

Cool School Challenge



Classroom Toolkit

Version 2.0 - October 2009

A climate education toolkit to challenge students, teachers, and schools to reduce their carbon footprint.



Cool School Challenge: Classroom Toolkit

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Cool School Challenge



Overview

The Cool School Challenge is an educational program intended to engage students and teachers in practical strategies to reduce carbon dioxide (CO₂) and other greenhouse gas emissions schoolwide. Through improved energy efficiency, reduced consumption, increased recycling and changes in transportation behaviors, Challenge participants will learn how simple actions, taken together, can create a climate of change.

How it works:

With the guidance of a "Challenge Coach," student teams will learn how to conduct a classroom energy audit and identify major sources of CO₂ emissions and opportunities for shrinking them. They will then recruit as many classrooms as possible into the Challenge, helping them measure their CO₂ emissions, setting a CO₂ reduction goal and then developing an action plan for achieving that goal.

The Cool School Challenge can be administered by anyone your school designates to be a Challenge Coach, such as science, math or other teachers, administrators, or leaders of student organizations. The role of the Challenge Coach is to train, support and oversee the Student Challenge Leaders in implementing the program at your school.

Student Challenge Leaders can be any interested class or group of students. Student Challenge Leaders monitor the progress of the participating classrooms and look for ways to motivate and inspire them to achieve the greatest reductions possible. The Cool School Challenge website includes guidelines on how to implement the Challenge, downloadable audit forms for measuring emissions, tips and resources, and other supporting materials. Participating schools have the option of submitting their results and success stories to the Cool School Challenge website.

Goals of the Cool School Challenge

- Educate young people about climate change and everyday actions they can take to reduce their impact locally and globally;
- Reduce carbon dioxide emissions and other greenhouse gas emissions in and around schools;
- Encourage student leadership and empowerment;
- Foster a community of teachers/students working together to reduce their greenhouse gas emissions; and
- Foster a new generation of environmental advocates.

Classroom Activities

The Cool School Challenge includes a collection of classroom activities for grades 7-12 designed to support the implementation of the Challenge at your school. Lessons focus on the connections between energy use, transportation, waste, electricity, and global climate change. Each activity is aligned with Washington Essential Academic Learning Requirements (EALRs) and Grade Level Expectations. All activities can be downloaded at no cost at www.CoolSchoolChallenge.org.

About Us

The Cool School Challenge program was created and developed by Redmond High School environmental science teacher Mike Town in partnership with the Puget Sound Clean Air Agency and Puget Sound Energy's Powerful Choices for the Environment program. Conceptually modeled after the U.S. Mayor's Climate Protection Agreement, the Cool School Challenge aims to inspire and motivate students, teachers, and school districts to think globally but act locally on climate change. At the heart of the Cool School Challenge is the philosophy that big changes start with small steps, and that taken together, individual actions create a world of difference.

Cool School Challenge



Get Started

The Cool School Challenge encourages flexibility and creativity in making it work for your unique situation: there is no right or wrong way to implement the program. You are welcome to use the materials provided here, or adapt them to better suit your needs. As you begin planning your approach, here are some tips and suggestions to help ensure your success.

Notify teachers and administrators

To garner support and buy-in from teachers and administrators, let them know you want to start the Challenge at your school and that you want as much participation from them as possible. You can send a memo or e-mail; arrange to speak at a faculty meeting, etc. See page 5 for a sample introduction memo, which you can tailor for your own use.

Form a team

Build a team to administer the Challenge at your school. Ideally a team will consist of:

- **A Challenge Coach** - such as a teacher, administrator, or interested parent. The program is especially suited for secondary science and math teachers. The role of the Challenge Coach is to train, support and guide students throughout the process. A collection of classroom activities for grades 7-12 are available for Coaches and are designed to accompany the Challenge. All activities are aligned with Washington Essential Academic Learning Requirements (EALRs) and Grade Level Expectations, and can be downloaded at no cost at www.coolschoolchallenge.org.
- **Student Challenge Leaders**. Student Challenge Leaders are any group of students that want to lead the challenge at their school. They might be an entire class, or smaller group of motivated students (Earth Club, or other service organization, for example). Student Challenge Leaders will recruit classroom participation in the Challenge, create CO₂ emission reduction plans for each classroom and, at the end of the Challenge, monitor, evaluate and summarize the school's accomplishments.

Decide on your timeline

You should develop a realistic timeframe for implementing the Challenge. Here for simplicity it's been structured as a four-week program, with emissions savings amortized for one school year. You can certainly keep the Challenge running for a longer period of time! A sample timeline is enclosed on page 6 for guidance.

Develop a participation strategy

Spend some time thinking about how to maximize participation in the Challenge. A lot of the actions we can take to protect the environment are fairly simple, such as turning off the lights or unplugging machines that aren't being used! What are some ways you can motivate and inspire schoolmates to actively participate in the Challenge?

Cool Ideas

- Kick off the Challenge with a school assembly, rally, public announcement or other attention-getting means, so everyone in the school knows what you are doing, why and how they can help.
- Offer a prize or other reward to the classroom(s) that achieve the greatest reductions. Especially consider incentives that are climate-friendly, or further encourage greenhouse-gas reducing behavior. You could hold fundraisers, or ask local businesses to donate prizes.
- Organize a school-wide education campaign to increase awareness about climate change along with the various ways students and teachers can take action. The campaign could include posters, daily announcements, articles in student publications, speaking at faculty meetings, coordinating behavior-changing activities such as a recycling drive, or a Carpool- or Bike-to-School Week, etc.



Cool School Challenge



Sample Introduction Memo

To garner support and buy-in from teachers and administrators, let them know you want to start the Challenge at your school and that you want as much participation from them as possible. Here is some sample language you could use in a memo or e-mail, or as talking points for a presentation to a faculty meeting, etc.

Dear [Teacher, principal, etc.]:

We are concerned about global climate change and believe that through education and action, we can make a difference at our school. That's why as a class project we are initiating a program known as the Cool School Challenge. Through the Challenge, we aim to reduce carbon dioxide (CO₂) emissions for our entire school by encouraging every classroom to take a pledge to reduce ___ pounds of CO₂ over the course of a school year. To help participating classrooms accomplish this goal, we will:

1. Conduct a quick pre-Challenge CO₂ emissions audit for each classroom;
2. Write a Climate Action Plan for each classroom;
3. At the end of the Challenge period, conduct a post-Challenge survey to measure results; and
4. Finally, based on the post-Challenge survey, project how much CO₂ could be reduced by each classroom if these efforts are implemented over the course of a 180-day school year.

Please join us in this effort to reduce CO₂ emissions at our school and to support us in finding solutions to this important community issue. We look forward to your participation!

Sincerely,

[Teacher/Students]

COOL TIPS

- Personalize the language to make it most compelling to your teachers/administration, etc.
- Have all the students in your class sign the memo/email, to demonstrate how many are behind this effort.
- Be sure you indicate how teachers can demonstrate their support or sign up to be part of the Cool School Challenge. Should they email you? Or sign a sheet in the faculty lounge? Give them a method for following up.

Cool School Challenge



Sample Challenge Timeline

You should develop a realistic timeframe for implementing the Challenge. For simplicity, this sample timeline has been structured as a 31-day program, with emissions savings amortized for one school year. This is only a guideline - you can organize your Challenge in whatever manner works best for you, and can certainly keep the Challenge running for a longer period of time!

Step	When?	Who?	What?
Get started	Day 1	Challenge Coaches	Assign Student Challenge Leaders into small teams.
		Coaches/Student Challenge Leaders	Assign student teams to (or let them choose) classrooms to recruit for participation in the Challenge.
		Student Challenge Leaders	Notify teachers about the Challenge and encourage them to participate. (See sample Introductory Memo on page 5 of the "Get Started" section of CoolSchoolChallenge.org.)
		Coaches/Student Challenge Leaders	Develop a participation strategy (<i>optional</i>).
Conduct an audit	Days 2 - 3	Challenge Coaches	Train Student Challenge Leaders how to conduct a CO ₂ emissions survey, using their classrooms as a model.
	Days 4 - 6	Student Challenge Leaders	Conduct the pre-Challenge Classroom Survey before or after school with the teachers of assigned classrooms.

