

Sustainable Schools:  
Techniques for Existing Facilities

Corrie Hood  
**shiver+associates** architects

Sustainable buildings have many advantages over conventional construction. They cost less to operate through energy and water efficiency. In turn, this efficiency aids in reducing our nation's dependence on fossil fuels and other nonrenewable resources. Increased air and lighting quality create healthier environments for children, while reducing illness and related absenteeism. Sustainable material selection reduces the negative impact of manufacturing processes that damage our environment.

The main disadvantage of green buildings is their initial cost. The cost of building green varies greatly depending on the strategies utilized in each individual project. A 2006 national study placed the average increase in school costs at three percent. It is true that this investment is repaid by lower operating and maintenance costs, but it can be understandably difficult for taxpayers and board members to buy into the benefits of going green, when their primary concern is the up front initial cost that affects financial bottom line of total program costs.

This following information packet is written for school administrators who are interested in sustainable facilities. The information presented covers methods of setting green precedents within existing school facilities and their surrounding communities. This packet is divided into two areas. The first section covers techniques that relate to existing facilities and methods of directly enhancing the sustainability of the built environment. The second section offers methods of preemptively advertising the benefits of sustainability to members of the surrounding community. These methods are intended to improve the communities' understanding and perception of sustainability.

Some of these methods presented do not have a cost and are simply a change in habit or lifestyle. Others are financial investments, but investments on a much smaller scale than constructing a new building. Once implemented, all of these methods become examples of the beneficial effects of green practices. Their success provides the district with proof that ecologically friendly activities are rewarding on many levels. Utilizing these methods provides districts with solid evidence with which to advocate for further investment in sustainable practices, including future investment in new sustainable schools.

1 Kats, Gregory. "Greening America's Schools: Costs and Benefits." Capital E Report. October, 2006.  
[www.cap-e.com](http://www.cap-e.com).

### **Existing Facility Improvements**

These techniques primarily focus on improving the energy and water systems of existing facilities. On a financial level, these methods offer more concrete and measurable benefits. Improving the sustainability of air conditioning and water systems has a direct and positive effect on operation and maintenance costs. These cost savings will be visible to district. Communication is vital. Savings provided by these same practices and techniques present community members with proof of the financial effectiveness of sustainable practices. These savings may serve to advocate future sustainability measures and programs through effective communication and marketing efforts to the community.

**Plant environmentally friendly landscaping:**

Why:

Instead of landscaping with plants that require supplemental water to survive, choose plants that grow naturally in the region. Once established, these plants will require little to no extra irrigation.<sup>2</sup> This reduction in irrigation will significantly reduce the district's water use. Cutbacks will have an ecologically beneficial impact on local and national water supplies. It will also have a beneficial impact on the District's water bills.

When planted strategically, trees act as natural shading devices for a building. Trees along the western face of a building work to block the western sun that provides undesired heat during the summer months. This effect impacts the heat gain of building enough to significantly reduce the cost of cooling. Deciduous trees are the best choice for this strategy as they offer benefits all year round. In the summer, they provide much needed shade. They lose their leaves and allow sunlight to hit the building at the time of year when solar heat is most desired. This natural warming decreases the cost of supplemental heating in the winter months. Careful planning and planting will insure that trees and other landscaping will not have a negative impact on building foundation systems. There are a variety of resources available to identify indigenous planting material. Landscape architects or local agricultural extension services can provide lists of such materials and assist with planning.



*Image courtesy Nature Works Landscape Services*

1 "Water-Efficient Landscaping: Preventing Pollution and Using Resources Wisely." United States Environmental Protection Agency Office of Water. September, 2002.  
[www.epa.gov/owm/water-](http://www.epa.gov/owm/water-)

How:

It is possible to convert an entire campus to water-efficient landscaping. Many regional government and independent groups offer grants for green projects of this scope. Unless campus groundskeepers are well versed in the care and management of local species, it would be best to hire a landscape architect to design a landscaping plan for any campuses that will undergo a full renovation. If the district will be covering the cost of the plan and can not afford to undertake everything at once, have the landscape architect phase the plan so that it can be executed in multiple sections by the District, Booster Clubs, PTA or local organizations.

