize project economics and achieve *LEED for Existing Buildings: Operations & Maintenance* certification. http://centerforgreenschools.org/utility-nav/resources/guides/paidfromsavings.aspx

GREEN EXISTING SCHOOLS TOOLKIT – This resource helps K-12 schools assess current practices and implement changes, and includes a Project Management Guide, Implementation Workbook, Web Trainings and more. http://www.centerforgreenschools.org/k12toolkit

NEW & RETROFIT GREEN SCHOOLS SMARTMARKET REPORT – An analysis that provides an in-depth look at the green activities occurring in schools and provides a pulse on the green education market and how it will evolve over time. http://analyticsstore.construction.com/index.php/new-and-retrofit-green-schools-smartmarket-report-2013.html

EPA PORTFOLIO MANAGER – This interactive energy management tool allows you to track and assess energy and water consumption across an entire portfolio of buildings online. Portfolio Manager can help you set investment priorities, identify under-performing buildings, verify efficiency improvements, and receive EPA recognition for superior energy performance. http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

TOOLS FOR IDENTIFYING OPPORTUNITIES IN SCHOOLS (CONTINUED)

EPA FINANCIAL EVALUATION TOOLS – The EPA offers three online worksheets for assessing the potential financial performance of energy saving building improvements, including the Cash Flow Opportunity Calculator, the Building Upgrade Value Calculator and the Financial Value Calculator. http://www.energystar.gov/index.cfm?c=assess_value.financial_tools

EPA INDOOR AIR QUALITY TOOLS – The EPA's free Action Kit provides best practices, industry guidelines, sample policies and a sample IAQ management plan to improve school air at little or no cost. http://www.epa.gov/iaq/schools/

NATIONAL CLEARINGHOUSE FOR EDUCATIONAL FACILITIES – This resource includes over 23,000 articles, comprehensive information on designing, building, and maintaining safe, healthy, high-performing schools. http://www.ncef.org/

CENTER FOR ENVIRONMENTAL EDUCATION BUILDING AUDITS – CEE provides tips and tools for using both educational and technical building audits to understand potential school building improvements. http://www.ceeonline.org/

STUDENT LEARNING, LEADERSHIP & BEHAVIOR-BASED ENERGY EFFICIENCY RESOURCES

GREEN APPLE DAY OF SERVICE – Every year, the Center for Green Schools at USGBC hosts the Green Apple Day of Service. On one day, advocates around the world, including students, teachers, parents, elected officials and more, will come together in support of healthy, sustainable schools by participating in local service projects. http://mygreenapple.org/

ALLIANCE FOR CLIMATE EDUCATION – ACE's mission is to educate high school students on the science behind climate change and inspire them to take action to curb global warming. http://www.acespace.org/

CEFPI SCHOOL OF THE FUTURE DESIGN COMPETITION – The School of the Future Design Competition offers an opportunity to illustrate the kind of creativity that students bring to the planning and design process. The annual competition, open to middle school students, challenges student teams to design their schools to enhance learning, conserve resources, be environmentally responsive and engage the surrounding community. http://www.cefpi.org

HEALTH, PERFORMANCE & BUILDING QUALITY

THE IMPACT OF SCHOOL BUILDINGS ON STUDENT HEALTH AND PERFORMANCE: A CALL FOR RESEARCH – This paper sheds light on how the school building—through its design, maintenance and operations—impacts the health and performance of the students in those buildings. http://mcgraw-hillresearchfoundation.org/wp-content/uploads/2012/02/GreenSchoolsWP-2012.pdf

INDOOR AIR QUALITY SCIENTIFIC FINDINGS RESOURCE BANK - This online database provides information summarizing the state of scientific knowledge about the relationships between people's health and productivity and the IAQ conditions or associated building characteristics in which the people work or reside, including schools. http://www.iaqscience.lbl.gov/

LEADERSHIP DEVELOPMENT & LOCAL ENGAGEMENT OPPORTUNITIES

THE COALITION FOR GREEN SCHOOLS – The Coalition brings together the nation's strongest advocates for our children to create a national infrastructure of healthy, high performance schools that are conducive to learning while saving energy, resources and money. Coalition Executive Committee participants collectively represent more than 10 million members nationwide. http://centerforgreenschools.org/coalition-for-green-schools.aspx

ARCHITECTURE FOR HUMANITY CHAPTER NETWORK – Around the world, designers are coming together to volunteer their time and their talents and solve issues in their own communities. Local chapters of Architecture for Humanity take many forms depending on the size of the chapter and its location. Contact the nearest chapter to get involved and to bring pro-bono design services to your school. http://chapters.architectureforhumanity.org/

U.S. GREEN BUILDING COUNCIL CHAPTERS – Through the leadership of passionate volunteers and expert staff, USGBC chapters engage in education, advocacy and outreach to promote green building, advocate for sustainable policies and expand the USGBC network where it matters most—in local communities. http://usgbc.org/community/chapters

LOCAL LEADERS IN SUSTAINABILITY: A NATIONAL ACTION PLAN FOR GREENING AMERICA'S SCHOOLS – Outlines a national action plan that mayors and local leaders can use as a framework to develop and implement green schools initiatives. The report also provides a summary of local, state and federal policy solutions; leadership profiles of green school advocates; and case studies from both large cities and small communities. http://bit.ly/greenschoolssummit

GREENING OUR SCHOOLS: A STATE LEGISLATOR'S GUIDE TO BEST POLICY PRACTICES – A toolkit and comprehensive guide for state lawmakers who are developing policy solutions that improve the health, productivity, efficiency, and fiscal responsibility of schools in their state. http://www.centerforgreenschools.org/docs/GreeningOurSchools_PRINT.pdf