Step	When?	Who?	What?
Create an action plan	Days 7 - 10	Student Challenge Leaders	Write a Cool School Climate Action Plan for each assigned classroom, identifying how each can reduce emissions (can be done as a graded activity).
		Challenge Coaches	Grade and offer feedback on Climate Action Plans (optional).
		Student Challenge Leaders	Present the Climate Action Plans to each teacher and ask if they will 'pledge' their classroom to reduce CO ₂ emissions by taking the actions outlined in the plan.
Take the pledge	Days 11 - 13	Student Challenge Leaders	<ul style="list-style-type: none"> • Collect names of each classroom making the pledge. • Submit the final list to info@CoolSchoolChallenge.org to post your school's goals and participation, and to compare them with those of other schools. • <i>Optional:</i> create a poster, certificate or other kind of signage to recognize each classroom that takes the pledge.
Monitor & evaluate	Days 14 - 25	Student Challenge Leaders	Periodically check in with each classroom to monitor progress and troubleshoot any difficulties with the action plan.
	Days 26 - 28	Student Challenge Leaders	Conduct the post-Challenge survey with the teachers of assigned classrooms.
	Days 29 - 30	Challenge Coach	Show Student Challenge Leaders how to analyze results from the post-Challenge survey and make a result projection using the Cool School Calculator.
		Student Challenge Leaders	<ul style="list-style-type: none"> • Calculate CO₂ emission reduction results for each assigned classroom. • Create a Cool School Report Card for each classroom summarizing the results.
Share your results	Day 31	Student Challenge Leaders	Compile results and submit to info@CoolSchoolChallenge.org , so they can be shared and compared with results of other schools.

Cool School Challenge



Step 1: Conduct an Audit

Now that your Cool School Challenge team is in place and ready to start reducing emissions at your school, the next step is to conduct an audit to identify sources of CO₂. You'll begin by gathering information on classroom electricity use, transportation, heating, and waste generation and recycling. You'll then use this data to estimate your classroom's carbon footprint. Repeat the audit process for other classrooms throughout the school - try to recruit as many teachers as possible to participate! The information gathered in the audits will be used to develop a Cool School Climate Action Plan in Step 2, outlining the various ways the classroom can reduce CO₂ emissions.

Refer to the Classroom Audit Kit to get started!



Cool School Challenge



Step 2: Create a Climate Action Plan

Based on the results of your classroom audits, develop a Climate Action Plan for each classroom to successfully reduce their CO₂ emissions over the course of the school year. Take a look at where most of their emissions are coming from and where it might be possible to change habits and behavior. Turning off half the lights, for example, reduces emissions from lighting by half. Eliminating unnecessary waste - either by conserving, using materials more efficiently or recycling - can reduce the amount of trash that ends up in the landfill which in turn reduces greenhouse gases.

Give each classroom a goal that is attainable - but not too easy. A reduction goal of 2,000 lbs or more per classroom is usually a good place to start. Or the goal could be to reduce emissions by a certain percent. It might be helpful to give teachers a menu of options to choose from, so they can select the actions that are most appropriate for their classroom. Some sample tips are provided on page 10.

Cool Ideas

- The success of the action plan in each classroom depends not only on the teacher, but on all the students who learn in that classroom. Getting them on board is important to meeting your Action Plan goals. If the teacher is willing, arrange to visit their class to speak directly with those students and brainstorm ideas to enhance their experience of the Challenge, such as classroom competitions, games, events, etc.
- Post the Climate Action Plan in a visible location, so everyone is aware of the goals.
- Create "tip signs" near light switches and recycling containers, for example, with reminders to turn things off and recycle properly.
- Identify the "low hanging fruit" and include them in your action plan. Just turning off one panel of lights is an easy way to cut down on electricity use and emissions, and it's something just about every classroom should be able to do for a few hours each day.

HERE ARE SOME TIPS YOU MIGHT INCLUDE:

ELECTRICITY TIPS

- ⇒ **Use the lights less, when possible.**
 - Turning off half the lights will reduce lighting emissions by 50%.
 - Turning off one-third of the lights will reduce lighting emissions by 33%.
 - Turn off lights when the classroom is empty - during lunch, planning periods, etc.
 - Turn off lights at the end of the day.
- ⇒ **Slay energy vampires.** Plug appliances into power strips, and turn the strips off at night. This will significantly reduce phantom loads.
- ⇒ **Flip the switch.** Turn off computers and printers at the end of the day, rather than putting them in sleep mode.

TRANSPORTATION TIPS

- ⇒ **Drive less, and walk, bike, bus, or carpool instead.**
 - Every gallon of gasoline reduced prevents roughly 20 pounds of CO₂ emissions.
 - Walking and biking are zero-emission ways to commute!
 - Sharing a ride with one other person halves your emissions; carpooling with two others reduces your emissions by one-third.

HEATING TIPS

If the classroom has an adjustable thermostat:

- ⇒ **Turn down the heat.** For every degree you turn down your heat, you could reduce your CO₂ up to 500 lbs/year (depending on how your school is heated).

SOLID WASTE TIPS

- ⇒ **Reduce.**
 - Every pound of waste that goes to the landfill creates 1.75 pounds of CO₂ pollution.
Generating less waste = Fewer greenhouse gas emissions
- ⇒ **Reuse.**
 - Using one ream of regular copy paper generates 13 pounds of greenhouse gases. Print and photocopy on both sides of the paper and get twice the use of your paper, and fewer emissions.
 - Use a reusable water bottle or cup instead of buying individual water bottles.
 - Use a reusable coffee tumbler for hot drinks instead of paper, plastic or Styrofoam cups.
- ⇒ **Recycle.**
 - Recycle Recycle Recycle! If the classroom doesn't recycle, start! Every pound of material recycled rather than thrown away prevents 1.75 pounds of CO₂ pollution.
 - Recycle disposable water bottles.
 - Use recycled paper. One ream of paper made from 100% recycled material generates 5 pounds less CO₂ pollution than regular copy paper.

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Step 3: Take the Cool School Pledge

For each teacher who accepts the Cool School Climate Action Plan, have them take a 'pledge' to implement the recommendations in the plan. It's up to you to decide how formal to make the pledge: you could simply collect signatures, or create individual pledge sheets for each teacher to sign with their goal clearly stated (sample template is provided). Or you might post a scorecard in the school commons or other public area with a list of all participating classrooms and their pledged goals - the sky's the limit! Once you decide on your method, Student Challenge Leaders should gather and compile pledges. It's not a bad idea to have a designated "scorekeeper" to create a log of classrooms and their CO₂ reduction goals.

After you have compiled all of your pledges and goals, submit them to CoolSchoolChallenge.org so you can compare your progress with other schools. Just fill out the online form at:

<http://coolschoolchallenge.org/take-the-pledge.aspx>.

Cool Ideas

- To motivate students and teachers to participate, create signs, posters or other fun visuals to place in each classroom that takes the pledge, so other students and teachers know who in the school is committed to protecting the climate and reducing greenhouse gas emissions.
- One school sent weekly emails to participating classrooms with different climate 'tips' and reminders on ways to protect the planet.
- You could also post each classroom's action plan in a highly visible location, so everyone who uses that classroom can be aware of the goals.



Cool School Challenge



Cool School Pledge

This classroom is concerned about global climate change and believes that through education and action, we can make a difference at our school. That's why we are participating in the Cool School Challenge, and hereby pledge to reduce our classroom carbon dioxide (CO₂) emissions.

Our CO₂ reduction goal: _____

Signed by _____

(teacher signature)

Print name _____ Classroom _____

Date: _____



Cool School Challenge



Step 4: Monitor & Evaluate

If possible, Student Challenge Leaders should periodically check in with each classroom to monitor progress and troubleshoot any difficulties with implementing the recommendations in the Climate Action Plan. Then at the end of the time allocated for your Challenge, Student Challenge Leaders will:

1. Using the Classroom Survey from Step 1, return to each classroom participating in the Cool School Challenge and conduct a post-Challenge survey to assess progress toward achieving their CO₂ emission reduction goals from electricity, solid waste, transportation and heating.
2. As you did in Step 1: Conduct an Audit, you'll once again calculate the emissions for each classroom with the results of the Post-Challenge survey. This will allow you to project the amount of CO₂ the classroom would save in one school year, if they continued the activities outlined in their Climate Action Plan. *Note: Savings are based on the assumption that each classroom will maintain throughout the school year the climate-friendly actions they've adopted.*
3. (Optional) Prepare a Cool School Challenge Report Card for each classroom, summarizing the results of #2 above.

Refer back to the Classroom Audit Kit to finish!

OPTIONAL: PREPARE REPORT CARDS

Once you've tallied up your results, prepare Cool School Challenge report cards for each classroom, letting them know their progress toward reducing their CO₂ emissions. You might highlight areas where they did exceptionally well, or point out areas where a little more effort could have resulted in greater emission reductions. Or you might recognize different levels of achievement - bronze, silver, gold, for example, or a star-system. Whatever your approach, get creative - have fun!



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Step 5: Share your results!

Tally the results for all classrooms and share them with everyone who participated: the principal, the whole school, or even your school board. Hopefully your school successfully met, and even exceeded, its Cool School Challenge goals!

The Cool School Challenge project team would love to hear how your school did, and with your permission will post your results on CoolSchoolChallenge.org to share your achievements with other schools and community members. You can see how your school compares with other schools in the area and share any tips and strategies that might help other schools meet their goals. Just complete and send in the results form on page 15. Thank you!

Cool Ideas

- So what now? Build on the momentum you've started and think of other creative ways to keep cool, either as a classroom, student activity group or team, or on your own.
- Challenge another school in your district to meet or beat your emission reductions.
- Make a commitment to revisit your climate action plans, either next term or next school year, to identify any areas where you could potentially do more.