It would be more cost effective and less wasteful to make the transition slowly as older plants die and need replacing. Start by substituting any annuals used last year with regionally native perennials. Check with a local nursery or the state agriculture department to find out which plants would be appropriate. As shrubs and trees reach the end of their lifecycle, replace them with regional natives as well. In addition, it is a good idea to have any groundskeepers attend a seminar or study appropriate literature with information on maintaining native plants. The local nursery and agriculture department should also have information on maintenance and serve as a resource.

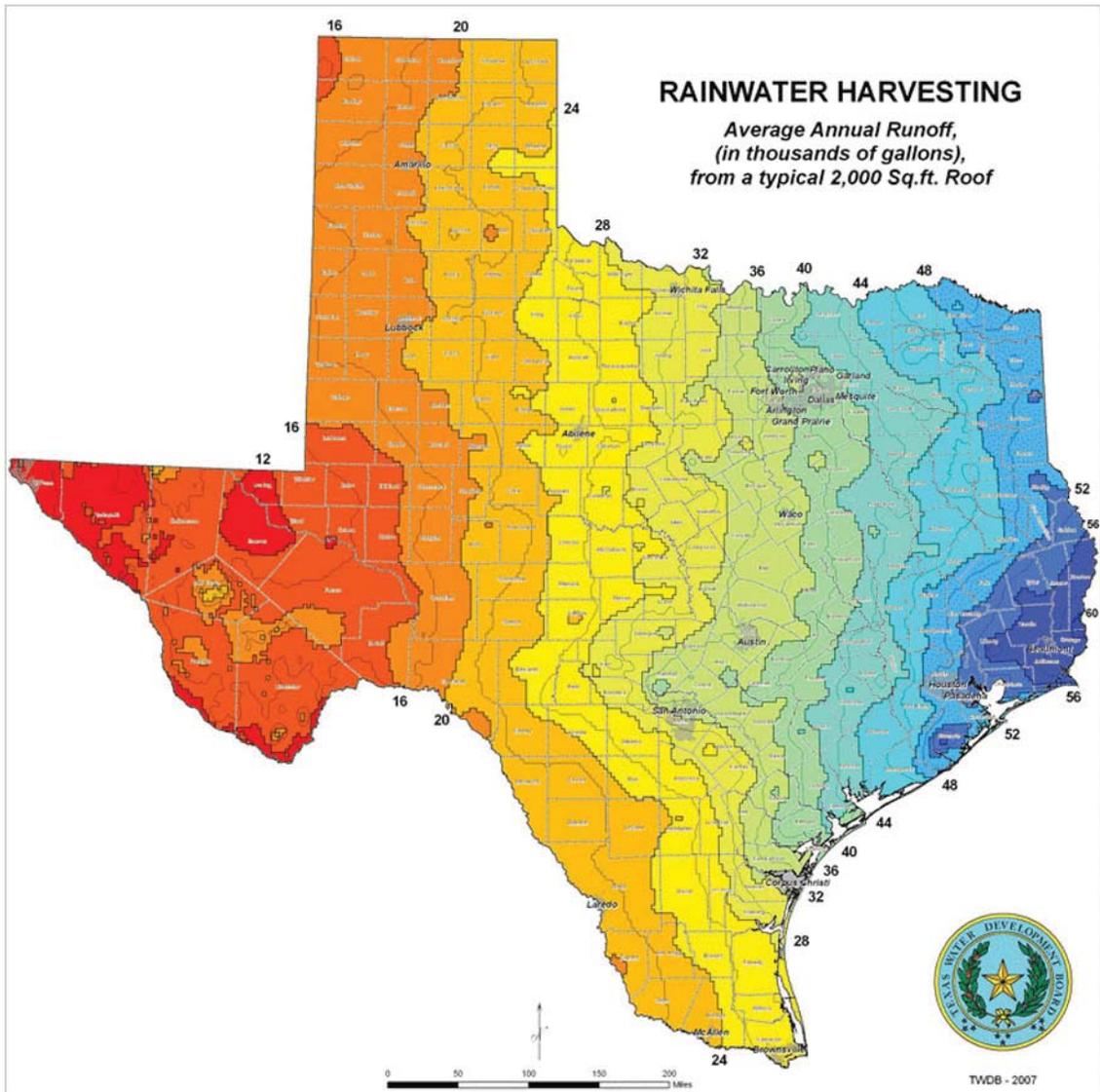
Proper maintenance is important. Even native plants are vulnerable until they are established. Management of planting needs insures a return, rather than loss of, the district's investment. Improper maintenance can also mean over watering. Too much water could damage the plants, while negating any possible savings of reduced water use. This is why it is important that those in charge of maintaining the campus landscaping are well versed in the needs of the new planting additions.