FOR GENERATIONS TO COME: A LEADERSHIP GUIDE TO RENEWING PUBLIC SCHOOL BUILDINGS – This "how-to" manual is designed for individuals interested in modernizing or building new public school facilities in their neighborhoods. Modeled after an innovative public-private development partnership, this tool details the importance of school facilities and community involvement, then explains the five basic steps to planning a new school or renovating an existing building:assessment, envisioning, planning, development and implementation. http://www.21csf.org/csf-home/Documents/Organizing_Manual.pdf

CITIZENS OVERSIGHT OF PUBLIC SCHOOL CONSTRUCTION PROGRAMS – This paper provides information on the advantages associated with having a Citizen Oversight Committee as well as lessons and promising practices on how to develop and establish a committee. The authors interviewed ten districts with citizen oversight committees in place to determine some promising practices that are most effective in fulfilling the responsibilities and achieving the potential advantages of an oversight committee. http://www.21csf.org/csf-home/Documents/CitizenOversight.pdf

CASE STUDIES

FINANCING ENERGY UPGRADES FOR K-12 SCHOOL DISTRICTS – This guide is written explicitly for school administrators, facilities managers, and others in K-12 education management. It covers different options for public and private financing approaches, and contains numerous case studies of school district projects. http://emp.lbl.gov/sites/all/files/lbnl-6133e.pdf

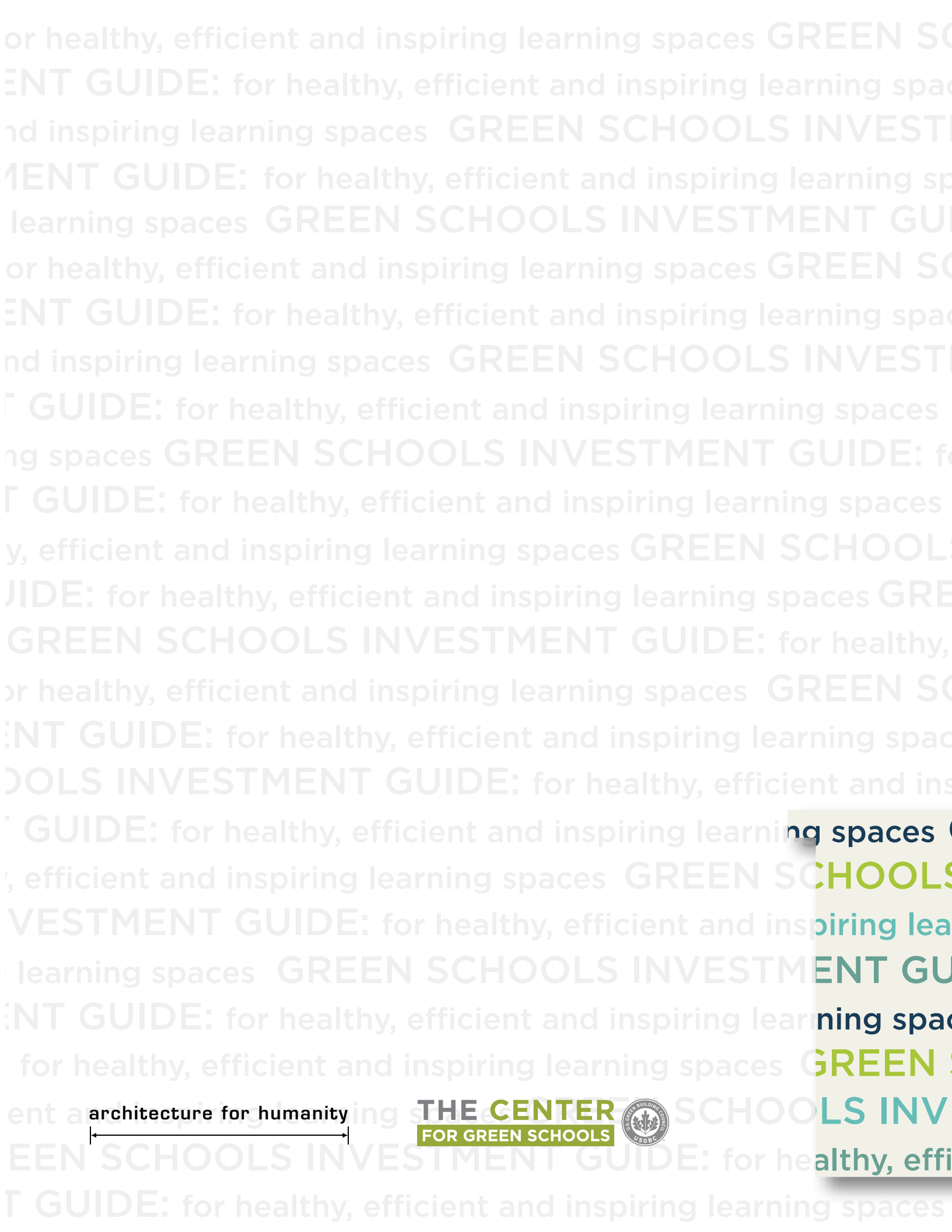
NATIONAL CLEARINGHOUSE FOR EDUCATIONAL FACILITIES CASE STUDIES – This website includes descriptions, photographs, and plans of high performance green schools, compiled by NCEF. http://www.ncef.org/rl/casestudies_HPS.cfm

JOIN THE CONVERSATION

Do you have a story of positive change in your school that you want to share with the world? Are you eager to learn more and engage with like-minded school advocates? Join the global conversation around our schools and our communities online at www.centerforgreenschools.org/investmentguide

architecture for humanity

THE CENTER FOR GREEN SCHOOLS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