Cool School Challenge



Send us your results!

The Cool School Challenge project team would love to hear how your school did and, with your permission, will post your results on CoolSchoolChallenge.org to share your achievements with other schools and community members. You can see how your school compares with other schools in the area, and share any tips and strategies that might help other schools meet their goals. Either fill out the online form at <http://coolschoolchallenge.org/share-your-results.aspx>, or complete the form below and send it to us via email or fax. The School Tally Sheet may help you tally your school results. For more information about to use the School Tally Sheet, see page 44.

Send via E-mail to:
info@CoolSchoolChallenge.org

Send via Fax to: 206-343-7522

Send via mail to:
Cool School Challenge
c/o Puget Sound Clean Air Agency
1904 Third Avenue, Suite 105
Seattle, WA 98101

Cool School Challenge Results for:

Your name: _____

Email address: _____

Your school/address: _____

School district: _____

How many classrooms took the Challenge? _____

By how many pounds did your school **pledge** to reduce its CO₂ emissions? _____

By how many pounds will your school **actually** reduce its CO₂ emissions? _____

Did you find it easy, or difficult, to reach your goals? Explain.

What tips or suggestions would you like to share with other schools interested in participating in the Cool School Challenge to help them reach their goals?

Cool School Challenge



Classroom Audit Kit

This kit accompanies [Step 1: Conduct an Audit](#) and [Step 4: Monitor & Evaluate](#). It includes:

- ♦ **Classroom Survey**. Use the Survey to gather data about classroom electricity use, heating, waste generation and recycling, and transportation both before and after the Challenge.
- ♦ **Classroom Carbon Calculator**. The enclosed worksheets will help you calculate classroom emissions based on the results of the Survey. You will compare before-and-after totals to measure your school's progress toward reducing its climate impact.
 - **To streamline calculations**, you can also use the Classroom Carbon Calculator Excel spreadsheet available at coolschoolchallenge.org.

Instructions:

You'll conduct the audit process twice: at the beginning of the Challenge as part of [Step 1](#), where you will collect baseline information about current classroom behaviors that may be contributing to its carbon footprint, and then again in [Step 4](#) after you've implemented your Climate Action Plan, to see how well each classroom did at reducing its climate impact. This information will help you project the CO₂ reductions possible if the classroom continued climate-protecting behaviors for the entire school year.

1. Begin by reviewing the background information in the Classroom Survey.
2. Conduct the Survey.
3. Use the information gathered in the Survey to estimate classroom emissions in the Classroom Carbon Calculator.

Hint: Be sure to keep your "Pre-Challenge" survey results and calculations from [Step 1](#) handy so you can compare results in [Step 4](#).



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Classroom Survey

Use the enclosed "Classroom Survey" form (or feel free to create your own!) to gather data about classroom electricity use, transportation, heating, and waste generation and recycling habits. Survey each classroom twice: first at the *beginning* of the Challenge to gather preliminary data and then again at the *end* of the Challenge, to see whether classrooms successfully met their CO₂ emissions reduction goals. To help get you started, review this background information on each of the categories you'll be auditing.

Background information

Electricity Electricity used by schools for lighting and powering computers, televisions and other devices contributes to emissions of carbon dioxide (CO₂), a greenhouse gas. Reducing the amount of electricity used can help lower CO₂ emissions. In this part of the Classroom Survey you'll take a look at how much energy is being used to light the classroom, power computers and other electrical devices, and also hunt for energy "vampires."



LIGHTING

Most classrooms are lit by overhead light panels, commonly equipped with 32-watt fluorescent bulbs. In conducting your audit, look for the number and type of bulbs powered by each light switch, as well as for any other lights that might be in the classroom (such as desk lamps). If you cannot find the wattage of the bulbs, use 32-watts as your default or check with your custodian. Also find out how many hours the lights are kept on during a typical school day.



ENERGY "VAMPIRES"

Lights aren't the only devices that use electricity. Take a look around the classroom. In addition to classroom lights, what else is using electricity? Are there any computers, projectors or DVD/VCR players? Appliances suck up energy even when they are not being used - which is why they are sometimes referred to as "energy vampires." Vampires include devices with digital clocks (like DVD players) or internal remote control sensors (like some televisions), which draw energy just from being

Cool School Challenge – Classroom Survey

plugged in. Reducing vampire loads is as easy as plugging the appliance into a power strip and then turning off the power strip when not in use. Because computers and other electronics are usually put to good use during school sessions, this exercise focuses only on what happens to electronic equipment *after* school hours to see how much energy is being wasted.

In this part of the Classroom Survey, take an inventory of the different electric devices and find out whether they are left on in “active” mode overnight, put to “sleep” or turned completely “off.” Refer to the table below for a description of the different operating modes. If devices are plugged into a power strip, find out whether the power strips are actually turned off at the end of the day.

COMMON OPERATING MODES FOR ELECTRIC DEVICES

MODE	
“Active”	Device is on and serving its primary function. (Example: a DVD player playing a movie, or a computer running a program.)
“Sleep/Standby”	Device is in low-power mode. (Example: DVD player is on but not playing a disc; computer is on but in power-save/sleep mode.)
“Off”	Device is turned off but still plugged in and ready for action. (Example: DVD player is turned off but could be activated by remote. Digital displays will be visible.)
“Power strip/ Unplugged”	Device is plugged into a power strip, which is turned off at the end of the day. Or - the electronic device is unplugged. (Example: DVD player is receiving NO power. Digital display is NOT on and cannot be activated by remote.)

ELECTRICAL APPLIANCES (OPTIONAL)

During the school day, energy “vampires” and other appliances transform into useful tools to help you learn. Nonetheless, you might want to know how much energy they consume during active use. In conducting your audit, look for the wattage of each classroom appliance and estimate how many hours each day the device is on. If the wattage is not listed on the appliance, you can still estimate it by finding the current draw (in amperes) and multiplying that by the voltage used by the appliance. Most appliances in the United States use 120 volts. The amperes might be stamped on the appliance in place of the wattage. If not, find a clamp-on ammeter – an electrician’s tool that clamps around one of the two wires on the appliance—to measure the current flowing through it. You can obtain this type of ammeter in stores that sell electrical and electronic equipment. Take a reading while the device is running: this is the actual amount of current being used at that instant. If you cannot find or measure the current draw, the average wattages for typical pieces of classroom equipment are listed in **Section 1: Electricity References**.



Transportation

How 'carbon-ated' is your commute? Different ways of getting to and from school affect our climate differently. Some options, such as driving alone in an inefficient, low mileage vehicle, generate more carbon dioxide emissions than others, such as riding a bike, taking the bus or walking. For simplicity, the Classroom Survey focuses just on how the teacher of your assigned classroom gets to and from school. (For the über-dedicated climate crusaders, you can assess the transportation choices of the entire student body by conducting the Transportation Survey.) Find out how far and by what means each teacher travels to and from school each day. For teachers that drive, ask what kind of mileage their vehicle gets. If they aren't sure, ask for the make and model of their car and look it up at www.fueleconomy.gov.

Heating

Keeping schools warm and cozy inside when it's cool outside uses a lot of energy, which in turn generates CO₂ emissions. Measuring these emissions and finding ways to reduce them can be challenging and depend on many variables. For example, the type of fuel used to generate heat, the number of windows, the quality of insulation, and the age and location of the school building all figure into energy use and related CO₂ emissions. Most of these are variables that individual students and teachers have no control over. One thing students and teachers *can* do, though, is adjust classroom temperature, if there is a controllable thermostat. For this category of the Classroom Survey, find out if the classroom has a controllable thermostat and, if so, to what temperature it is set.



No control? Classrooms without controllable thermostats cannot do much to influence how much energy they use for heat, but there are other ways to save CO₂ through simple behavioral changes. For example, closing and opening windows or doors can affect the amount of energy that classrooms use. Include some of these tips in your Action Plan.

Solid Waste/Recycling



Every person in Washington generates about 8 pounds of waste per day, on average.¹ Over the course of one school year (180 days), that adds up to 1,440 pounds of waste per person! Waste affects the environment in a number of ways, ranging from the greenhouse gases released after it's dumped in a landfill and the emissions associated with transporting that waste to the landfill, to the emissions generated just to produce that item in the first place. According to the U.S. Environmental Protection Agency, each pound of waste produces roughly

Cool School Challenge – Classroom Survey

1.75 pounds of greenhouse gas pollution as it journeys from your trash can to the landfill.² Fortunately, there are many ways to shrink your waste – and greenhouse gas emissions – by reducing, reusing and recycling.

In this section of the Classroom survey you will look at how much trash each classroom generates in a week. Also examine whether wasteful habits are in practice – such as using only one side of paper for printing/copying, or drinking bottled water or coffee from a paper cup, instead of using a reusable container. Just one ‘grande’ size paper coffee cup is responsible for one-quarter pound of greenhouse gas pollution.³ Does the classroom recycle? Americans use roughly 60 billion plastic bottles every year – nearly 7 million an hour – yet only one bottle out of every five is recycled.⁴ Filling a reusable water container or bringing your own mug helps reduce waste, save resources and cut down on emissions.