**Recapture rainwater for use in irrigation:**

Why:

Water harvesting is done either by capturing rainwater or condensate from air conditioning units. Water that would normally be shed to the storm sewer or site drainage system is filtered and stored to be used for irrigation later. Systems vary greatly in size and cost depending on owner preference. Large capacity tanks need to be professionally designed and installed, but smaller tanks can be built easily out of basic hardware materials.

Capturing condensate from air conditioning units is a similar process with slightly different collection materials. Instead of gutters, excess water is collected in pans or small tanks that drain to a larger containment unit. The beauty of this system is that the most condensation is produced during the hottest months when air conditioners are working hardest. The air conditioning system will produce its maximum water runoff during the time of the year with the least amount of rainfall.<sup>3</sup> Both methods of collection will reduce the overall cost of landscape irrigation.



3 "The Texas Manual on Rainwater Harvesting." Texas Water Development Board. Third Edition. Austin, Texas. 2005.

How:

Before installing a water harvesting system, check with local government offices to determine whether any restrictions apply. If large-scale water collection is desired, consult with a professional tank installer in the area. The installer will be able to determine the appropriate size of the tank and filtration system necessary for each individual building. An alternative to installing a tank would be an on-site detention pond. Student safety and feasibility of location should both be looked at before choosing this option.

It is possible to construct smaller rain barrel systems from products available at a local hardware store. This type of system attaches directly to the end of an existing downspout. Major components of this system include a watertight barrel for storage with a spigot at the bottom and screens at the downspout connection to filter any large debris. This smaller system is typically used in residential settings but could be effectively used for sections of a campus that have particularly high water needs, such as newly planted trees.

**Purchase electricity from green sources:**

Why:

Green power is electricity generated in part or full by renewable sources. There are multiple providers in the state of Texas that sell electricity provided by 100 percent renewable sources.<sup>4</sup> All renewable energy is produced domestically, which reduces dependence on fuel imports. This also reduces the need for coal-burning power plants which is a major source of air pollution. Buying green power improves the quality of Texas air and the health of those who breathe it.

How:

If the district is located in a deregulated area, look at switching to a green energy provider. The Texas Electric Choice Education Program has a comparison chart of offers by zip code. They also maintain information on complaint statistics by company. Contact TASB if your district participates in a Co-op and ask if Green power is a component of the energy provided by the co-op.



*Photo courtesy Christopher Crawford*

4 "Texas Electric Choice Education Program." Public Utility Commission of Texas.  
[www.powertochoose.org](http://www.powertochoose.org).

**Implement an Indoor Air Quality management program:****Why:**

The term “Green” is most often associated with sustainability and preservation of the environment. It is less well known that green buildings also create healthier environments for their occupants. Indoor air quality is a major component of a healthy built environment. It is adversely affected by poor ventilation, mold, mildew, dust, animal dander, volatile organic compounds, radon, carbon monoxide and formaldehyde.

Children with respiratory health issues that are negatively impacted by the elements listed above are more likely to experience illness-related absenteeism. Asthma, for example, is a respiratory illness that is seriously impacted by environmental factors. Incidences of the disease have increased in children in recent years. “According to a 2001 report by the U.S. Department of Health and Human Services, between 1980 and 1994, the percentage of preschool-age children with asthma increased 160 percent.”<sup>5</sup> These absences affect the individual students and the district as a whole in instruction and finance. In states that provide funding based on attendance rates, school finances are negatively impacted by absent students.

Schools that take measures to improve indoor air quality often see a direct, beneficial impact on building finances as well. Tactics to improved quality include improving ventilation, water tightness and insulation. As a result, “operational measures to improve indoor air quality can cut energy costs and annual maintenance costs by 10 to 20 percent.”<sup>6</sup>

**How:**

The United States Environmental Protection Agency has developed a program specifically designed to help schools improve indoor air quality. It is called the IAQ Tools for Schools Program. This program has a kit that goes through the step-by-step process of implementing the program. The kit includes documentation and information on organizing interested participants, assessing current conditions, creating a plan of attack, taking action, evaluating the implemented program and communicating the reasons and results to the public. Participation and materials are available free of charge on the program’s website at [www.epa.gov/iaq](http://www.epa.gov/iaq).