¹ *Source:* Washington State Department of Ecology, “Solid Waste in Washington State: 16th Annual Status Report.” December 2007. <http://www.ecy.wa.gov/pubs/0707048.pdf>

² Derived from the U.S. Environmental Protection Agency WARM Calculator. http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_Form.html

³ *Source:* Environmental Defense and Pew Charitable Trust, http://www.edf.org/documents/523_starbucks.pdf

⁴ *Source:* Container Recycling Institute, <http://container-recycling.org/images/plastic/graphs/PETrecsale-units-96-06.gif>

Classroom Survey

Survey conducted for _____

Survey conducted by _____

Date: _____

ELECTRICITY ~CLASSROOM LIGHTING

Switch	How many bulbs per switch?	Watts per bulb	# of hours per day the switch is on	
			Pre-Challenge	Post-Challenge
1				
2				
3				
4				
5				

ELECTRICITY ~ENERGY “VAMPIRES”

Electronic Device	How many?	End of Day: (check one)							
		“Active” (on and performing main function)		“Sleep/Standby” (on, ready-for-action but not in use)		“Off” (turned off, but still plugged in)		“Power strip” (Plugged into power strip, which is turned off at end of day)	
		Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge
Desktop computer									
Computer monitor, -conventional (CRT)									
Computer monitor, flat screen (LCD)									
Laptop computer									
Printer									
DVD/VCR Player									
LCD Projector									
Television									
DVR/TiVo									

TRANSPORTATION, HEATING, & SOLID WASTE

CATEGORY		PRE-CHALLENGE	POST-CHALLENGE
TRANSPORTATION	1. What is the roundtrip distance the teacher travels to and from school each day?	_____ miles	_____ miles
	2. How many days per week does the teacher use each mode of transportation to get to school?	_____ Drive alone _____ Carpool _____ Walk, bike or bus	_____ Drive alone _____ Carpool _____ Walk, bike or bus
	⇒ If the teacher drives alone or carools, what is the car's fuel efficiency in miles per gallon (mpg)?	_____ Drive alone mpg _____ Carpool mpg	_____ Drive alone mpg _____ Carpool mpg
	⇒ If unknown, what is the make and model of the car? (so you can look up its fuel economy online)		
	⇒ If the teacher carools, how many people total are in the carpool?	_____ passengers	_____ passengers
HEATING	1. Is there a controllable thermostat in the classroom?	Yes No	-- SAME --
	2. If so, to what temperature is it set?	_____ degrees	_____ degrees
SOLID WASTE/RECYCLING	1. Approximately how many full bins of trash does the classroom generate each week?	_____ Full bins	_____ Full bins
	2. What is the net weight of a full bin of trash - that is the weight of the trash without the bin?	_____ pounds	_____ Pounds
	3. Does the classroom recycle?	Yes No	Yes No
	⇒ If yes, what does the classroom recycle? <i>Check all that apply:</i>	_____ Paper _____ Plastic _____ Aluminum cans _____ Glass	_____ Paper _____ Plastic _____ Aluminum cans _____ Glass
	4. Approximately how many reams of paper are used by the classroom per week?	_____ reams	_____ reams
	⇒ What is the recycled content of the paper?	_____ % recycled	_____ % recycled
	⇒ Are both sides of the paper used for printing?	Yes No	Yes No
	5. If the teacher drinks bottled water, approximately how many plastic water bottles does he/she use each week?	_____ bottles	_____ bottles
	⇒ Most of the time, are the bottles usually recycled, or thrown away?	Recycled Thrown away	Recycled Thrown away
	6. If the teacher drinks coffee/tea or other beverages, does he/she use his/her own mug?	Yes No	Yes No
⇒ Approximately how many disposable cups does he/she consume in a week?	_____ cups	_____ cups	

Cool School Challenge



Classroom Carbon Calculator

With your completed Classroom Survey handy, it's now time to calculate the CO₂ emissions from each classroom you audited. Follow the steps below and record your information on the enclosed **Worksheets**. Note that you will complete this process twice: first to estimate the classroom's emissions *before* the Challenge, and then again at the *end* of the Challenge to measure progress toward meeting classroom Challenge goals.

The Classroom Carbon Calculator includes:

- **Section 1: Electricity**
 - **Worksheet 1A**: Classroom Lighting
 - **Worksheet 1B**: Energy Vampires
 - **Worksheet 1C**: Classroom Appliances (OPTIONAL)
 - **Worksheet 1D**: Calculate kWh and Cost Savings (OPTIONAL)
 - **Electricity References**
- **Section 2: Transportation**
 - **Worksheet 2**: Transportation
- **Section 3: Classroom Heating**
 - **Worksheet 3**: Classroom Heating
- **Section 4: Solid Waste/Recycling**
 - **Worksheet 4A**: Classroom Trash
 - **Worksheet 4B**: Classroom Paper Use
 - **Worksheet 4C**: Plastic Water Bottles
 - **Worksheet 4D**: Disposable Beverage Cups

Note: To streamline or check your calculations, you can also use the Excel spreadsheet available at coolschoolchallenge.org.

Cool School Challenge



Section 1: Electricity

To calculate emissions from classroom electricity use, first estimate the electricity consumed by classroom lights, energy vampires and other appliances (*optional*) in kilowatt-hours (kWh). Next, calculate the CO₂ emissions generated from that electricity. Finally, compare the CO₂ emissions before and after the Challenge. Did the classroom shrink its footprint?



CLASSROOM LIGHTING

1. Estimate electricity from lighting in kWh

- Record the data gathered in your Classroom Survey into the appropriate columns of **Worksheet 1A: Classroom Lighting**.
- Calculate the total kWh used by classroom lights during the Challenge.

Electricity is measured in kilowatt-hours (kWh)

1 kilowatt = 1000 watts

kWh = kilowatts x hours the lights are on

2. Estimate CO₂ emissions from lighting

- First, select the utility that provides electricity to your school from the box in **Section 1: Electricity References**. This will let you know how many pounds of CO₂ the utility creates per kilowatt-hour of electricity. This is called the "CO₂ conversion factor." If you do not know your school's electricity provider, or if it isn't listed, just use the Washington State or national average.
- Record the appropriate CO₂ conversion factor for your school's utility on **Worksheet 1A**.
- Determine how many pounds of CO₂ the classroom lighting generates each day by multiplying the "Total kWh per day" by the utility's CO₂ conversion factor. Enter your result in Column 8.

Pounds (lbs) of CO₂ emissions = conversion factor x kWh

- Add it all up!** How many pounds of CO₂ would the classroom generate if it used the same amount of electricity for lighting *all year*? Record your answer in the "Summary of Results" box.

ENERGY VAMPIRES

Similar to your approach with classroom lighting, begin by first estimating the electricity consumed by energy vampires (appliances that suck up energy even when they aren't in use) in kWh; then calculate the associated CO₂ emissions. This will measure the "phantom load" of the classroom. Finally, at the end of the Challenge, compare CO₂ emissions before and after the Challenge, to see how much progress the classroom made toward shrinking its carbon impact.



1. Estimate electricity from energy vampires in kWh.

- Record the data gathered in your Classroom Survey into the appropriate columns of **Worksheet 1B: Energy Vampires.**
- Refer to **Section 1: Electricity References** to determine the wattage of each appliance in different operating modes and record your information into Worksheet 1B. **For any appliance that is either unplugged, or plugged into a power strip AND turned off at night, record a "0" in the Watts per Hour column.**
- Convert the watts to kilowatts and then to kilowatt-hours, based on a 16-hour 'night.' Record your answers in the "Classroom Results" section of Worksheet 1B.

Note:

⇒ Assume the devices are actively being used during an 8-hour school day. This exercise will only measure kWh used during the 16 hours *outside* regular school hours to see how much energy is being wasted.

Electricity is measured in kilowatt-hours (kWh)

1 kilowatt = 1000 watts

kWh = kilowatts x hours the appliance is on

2. Estimate CO₂ emissions from energy vampires.

- As you did with Classroom Lighting, first select the utility that provides electricity to your school from **Section 1: Electricity References**(page 32). This will let you know how many pounds of CO₂ the utility creates per kilowatt-hour of electricity. This is called the "CO₂ conversion factor." If you do not know your school's electricity provider, or if it isn't listed, just use the Washington State or national average.
 - Enter the appropriate CO₂ conversion factor for your school onto **Worksheet 1B.**
 - Determine how many pounds of CO₂ energy vampires generate each day by multiplying the "Total kWh consumed per night" by the utility's CO₂ conversion factor.
3. **Add it all up!** How many pounds of CO₂ would the classroom generate if energy vampires sucked up the same amount of electricity *all year*? Record your answer in the "Summary of Results" box.

CLASSROOM APPLIANCES (OPTIONAL)

Similar to your approach with classroom lighting and energy vampires, begin by first estimating the electricity consumed by classroom appliances in kWh; then calculate the associated CO₂ emissions. Finally, at the end of the Challenge, compare CO₂ emissions before and after the Challenge, to see whether the classroom made any changes.

1. Estimate electricity from electrical appliances in kWh.

- Record the data gathered in your Classroom Survey into the appropriate columns of **Worksheet 1C: Classroom Appliances**.
- Refer to **Section 1: Electricity References** to determine the wattage of each appliance when in use and record your information into Worksheet 1C.
- Convert the watts to kilowatts and then to kilowatt-hours, based the hours per day each device is on. Record your answers in the "Classroom Results" section of Worksheet 1C.

Note:

Electricity is measured in kilowatt-hours (kWh)

1 kilowatt = 1000 watts

kWh = kilowatts x hours the appliance is on

2. Estimate CO₂ emissions from classroom appliances.

- As you did with Classroom Lighting and Energy Vampires, first select the utility that provides electricity to your school from **Section 1: Electricity References** (This will let you know how many pounds of CO₂ the utility creates per kilowatt-hour of electricity. This is called the "CO₂ conversion factor." If you do not know your school's electricity provider, or if it isn't listed, just use the Washington State or national average.
 - Enter the appropriate CO₂ conversion factor for your school onto **Worksheet 1C**.
 - Determine how many pounds of CO₂ classroom appliances generate each day by multiplying the "Total kWh consumed per night" by the utility's CO₂ conversion factor.
- Add it all up!** How many pounds of CO₂ would the classroom generate if classroom appliances used the same amount of electricity *all year*? Record your answer in the "Summary of Results" box.
 - Calculate kWh and Cost savings!** How many kWh does your classroom save per year? How many dollars will your school save because of your reduced electricity use? Record your answer in the "Summary of Results" box.

Worksheet 1B: CALCULATE EMISSIONS FROM ENERGY VAMPIRES

Utility Conversion Factor
_____ lbs CO₂ per kWh

1. Enter the CO₂ Conversion Factor for your school's utility in box at right
2. Record data from your Classroom Survey into the table below.
3. Refer to **Section 1: Electricity References** to find the "Watts per Hour" for the operating mode of each device.
4. Calculate emissions from ENERGY VAMPIRES by multiplying total kWh by the CO₂ conversion factor.

INPUT CLASSROOM DATA HERE

CLASSROOM RESULTS:

Electronic device	How many?	End of day operating mode		Watts per hour		Total kWh consumed overnight		Total CO ₂ emissions per 16-hour "night" (lbs)	
		Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge
Desktop computer						=		=	
Computer monitor, conventional (CRT)						=		=	
Computer monitor, flat screen (LCD)						=		=	
Laptop computer						=		=	
Printer						=		=	
DVD/VCR Player						=		=	
LCD Projector						=		=	
Television, Conventional or LCD						=		=	
DVR/TiVo						=		=	
Total lbs of CO ₂ emissions from vampires per 'night':									

SUMMARY OF RESULTS

1. Enter the pre-and post-Challenge "nightly" CO₂ totals into the appropriate boxes, to the right.
2. Now estimate the annual emissions, and enter the results in the appropriate boxes to the right. (Hint: there are 180 days in a typical school year.)

	CO ₂ Emissions per 'night' (lbs)	CO ₂ Emissions per 180-day school year (lbs)
Pre-Challenge	<input type="text"/>	<input type="text"/>
Post-Challenge	<input type="text"/>	<input type="text"/>

Worksheet 1C: CALCULATE EMISSIONS FROM CLASSROOM EQUIPMENT

1. Enter the CO₂ Conversion Factor for your school's utility in box at right.
2. Record data from your Classroom Survey into the table below.
3. Refer to **Section 1: Electricity References** to find the "Watts per Hour" for the operating mode of each device.
4. Calculate emissions from ENERGY VAMPIRES by multiplying total kWh by the CO₂ conversion factor.

Utility Conversion Factor
_____ lbs CO₂ per kWh

INPUT CLASSROOM DATA HERE

CLASSROOM RESULTS:

Electronic device	How many?	Hours on per day		Watts per hour	=	Total kWh consumed per day		=	Total CO ₂ emissions per day (lbs)	
		Pre-Challenge	Post-Challenge			Pre-Challenge	Post-Challenge		Pre-Challenge	Post-Challenge
					=			=		
					=			=		
					=			=		
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					=			=		
					=			=		
					=			=		

Total lbs of CO₂ emissions from appliances per day:

--	--

SUMMARY OF RESULTS

1. Enter the pre-and post-Challenge daily CO₂ totals into the appropriate boxes, to the right.
2. Now estimate the annual emissions, and enter the results in the appropriate boxes to the right. (Hint: there are 180 days in a typical school year.)

	CO ₂ Emissions per day (lbs)	CO ₂ Emissions per 180-day school year (lbs)
Pre-Challenge		
Post-Challenge		

Worksheet 1D: ****OPTIONAL**** CALCULATE KWH AND COST SAVINGS

With this worksheet you can calculate how much energy the classroom could save each year, as well as the potential cost savings of using less electricity.

How much electricity could the classroom save each year?

- Record your pre-and post-Challenge electricity data from Worksheets 1A, 1B and 1C into the table below.
- Calculate kWh savings by subtracting the Post-Challenge result from the Pre-Challenge.

INPUT CLASSROOM DATA HERE:

Electricity Category	Total kWh consumed per year	
	Pre-Challenge	Post-Challenge
Classroom Lighting		
Energy "Vampires"		
Other Appliances		
Totals:		

CLASSROOM RESULTS:

Annual kWh savings per 180-day school year

How much money could the classroom save each year by reducing electricity use?

- Enter the cost per kWh for your school's region in box at right. (You'll find this in **Electricity References**)
- Calculate the **cost** of the electricity consumed by your classroom in both the pre and post-Challenge.
- Calculate the cost savings by subtracting the Post-Challenge cost from the Pre-Challenge cost.

Cost per kWh:
_____ \$ per kWh

INPUT CLASSROOM DATA HERE:

Electricity Category	Total kWh consumed per year	
	Pre-Challenge	Post-Challenge
Classroom Lighting		
Energy "Vampires"		
Other Appliances		

CLASSROOM RESULTS:

	Total \$\$ spent on electricity per year			=	Total \$ saved per 180-day school year
	Pre-Challenge	Post-Challenge			
⇒	\$	\$	-	=	\$
⇒	\$	\$	-	=	\$
⇒	\$	\$	-	=	\$
Totals:	\$	\$	-	=	\$

SUMMARY OF RESULTS

Total kWh Savings per Year:

Total \$\$ Saved per year:

Section 1: Electricity References

Here you will find information about utility conversion factors (how many pounds of carbon dioxide are emitted per kilowatt-hour of electricity, as well as the different operating modes and wattages for energy *vampires*.

Note: See Methodology Note 1 for an explanation of how the utility conversion factors were derived, or to derive one for your specific utility.

Utility CO ₂ Conversion Factors	
Pounds (lbs) CO ₂ per kWh by utility	
Utility	Lbs CO ₂ per kWh
Puget Sound Energy	1.03
Seattle City Light	0.04
Snohomish County Public Utility District	0.19
Tacoma Power	0.08
Washington state average	0.5
National average	1.39

Source: 2009 Utility Fuel Mix Report, State of Washington Department of Commerce, 2009.
<http://www.commerce.wa.gov/site/539/default.aspx>

WATTAGE OF SELECT ENERGY VAMPIRES IN COMMON OPERATING MODES

COMMON OPERATING MODES FOR ELECTRONIC DEVICES	
MODE	DESCRIPTION
"Active"	Device is on and serving its primary function. (Example: a DVD player playing a movie, or a computer running a program.)
"Sleep/Standby"	Device is in low-power mode. (Example: a DVD player is on, but not playing a disc, or a computer is on, but in power-save mode.)
"Off"	Device is turned off, but still plugged in and ready for action. (Example: DVD player is turned off, but could be activated by remote. Digital displays will be visible.)
"Power strip/Unplugged"	Device is plugged into a power strip, which is turned off at the end of the day. Or - the electronic device is unplugged. (Example: DVD player is receiving NO power. Digital display is NOT on and cannot be activated by remote.)