5 “Indoor Air Quality for Schools Communications Guide.” United States Environmental Protection Agency Office of Air and Radiation. January 2003. [www.epa.gov/iaq](http://www.epa.gov/iaq).

6 Ibid.

**Retrocommission energy systems:**

## Why:

Retrocommissioning is done to improve the performance of systems in an existing building. Building commissioners analyze the performance and efficiency of energy related systems. Heating, ventilation, air conditioning and refrigeration are typically included in such a study. Retrocommissioning will determine how well systems are functioning and whether they require recalibration or maintenance.

Checking these systems ensures that they are performing at peak levels. Equipment that is operating properly “lasts longer, works more reliably and needs fewer repairs during its lifetime.” Inefficient systems cost more to operate and maintain. This inefficiency is paid for by building owners who receive higher utility bills resulting from poorly functioning systems.

When building temperatures are maintained at satisfactory levels, inhabitants are more comfortable and productive. Retrocommissioning of air handling systems also improves the indoor air quality of a building. A properly operating system that is circulating the correct amount of air reduces mold and mildew problems that result from poor ventilation.

When mold is present in a building, it can trigger allergic reactions, asthma attacks and other respiratory ailments in building inhabitants. Mold needs moisture to grow. As such, wet, humid interior spaces are most at risk for mold problems. In addition to keeping water out of a building, reducing humidity is a means of mold prevention. Properly functioning HVAC systems will increase ventilation of building spaces and reduce interior humidity. Reducing building humidity will aid in reducing interior moisture and mold growth.

## How:

Before undertaking retrocommissioning, speak to all the shareholders, including the finance and maintenance departments. In addition to the building commissioner’s fee, some recommendations may include repairs or servicing of mechanical units. Be sure that all parties are aware of the possible costs as well as the future savings expected to result from more efficient system performance. Schedule maintenance costs and budget appropriately for building maintenance needs on a yearly cycle.

Once financing is in place, research energy commissioning agents. The Building Commissioning Association has a list of providers at: [www.bcxa.org](http://www.bcxa.org). Issue a Request for Qualifications that focuses on experience in general and specific work with educational systems. To some agents, commissioning involves little more than testing and measuring equipment. Responding applicants should have a similar definition of commissioning to the American Society of Heating, Refrigeration and Air-Conditioning Engineers’ Guideline 0, which states that commissioning is “a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.” This will ensure that systems are comprehensively studied.

7 “Building Commissioning Guidelines: a Source Book on Building Systems Performance.” Energy Design Resources. [www.energydesignresources.com](http://www.energydesignresources.com).

8 “Mold Course.” United States Environmental Protection Agency. [www.epa.gov/mold/moldcourse](http://www.epa.gov/mold/moldcourse).

9 Ibid.

**Install on-site renewable energy:**

## Why:

On-site renewable energy is “energy produced from ‘fuels’ that have a stable, predictable supply, such as solar or wind.” These sources are installed at the building site and replace part or all of the power provided by a central power plant. Solar and wind power are the most common alternative providers of electricity. Other sources include biomass, green source and hydrogen. On-site renewable energy is a long-term investment, which makes educational facilities excellent candidates for this type of investment because their operating life is longer than that of residential or commercial buildings. A school will reap more cost benefits from on-site renewable energy in its fifty year operation than a commercial office will in twenty years.

The downside of on-site renewable energy is that it is the most cost prohibitive method of retroactively enhancing a building to make it green. In addition to requiring the professional assistance of engineers and installers, green fuel sources tend to be newer technologies. As such, the current market demand for these products is less than that of more conventional energy systems. Increased demand encourages production and higher production volumes tend to lower costs. When producers sell these products at higher volumes, they are then able to lower the price of individual units without profit loss. On-site renewable energy is becoming more and more popular with many large corporations utilizing on-site power. There are also government programs that offer tax incentives to aid in the development of these technologies. As a result, production has increased. Solar power production, for example, is increasing at an average rate of 20 percent per year. Though demand is increasing and costs have fallen, the initial price of investing in on-site renewable energy does not match the cost of conventional energy systems.