Appliance	Off (but plugged in)	"Sleep": On but not in use	Active (on and in use)
	(watts)	(watts)	(watts)
Desktop Computer	4 watts	17 watts	68 watts
Laptop Computer	1 watt	3 watts	22 watts
Conventional (CRT) Monitor	2 watts	3 watts	70 watts
Flat screen (LCD) Monitor	1 watt	2 watts	27 watts
Multi-Function Printer/Scanner/Copier	6 watts	9	15 watts
LCD Projector	3 watts	6 watts	230 watts
Television, <40" CRT or LCD	1.5 watts	N/A	72 watts
DVD/VCR player	1 watt	5 watts	11 watts
DVR/TiVo	37 watts	37 watts	37 watts

Sources: Compiled from Puget Sound Energy and ECOS Consulting, 2006: Final Field Research Report for the California Energy Commission; available from the American Council for an Energy Efficient Economy; <http://aceee.org/consumerguide/electronics.htm>

Cost per Kwh		
Energy source	Cost	Units
Electricity (WA)	\$0.07	\$/kWh
Electricity (US)	\$0.10	\$/kWh

Source: Energy Information Administration, average prices for 2008-2009

Cool School Challenge



Section 2: Transportation

Using the findings from the Classroom Survey, calculate the teacher's CO₂ emissions from his/her commute to and from school.



1. Estimate the amount of fuel burned per day from the teacher's commute.

- Enter your data from the Classroom Survey on Worksheet 3: Transportation.
- Calculate how many gallons of gas are burned per commute.
- If the teacher carools, determine how many gallons are burned per person. Do this by dividing total gallons burned by the carpool vehicle by the total number of passengers in the carpool.
- If the teacher walks, bikes or rides the bus to school, fuel burned = ZERO.

Gallons used per day = Miles traveled per day ÷ mpg

Lbs of CO₂ per day = 20 lbs CO₂ x gallons used per day

2. Estimate CO₂ emissions from the teacher's commute.

- If the teacher carools, divide total emissions by the number of people who share the ride.
- If the teacher walks, bikes or rides the bus to school, CO₂ emissions equal ZERO*.

3. Add it all up! How many pounds of CO₂ would be produced if the teacher commuted the same way *all year*? Record your answer in the "Summary of Results" box.

* Although buses produce emissions, they run regardless of the number of passengers they carry. For the purpose of this exercise it is assumed that a teacher who rides the bus is not generating any *additional* emissions.

Worksheet 2: TRANSPORTATION

Roundtrip distance traveled
_____ miles per day

INPUT CLASSROOM DATA HERE:

Transportation Mode	Pre-Challenge	Post-Challenge
If the teacher ever <u>drives alone</u> to school:		
What is the mileage of the vehicle he/she drives? (mpg)		
How many days per week does the teacher drive alone to work?		
If the teacher ever <u>carpools</u> to school:		
What is the mileage of the carpool vehicle? (mpg)		
What is the total number of people traveling in the carpool?		
How many days per week does the teacher carpool to work?		
If the teacher ever <u>walks, bikes or rides the bus</u> to school:		
How many days per week does the teacher commute by walking, biking or riding the bus?		

CLASSROOM RESULTS:

Carbon Impact	Pre-Challenge	Post-Challenge
⇒ Gallons of gasoline burned each day:		
⇒ Gallons of gasoline burned each week:		
Pounds of CO ₂ emitted per week:		
⇒ Gallons of gasoline burned each day:		
⇒ Gallons of gasoline burned per person each day:		
⇒ Gallons of gasoline burned per person each week:		
Pounds of CO ₂ emitted per person per week:		
⇒ Enter a "0". These climate-friendly modes of transportation do not generate any additional emissions.		

SUMMARY OF RESULTS

- Sum the weekly pounds of CO₂ emitted from driving alone, carpooling, walking, biking, and riding the bus and enter the pre-and post-Challenge weekly CO₂ totals into the appropriate boxes, to the right.
- Now estimate the *annual* emissions, and enter the results in the appropriate boxes to the right.
(Hint: there are 36 weeks in a typical school year)

	CO ₂ emissions per week (lbs)	CO ₂ emissions per 36-week school year (lbs)
Pre-Challenge	<input type="text"/>	<input type="text"/>
Post-Challenge	<input type="text"/>	<input type="text"/>

Cool School Challenge

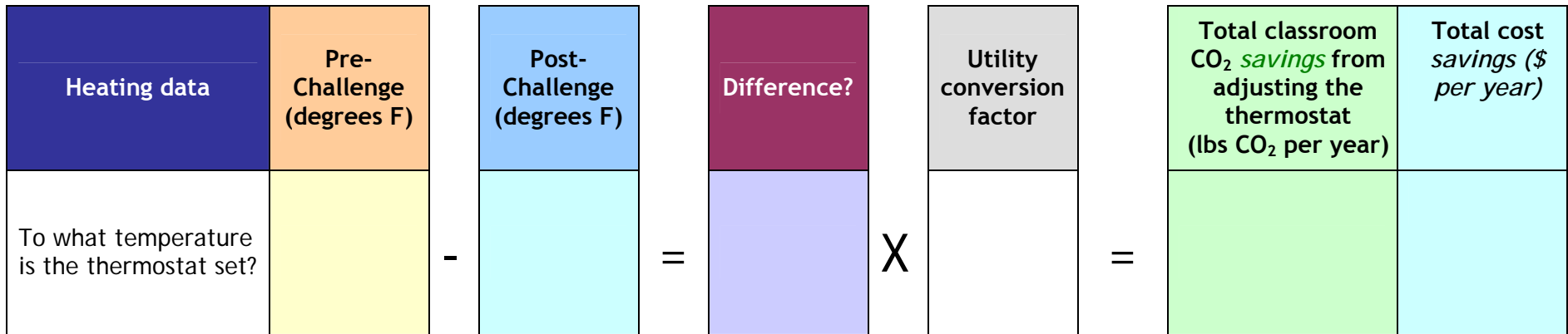


Section 3: Heating

Complete this section only if the classroom has an adjustable thermostat and during the Challenge, turned down the temperature. Rather than calculate the emissions *generated* from heating as in other sections, here you will estimate the emissions that could be *prevented* by turning down the heat.

1. **Find out how your school is heated.** Is your school heated by natural gas? Fuel oil? Electricity? If electricity, who is your school's utility? The type of fuel used to heat your school affects its carbon impact. Refer to the "Conversion Factors" table below to find the source of energy that most closely fits your school. If you don't know how your school is heated, just use the "National Average." Enter this value in the appropriate place in **Worksheet 4: Classroom Heating**.
2. **Estimate CO₂ emissions from classroom heating.**
 - a. Enter data from the Classroom Survey into the appropriate columns.
 - b. Did the classroom turn down its thermostat during the Challenge? If so, by how many degrees?
 - c. Calculate emissions savings by multiplying the number of degrees the thermostat was turned down by the conversion factor for your utility.
3. **Estimate cost savings.**
 - a. Calculate cost saving based on the figures in the Cost Savings table on the worksheet.

➔ Worksheet 3: CLASSROOM HEATING



Conversion Factors			
Pounds (lbs) of CO ₂ saved per year per degree thermostat is turned down, by utility and energy source.			
Utility	Electricity	Natural gas	Fuel oil
Puget Sound Energy	397.5		
Seattle City Light	7.5		
Snohomish County Public Utility District	67.5		
Tacoma Power	22.5		
National Average	510		
Other		113.5	167.8

Cost Savings	
Dollars saved per year per degree thermostat is turned down, by source and region.	
Energy source	Cost
Electricity (WA)	\$26.25
Electricity (US)	\$37.50
Natural gas (WA)	\$1.16
Natural gas (US)	\$1.16
Fuel oil (US)	\$27.80

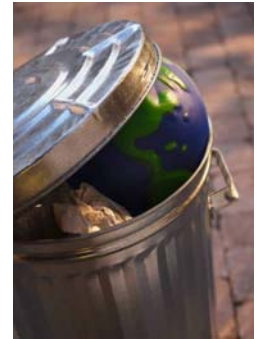
Note: Refer to Methodology Note 2 for explanation on how these factors were derived.

Cool School Challenge



Section 4: Solid Waste/Recycling

Using the findings from the Classroom Survey, calculate the classroom's CO₂ emissions and savings from solid waste and recycling. At the end of the Challenge you'll explore how well the classroom did in reducing, reusing and recycling and see how generating less waste and using materials more efficiently helped the climate!



CLASSROOM TRASH

Follow the instructions on [Worksheet 4A: Classroom Trash](#) to:

1. Estimate the amount of trash (in pounds) generated by the classroom each week;
2. Estimate CO₂ emissions from classroom trash; and
3. **Add it all up!** How many pounds of CO₂ would the classroom produce if it generated the same amount of garbage *all year*? Record your answer in the "Summary of Results" box.

CLASSROOM PAPER USE

1. Estimate CO₂ emissions from paper use.
 - a. Enter data from the Classroom Survey into [Worksheet 4B: Classroom Paper Consumption](#).
 - b. Paper made from recycled paper generates less climate pollution than paper made from raw materials. Refer to the "Conversion Factors - Paper" table on [Worksheet 4B](#) to see how many pounds of CO₂ the classroom's paper generates per ream. Enter the factor that matches the recycled content of the paper on your Worksheet. For example, a classroom that uses paper with 30% recycled content generates 13 lbs of CO₂ per ream.
 - c. Calculate the CO₂ emissions from classroom paper consumption.



$$\text{Lbs of emissions} = \# \text{ of reams} \times \text{CO}_2 \text{ conversion factor}$$

2. **Add it all up!** How many pounds of CO₂ would the classroom generate if it used the same amount of paper *all year*? Record your answer in the "Summary of Results" box.

PLASTIC WATER BOTTLE CONSUMPTION

One pound of plastic generates 2.3 pounds of greenhouse gases, from the extraction of raw materials to produce the plastic, to the manufacturing of the bottles, to transporting the bottles to the store, etc. Recycling plastic water bottles can help reduce that impact by shrinking the need to create brand new bottles. To determine the climate impact of this classroom's plastic water bottle habit, first determine how many pounds of plastic are used and whether water bottles are usually recycled.



2. Estimate the amount of plastic (in pounds) generated by the number of plastic water bottles used each week.

- a. Enter your data from the Classroom Survey on Worksheet 4C: Plastic Water Bottle Consumption.
- b. Estimate the amount of plastic used each week.

$$\text{Lbs of plastic} = \# \text{ of bottles} \times 0.04 \text{ lbs}$$

(One 16 oz plastic water bottle weighs approximately 0.04 lbs)

3. Estimate CO₂ emissions from plastic water bottles.

- a. Determine the CO₂ emissions created from the plastic in the water bottles. Enter your total on Worksheet 2D.

$$1 \text{ lb of plastic} = 2.3 \text{ lbs of CO}_2$$

- b. If water bottles are usually *recycled*, the climate impact can be reduced. Each pound of plastic that is recycled *saves* 1.6 pounds of CO₂. Estimate CO₂ savings by multiplying lbs of plastic (from Step 1 above) by 1.6, and then subtracting that from the total in 2a. This is the new CO₂ total.

4. **Add it all up!** How many pounds of CO₂ would be produced if the same amount of plastic water bottles were used *all year*? Record your answer in the "Summary of Results" box.

DISPOSABLE BEVERAGE CUPS

1. **Estimate CO₂ emissions from disposable beverage cups.** Follow the instructions on Worksheet 4D: Disposable Beverage Cups.

$$\text{One 16-oz "grande" size cup} = 0.25 \text{ lbs of CO}_2$$



2. **Add it all up!** How many pounds of CO₂ would be produced if the same amount of disposable cups were used *all year*? Record your answer in the "Summary of Results" box.

Worksheet 4A: CLASSROOM TRASH

To determine how many pounds of CO₂ each classroom generates from the trash they throw away, you'll first need to figure out how many pounds of trash they create. Rather than weigh every classroom's trash can, you will estimate this by using your own classroom's bin as a model. Because the size and type of trash receptacles in schools varies, for simplicity we suggest using the trash bin in your classroom as the standard for your school. Ambitious challengers are welcome to audit every trash can in the school for more accurate results! Just copy this procedure for each classroom participating in the Challenge.

1. Weigh your own classroom's trash can when it's empty, to see how heavy the can is by itself.
2. Weigh the bin again when it's full.
3. Subtract the weight of the empty bin from the weight of the full bin.
The difference = # of pounds of trash in a full classroom trash can.
4. Enter this value in Column 1 of the table below.
5. Record your answer from the Classroom Survey in Column 2.
6. One pound of trash generates roughly 1.75 lbs of CO₂. Calculate how many pounds of trash and CO₂ the classroom generates each week.

1 lb of trash generates
1.75 lbs CO₂

INPUT CLASSROOM DATA HERE:

Column 1	Column 2	
Pounds per full trashcan (enter from #3 above)	How many full trash bins per week?	
	Pre-Challenge	Post-Challenge

CLASSROOM RESULTS:

Column 3		Column 4	
Pounds of trash per week		Pounds of CO ₂ per week (lbs trash x 1.75 lbs CO ₂)	
Pre-Challenge	Post-Challenge	Pre-Challenge	Post-Challenge
=			
Total lbs CO ₂ from classroom trash generated per week			

SUMMARY OF RESULTS

1. Enter the pre-and post-Challenge weekly CO₂ totals into the appropriate boxes, to the right.
2. Now estimate the *annual* emissions, and enter the results in the appropriate boxes to the right. (*Hint: there are 36 weeks in a typical school year.*)

	CO ₂ Emissions per week (lbs)	CO ₂ Emissions per 36-week school year (lbs)
Pre-Challenge		
Post-Challenge		

Worksheet 4B: CLASSROOM PAPER CONSUMPTION

$$\text{Lbs of emissions} = \# \text{ of reams} \times \text{CO}_2 \text{ conversion factor}$$

INPUT CLASSROOM DATA HERE:

Paper Consumption	Pre-Challenge	Post-Challenge
1. How many reams of paper are used by the classroom per week, on average?		
2. What is the recycled content of the paper?		
3. Enter the CO ₂ per ream, refer to the "Conversion Factors - Paper" table below.		

CLASSROOM RESULTS:

Carbon Impact	Pre-Challenge	Post-Challenge
Calculate weekly CO ₂ emissions and enter your totals in the columns to the right.		



Conversion Factors- Paper	
Pounds (lbs) CO ₂ equivalent per ream of paper, by recycled content	
Recycled content (%)	Lbs CO ₂ per ream
0-30%	13
40-50%	12
60-70%	11
75-80%	10
90-100%	9

SUMMARY OF RESULTS

1. Enter the pre-and post-Challenge weekly CO₂ totals into the appropriate boxes, to the right.
2. Now estimate the *annual* emissions, and enter the results in the appropriate boxes to the right. (*Hint: there are 36 weeks in a typical school year.*)

Notes: Unit of measurement is CO₂ equivalents and includes CO₂ emissions from burning fossil fuels as well as methane from paper decomposing in landfills. Estimates based on a standard, 5-lb ream of copy paper. Environmental impact estimates were made using the Environmental Defense Paper Calculator. For more information visit <http://www.papercalculator.org>.

TIP: If you print double-sided, you waste less paper and generate fewer emissions.

	CO ₂ Emissions per week (lbs)	CO ₂ Emissions per 36-week school year (lbs)
Pre-Challenge	<input type="text"/>	<input type="text"/>
Post-Challenge	<input type="text"/>	<input type="text"/>

Worksheet 4C: PLASTIC WATER BOTTLES

Plastic Water Bottle Consumption	Pre-Challenge	Post-Challenge
If the teacher drinks bottled water, approximately how many plastic water bottles does he/she go through each week?		
Most of the time, does the teacher usually recycle the water bottles, or throw them away ? ("Recycle" or "Toss")		

Resource Impact	Pre-Challenge	Post-Challenge
How much plastic is that? (lbs) 1 water bottle = 0.04 lbs of plastic.		
If the water bottles are usually recycled , the carbon impact is reduced by 1.6 lbs of CO ₂ per lb of plastic.		

Carbon Impact	Pre-Challenge	Post-Challenge
1. Emissions: Each pound of plastic creates 2.3 lbs of CO ₂ .		
2. Savings from recycling bottles:		
3. Total Emissions (subtract #2 from #1, above)		

SUMMARY OF RESULTS

1. Enter the pre-and post-Challenge weekly CO₂ totals into the appropriate boxes, to the right.
2. Now estimate the *annual* emissions, and enter the results in the appropriate boxes to the right.
(Hint: there are 36 weeks in a typical school year.)

	CO ₂ Emissions per week (lbs)	CO ₂ Emissions per 36-week school year (lbs)
Pre-Challenge	<input type="text"/>	<input type="text"/>
Post-Challenge	<input type="text"/>	<input type="text"/>

Worksheet 4D: DISPOSABLE BEVERAGE CUPS

Enjoying a daily coffee or cocoa in a paper cup adds up to a lot of waste! Bringing your own mug helps reduce waste, save resources and cut down on emissions. If in the Classroom Survey **SOLID WASTE/RECYCLING** section the teacher answered “yes” to drinking beverages from disposable cups, complete this section to estimate the CO₂ implications of those choices.

A typical 16-oz “grande” size beverage cup with lid and sleeve generates 0.25 lbs of CO₂

INPUT CLASSROOM DATA HERE:

Beverage Cup Consumption	Pre-Challenge	Post-Challenge
If the teacher drinks coffee, tea or other beverage, does he/she usually use his/her own mug? (Yes or No)		
Approximately how many disposable cups does he/she use in a week?		



CLASSROOM RESULTS:

Carbon Impact	Pre-Challenge	Post-Challenge
Calculate weekly CO ₂ emissions and enter your totals in the columns to the right.		
<i>1 cup = 0.25 lbs CO₂ emissions</i>		

SUMMARY OF RESULTS

1. Enter the pre-and post-Challenge weekly CO₂ totals into the appropriate boxes, to the right.
2. Now estimate the *annual* emissions, and enter the results in the appropriate boxes to the right.
(*Hint: there are 36 weeks in a typical school year.*)

	CO ₂ Emissions per week (lbs)	CO ₂ Emissions per 36-week school year (lbs)
Pre-Challenge		
Post-Challenge		

Cool School Challenge



➔ Add it all up!