Many on-site energy systems have the added benefit of being scaleable according to the desired size of investment and power generation. These systems can be sized to power large portions of building systems or as supplemental energy. Two systems that are scalable and easily integrated in existing infrastructure are fuel cells and photovoltaics.

Fuels cells are energy generators that run on hydrogen. They operate similarly to batteries but without the need for recharging. To create a fuel cell, two electrodes are sandwiched around an electrolyte. One electrode takes in oxygen and the other hydrogen. This reaction generates electricity and heat. The only waste discharge produced by the cell is water. As such, fuel cells are a zero emission energy source. In addition to energy, fuel cells also create heat which can be used in the building’s HVAC system. They are quiet, which means they can be placed almost anywhere without disturbing building occupants. Hydrogen is available through domestic sources, which reduces the nation’s foreign oil dependency. Adding a fuel reformer to the fuel cell allows it to run on a variety of fuels that contain hydrogen. These include eco-friendly options like methane, biomass and landfill gas.

10 “Fact Sheet: On-Site Renewable Energy.” United States Green Building Council: Cascadia Chapter.

11 “Photovoltaic Systems.” U.S. Department of Energy: Energy Efficiency and Renewable Energy.  
[www1.eere.energy.gov](http://www1.eere.energy.gov).

12 “Fuel Cell Basics.” Fuel Cells 2000. [www.fuelcells.org](http://www.fuelcells.org).

Photovoltaic panels are made up of solar cells which utilize energy from the sun to generate direct current. Currently, the most efficient and common type of photovoltaic system is referred to as grid-connected or utility-interactive. In this system, the DC current generated by the solar array is transferred to an inverter to which converts it to alternating current. The AC current is then sent to a distribution panel where it is either used by systems in the building or sent to the electric utility. In residential buildings, this system is necessary since electricity use occurs primarily in the evening. The energy collected during the day and sent to the power company causes the meter on the house to run backwards as the utility buys it from the residence. The energy generated during the day negates the cost of the energy provided by the utility company at night. School buildings would generally use the power generated during the day since these are the peak operating hours. Tying into the grid would be recommended to ensure that there is power for any nighttime events hosted on school grounds. This would also financially benefit the school during periods of low use. As an added benefit, tying into the grid would allow schools to sell harvested electricity to energy utilities during the summer and holidays, when facility electricity requirements are minimal.

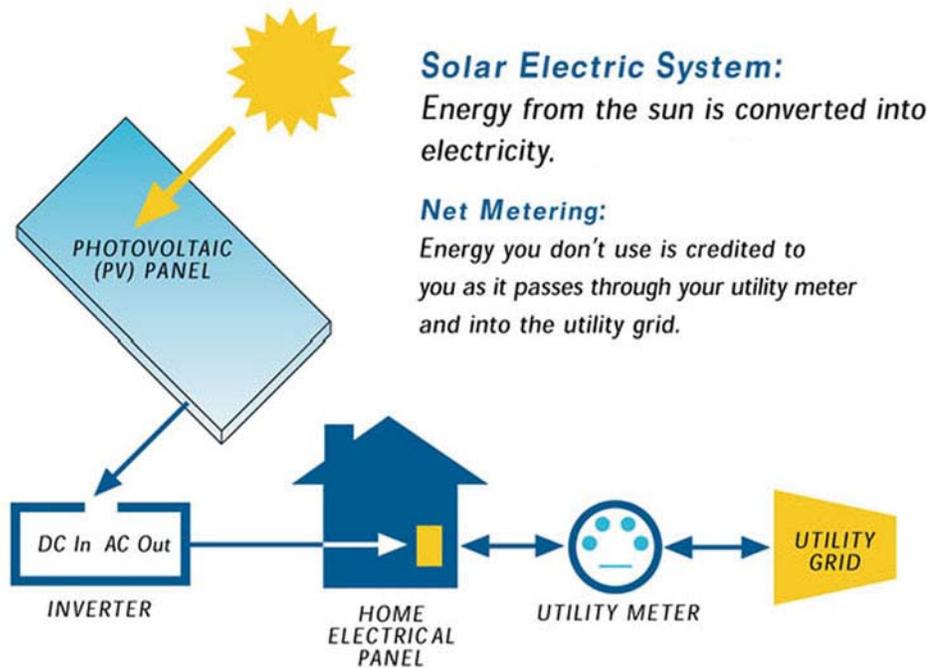


Diagram courtesy of Energy Trust of Oregon

How:

These systems will require professional integration. It would be best to research suppliers of both fuel cells and photovoltaics and then decide which type to use. Speak to various providers about the financial and time requirements of the preferred system. Choose a provider and work with them to create a basic systems analysis and cost estimate.

After becoming fully informed, speak to the board, business, finance and maintenance departments that would be in charge of financing and appropriating funds for these capital projects. Become well-acquainted with the benefits and pitfalls and gather information on the expected financial gains expected for the size of the system that will be integrated. Once everyone understands and supports the initiative, begin the process of implementing the system and advertise the environmental benefits and savings to the public. Continue to proactively communicate and advertise the systems once they are integrated and producing electricity.

13 "On-Site Renewable Energy." Building Technologies Program. Energy Efficiency and Renewable Energy. U.S. Department of Energy. [www1.eere.energy.gov](http://www1.eere.energy.gov).

**Influential community techniques:**

Unlike the options listed previously, these techniques are unrelated to building systems. Their purpose is to emphasize the benefits of green practices in community members' everyday lives. By encouraging green practices, school administrators begin to normalize the principles of sustainability. This is an indirect method of supporting future green facilities. Reaping the benefits of green principles in their day-to-day lives provides community members with a relatable example of sustainability benefits. Utilizing green principles will not cause community members to automatically vote to fund a sustainable school. The goal of the following techniques is to help foster a comprehensive approach to promoting sustainability. These, in addition to improving existing facilities, foster a community that is more informed, understanding, and open to investing in the benefits of sustainability that exist in multiple areas of life.

### **Implement a Recycling Program:**

Why:

Recycling is not just a sustainability issue. Recycling turns materials that were once potentially imported into regional products. When recyclables are collected and redistributed, manufacturers using these recycled products do not have to import raw materials.

Aluminum is a good example of this principle. Since the 1960s, recycling has been a large part of the aluminum industry. Aluminum can be melted down and reformed infinitely without the resulting product degrading in quality. As of 2005, about fifty percent of raw aluminum ore was supplied from American mines, thirty percent came from recycling and the rest was imported. The thirty percent that came from recycling was processed domestically at one of the 10,000 recycling centers nationwide. All of which was done by American workers in jobs that did not exist before recycling programs.

Students can be involved in the recycling process. Collection of recyclables can be as simple as having custodial staff transport recyclables and trash in separate bins. Recycling can also be integrated into the learning experience. The commercial process of creating the things we buy and then reusing their materials would fit the economic sessions of various social sciences classes. Classroom teams can be coordinated to create bins from found objects to separate trash from recyclables. Once a week, supervised groups of volunteer students could collect recyclables throughout the school, and deliver them to the appropriate pickup location. This would spare custodial staff of any additional work and, if implemented properly, would alleviate some of the required custodial waste collection.

If the district already recycles, check to be sure that all possibilities are covered. Paper, aluminum and glass are the most plentiful and common recyclables. Look at including less known items into the district's recycling program. Batteries, computer equipment, printer and photocopier cartridges and cell phones are all items usually assumed to be destined for a landfill.

How:

The first step is to contact the district's current waste management company to find out if they also offer recycling services. If they do, inquire about costs. If they do not offer recycling programs, check the contract requirements the company has with the district. From there, proceed to check for recycling services in the area and inquire about their cost and contractual requirements.

Next, the district's volume of trash generation should be evaluated. If the waste collection company charges by the ton, check to see if they will provide an account of the yearly totals of trash removed from the district. This can also be turned into a student activity. Have each class weigh their trash can at the end of each day for a week. Once these numbers are tallied, it will give a general indication of the amount of trash produced by the students.

Talk to the teachers and staff. They will be primarily responsible for encouraging any recycling plans. Discuss how and if their workload would be increased as well as the administration's reasons for implementing the program. Try to reach a consensus about how the program will be implemented. Teacher and administration support will be needed to ensure a successful program.

Energize the students. Hold assemblies and have guest speakers discuss the process and reasons for recycling. Hold school competitions where the class with the heaviest recycling bin at the end of the week or month wins a prize. Give a presentation at a PTA meeting to inform parents about the school's new activities and recycling program. Publicize the program through different media so the kids hear about it often and become accustomed to the idea. The goal is to make recycling second nature.

## Purchase green products

### Why:

Most office and school supplies now come in eco-friendly alternatives. Choosing sustainable products does not mean increasing the budget. Many major brands such as Office Max and Staples are joining the green movement by offering supplies that are either recycled, less toxic, and/or biodegradable. Choosing sustainable purchases is an easy and subtle way of promoting green practices. Encourage teachers to opt for green supplies whenever possible and set an example by making responsible purchases at the administrative level.

### How:

Wood-based office supplies are a good place to start. Not only do many of them come in recycled options but many are also certified by the Forest Stewardship Council. The council monitors wood producers and suppliers and certifies products have been sustainably produced and harvested. For example, Forest Choice produces typical #2 pencils that are FSC certified.<sup>18</sup> Other green options include biodegradable and recycled ballpoint pens and cellulose-based transparent tape.

Look for the following logos to identify green products.



Energy Star was jointly created by the U.S. Environmental Protection Agency and the U.S. Department of Energy. This label is applied to products that meet their requirements for energy efficiency.

[www.energystar.gov](http://www.energystar.gov)



Green-e retail products have been certified by an independent organization for their use of renewable energy and reduction in greenhouse gas emissions.

[www.green-e.org](http://www.green-e.org)



Green Seal is an independent, non-profit organization that certifies products based on scientific requirements that meet their environmental standards.

[www.greenseal.org](http://www.greenseal.org)



The Forest Stewardship Council independently certifies wood products that come from forests that meet certain social, economic and ecological management requirements.

[www.fsc.org](http://www.fsc.org)

18 Wortman, David. "Eco Checklist 2008: Green Gear for the Back-to-School Blues." Green Guide. [www.thegreenguide.com/doc/121/backtoschool](http://www.thegreenguide.com/doc/121/backtoschool).

### **Start a Green Club:**

#### **Why:**

Encourage the formation of an extracurricular Green club in the district's high schools. These groups could engage in many different activities. They include participating in local civic clean up programs such as Adopt-a-Highway. Students could work with the Ag club to plant a garden and engage in organic growing practices. The Green Club could place and then collect recycling bins throughout the school. The club could engage in any number of activities that the students feel would be worthwhile.

As green practices become more mainstream, more colleges are engaging in eco-friendly practices as well. Colleges and universities will be mindful of students who are interested in going green. As such, participation in a High School Green Club will serve to enhance a student's college resume.

#### **How:**

Find a teacher willing to sponsor the club and a location to hold meetings. Have the sponsor plan a few activities to advertise and get students interested in joining. Pre-planning the initial activities will provide the kids with the experience of a successful program and inspire confidence in the success of future activities. In the first few meetings, the sponsor should request feedback from the students concerning specific green activities and causes that they are interested in. Engage specific students who demonstrate leadership traits to plan and enact these activities. The more students feel invested in a group, the more likely they are to remain active members and committed to the cause.

### **Promote alternative transportation:**

#### **Why:**

Four methods are considered the most common forms of alternative transportation. These include: walking, biking, riding the bus and carpooling. For consumers, the common link between all four options is a reduction in the use of gas. Single family vehicles are the most common mode of transportation in America. As such, the rising cost of gasoline has had an impact on most of the American public. Offering means to lower these costs will be enticing to anyone in the district that makes use of a car.

Begin encouraging these practices with district staff. Encourage teachers and other staff to carpool and, if possible, walk and bike. This would cut down on their personal fuel costs and set an example for students and parents. The district would benefit from alleviated traffic congestion and additional visitor parking.

Most elementary parents are understandably wary of letting young children transport themselves to school. This results in long lines of individual families dropping off and picking up children by car. Encouraging carpooling, bus riding and walking groups will not just decrease gas bills for the average parent. It will also reduce the traffic congestion issues that occur at the beginning and end of school. Parents would save money in gas and time spent waiting in line.

Middle school parents would face many of the same congestion and cost issues but are more likely to allow their older children transport themselves to school unsupervised. This makes middle school students prime candidates for encouraging walking, biking and riding the bus. Students would gain freedom and learn responsibility for their own welfare. Parents would reduce costs and benefit from regaining the time that was previously spent transporting their children.

In High School, the alternative transportation campaign should target the students directly and parents in a secondary capacity. Though cars are status symbols in High School, gas prices have just as much, if not more, impact on the students that own them. Encourage these students to carpool with each other. They would also be good candidates for walking and bike riding. Turning these into club activities would be another way that students could add to their college resumes and offer an alternative to students that want to maintain a healthy lifestyle but are uninterested in team sports.

#### **How:**

Begin networking with the teachers. Hold a meeting to educate faculty and staff about alternative transportation. Create a sign-up list for those interested in carpooling and organize groups that live near each other. Have teachers at all grade levels distribute a survey to gauge interest in alternative transportation. Create one especially for parents at the elementary and middle school levels and one for students at the middle and high school levels. Start informational campaigns at all levels that emphasize the benefits of walking, biking and carpooling.

In elementary school, work with the PTA to set up a network of parents who want to participate. Create sign-up sheets online and make access available through a hard copy at the school. Set basic rules for alternative transport etiquette. Encourage taking turns between families and being on time for a child's pick up. Give carpooling parents preference at drop off and pick up times. Hold walking and biking safety courses in physical education classes before students begin the walking and biking programs. For walking groups, ensure that pedestrian access routes are safe and well-maintained by the city. Make sure that cyclists have safe access routes and an abundance of convenient, secure storage.

At the middle and high school levels, network directly with the students, while sending home information keeping parents informed. Have student leaders that express an interest in alternative transportation organize groups of people that live near each other and wish to participate. Encourage the same use of an online sign-up sheet as well as a hard copy on campus but direct it at students. Hold safety courses and check the route accessibility just as was done at the elementary level but gear the program towards older children.

Find a high school teacher willing to sponsor a cycling club. In addition to going to and from school, organize weekend and after school bike trips and participate in regional cycling trips with other groups. Insure that the school has plenty of bike storage and that it is accessible through bike routes. If possible, make shower facilities at the gym available to cyclists.

At the high school level, offer incentives to students who choose carpooling. Provide preferred parking near the school for carpooling vehicles and create rewards programs for groups that carpool consistently. If the program becomes more successful, the district can start to reclaim some of the unused parking as green space. Scarcer parking will help ensure that the practice continues.

**Fuel bus fleets with biodiesel:**

## Why:

Switching the district bus fleet to biodiesel is a means for the district to directly benefit from alternative fuel consumption. Biodiesel is a mixture of diesel fuel and renewable, domestic resources. Currently, biodiesel is made from animal fats, such as used cooking oil, and vegetable oils, such as soybean oil.<sup>19</sup> There are studies currently underway to develop biodiesel from non-food sources such as switchgrass and algae.

The most common biodiesel type is B20, which is a mixture of 20 percent renewable sources and 80 percent petroleum diesel. B100 is a type made completely from renewable resources and is also available from fleet suppliers. Busses would require little to no alterations to run on the new fuel type.<sup>20</sup> Since biodiesel is created and supplied by regional producers, using it would aid the American job market and decrease reliance on imported fuels.

## How:

Before using biodiesel in district busses check the vehicle warranties and with the bus companies. If the company recommends slight modifications to the vehicles be prepared to make these changes. Next, check the contract on the district's current fuel supplier. Find out when the contract ends and if it is possible to break. If the district's current supplier makes biodiesel find out what their prices are. If comparable to other suppliers, it may be easier to switch fuel type rather than supplier. If they do not make biodiesel, request estimates from fleet suppliers in the area and work out a contract with the company that best meets the district's needs.

19 "Biodiesel." The National Biodiesel Board. [www.biodiesel.org](http://www.biodiesel.org).

20 Ibid.

“Going green” is not a rigidly defined process. Building sustainable schools provides students with healthier learning environments and reduces operating and maintenance costs faced by administrators. Before reaping these benefits, someone has to fund the increased building cost that comes with building green. This cost most often falls on taxpayers, who can be understandably reticent about paying higher costs. The techniques in this information packet serve to improve the general view of sustainability within the community and make it common practice in many situations. Taken as a whole, the packet provides a comprehensive method that addresses the functionality of existing district facilities and the activities of the students, parents and faculty that use them. Utilizing successful, green practices now acts as a subtle but influential encouragement of increasing sustainable practices in the future.

For additional copies of this document, visit the documents section of our website at [www.shiverarchitects.com](http://www.shiverarchitects.com).