Now that you've calculated the classroom's emissions from electricity, solid waste and transportation and heating, add them up to determine the total carbon footprint.

As you complete the Pre-Challenge and Post-Challenge, record the values from each Worksheet into the table below. At the end of the Challenge, subtract your "Post-Challenge" results from your "Pre-Challenge" results to estimate the potential emissions and cost savings if each classroom took action on climate change the entire school year. Divide the classroom total by the number of students in the classroom to estimate the emissions and potential savings per student.

Audit category	Estimated CO ₂ Emissions per year				Potential emissions savings (lbs)	Potential cost savings (\$\$)
	Pre-Challenge (lbs)	Post-Challenge (lbs)				
Classroom lighting			-	⇒		
Energy 'vampires'			-	⇒		
Other appliances (<i>optional</i>)						
Transportation			-	⇒		n/a
Heating	n/a	n/a	-	⇒		
Classroom trash			-	⇒		n/a
Classroom paper			-	⇒		n/a
Plastic water bottles			-	⇒		n/a
Beverage cups			-	⇒		n/a
TOTAL:			-	⇒		

Emissions per student	Pre-Challenge	Post-Challenge	Change
Number of students in class			
Pounds of CO ₂ per student			⇒

➔ School Tally



Once you've added up the total from your classroom, you can work with other classes to add up a total for the whole school. The online Tally Sheet is the easiest way to this. You can download the Tally Sheet online in the "Resources" section at www.coolschoolchallenge.org. Data from the 'Add it all Up!' worksheet can be entered directly into the Tally Sheet Classroom report, shown below. Ask other classrooms for their completed 'Add it all Up!' worksheet or completed 'Classroom Carbon Calculator' Excel workbook to get a total for your whole school!

Classroom (teacher/room #):

Number of students:

Audit category	Estimated CO ₂ emissions per year		Potential savings per year	
	Pre-Challenge (lbs)	Post-Challenge (lbs)	CO ₂ Emissions Savings (lbs)	Electricity Savings (kWh)
Classroom lighting				
Energy "vampires"				
Other appliances				
Transportation				n/a
Heating				n/a
Classroom trash				n/a
Classroom paper				n/a
Plastic water bottles				n/a
Beverage cups				n/a
TOTAL				

Cool School Challenge



Methodology Note 1: Deriving Electric Utility CO₂ Emissions Factors

The carbon dioxide emissions factors for electric utilities were derived using the following methodology:

1. Identify the fuel mix profile of the utility (the percentage of electricity generated by each resource).
 - The Fuel Mix profiles of Washington state utilities can be found online via the Washington State Department of Commerce website, [Electric Utility Fuel Mix Reports](http://www.commerce.wa.gov/site/539/default.aspx). (<http://www.commerce.wa.gov/site/539/default.aspx>)
 - Washington State summary data compiled from the 2008 Washington State Electric Utility Fuel Mix Report.
 - National electric power data compiled from the U.S. Department of Energy, Energy Information Agency: [Summary Statistics for the United States, 2006](http://www.eia.doe.gov/fuelelectric.html).
 - For other state specific utility data, contact your local utility or see the Energy Information Administration for state electricity profiles: <http://www.eia.doe.gov/fuelelectric.html>
2. For each carbon-based fuel source, multiply its percentage contribution by the CO₂ emissions per kWh for that resource.
3. Add up the percentages for the total CO₂ emissions per kWh.

CARBON DIOXIDE EMISSION FACTORS FOR CARBON-BASED ELECTRICITY RESOURCES:

Fuel	Pounds of CO ₂ /kWh
Coal:	2.249 lbs CO ₂ /kWh
Oil	1.679 lbs CO ₂ /kWh
Natural Gas	1.135 lbs CO ₂ /kWh

Source: U.S. Environmental Protection Agency:
<http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html>

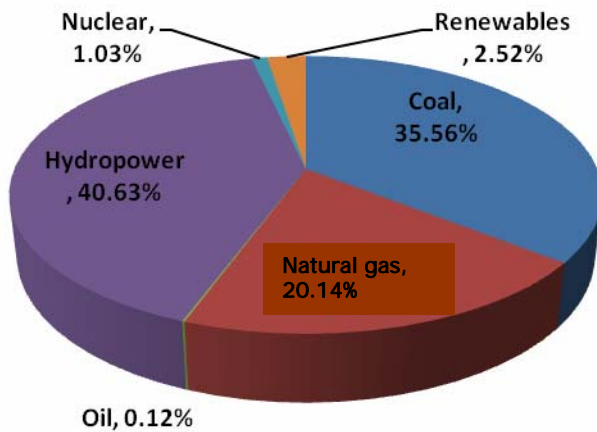
Notes:

Renewable energy sources such as hydropower, wind, solar and geothermal heat generate little if any emissions of carbon dioxide because no fuels are combusted. Though the burning of biomass produces carbon dioxide, it is considered to be part of the natural carbon cycle of the earth. Nuclear power plants do not emit carbon dioxide.

EXAMPLE

Using Puget Sound Energy's (PSE) profile as an example, here is how its CO₂ emissions factor of **1.03 lbs/kWh** was derived.

1. PSE's fuel mix profile consists primarily of hydropower, coal and natural gas:



Fuel	Percentage
Coal	35.56%
Natural gas	20.14%
Oil	0.12%
Hydropower	40.63%
Nuclear	1.03%
Renewables	2.52%

Source: As reported by Puget Sound Energy, to and published by, the State of Washington Department of Commerce, 2009.

2. Multiply the percentage contribution of each carbon-based fuel source by the corresponding emission factor.

Fuel	Percentage		Emission factor		Lbs CO ₂ /kWh
Coal	35.56%	x	2.249	=	0.7997
Natural gas	20.14%	x	1.135	=	0.2285
Oil	.13%	X	1.679	=	0.0024

3. Add it up!

$$0.7997 + 0.2285 + 0.0024 = 1.0306 \text{ lbs CO}_2/\text{kWh.}$$

=> **With rounding, PSE generates ≈ 1.03 lbs CO₂/kWh of electricity.**



Methodology Note 2: Deriving CO₂ Savings for Heating Adjustment

For the Heating section of the Cool School Challenge audit, we used the following conversion factors to estimate the carbon dioxide savings of turning down classroom thermostats one degree:

Pounds (lbs) CO ₂ saved per year per degree thermostat is turned down, by utility and energy source.			
Utility	Electricity	Natural gas	Fuel oil
Puget Sound Energy	397.5		
Seattle City Light	7.5		
Snohomish County Public Utilities District	67.5		
Tacoma Power	22.5		
National Average	510		
Other		113.5	167.8

These conversion factors were derived using the following approach:

- Determine the amount of energy (kWh) an average classroom uses each year.**
Puget Sound Energy (PSE) conducted a state-wide "School Building Benchmark Survey"² which collected and analyzed energy use data from many schools across Washington State. This data determined that an average 900 sq ft classroom consumes:
 - 12,492 kWh/year, if electricity is the energy source for heating.
 - 323 therms/year, if natural gas is the energy source for heating.
- Determine energy saved by turning down the thermostat in a classroom one degree.**
PSE determined that each degree a classroom thermostat was turned down correlated with a 3 percent savings in energy. This equates to savings of:
 - 375 kWh/year for schools that heat with electricity.
 - 9.7 therms/year for schools that use natural gas as their energy source for heating.

² Younger, Bill, CEM. (2005). *School Building Benchmark Survey*. Puget Sound Energy.

3. For schools that rely on **electricity** for heating:
- A. **Derive the CO₂ emissions factor (lbs CO₂/kWh) for its utility.** Refer to “Cool School Challenge Methodology Note 1: Deriving Electric Utility CO₂ Emissions Factors” for guidance.
 - B. **Convert the kWh savings to CO₂ savings.** Multiply the energy savings factor identified in #2 above (375 kWh/year) by the utility’s CO₂ emissions factor. For example, the emissions factor for Puget Sound Energy is 1.06 lbs CO₂/kWh. If a classroom heated by electricity from PSE turned down its thermostat one degree, its CO₂ savings would be:

$$(375 \text{ kWh/yr}) \times (1.06 \text{ lbs CO}_2/\text{kWh}) = 397.5 \text{ lbs CO}_2 \text{ saved per degree thermostat is turned down}$$

4. For schools that rely on **natural gas** or **fuel oil** for heating, convert the therm savings to CO₂ savings. Multiply the energy savings factor identified in #2 above (9.7 therms/year) by the corresponding emission factor for natural gas or fuel oil.

Example:

Natural gas: $(9.7 \text{ therms/year}) \times (11.7 \text{ lbs CO}_2/\text{therm}) = 113.5 \text{ lbs CO}_2 \text{ saved per degree thermostat is turned down}$

Fuel oil: $(9.7 \text{ therms/year}) \times (17.3 \text{ lbs CO}_2/\text{therm}) = 167.8 \text{ lbs CO}_2 \text{ saved per degree thermostat is turned down}$

5. To determine the cost savings, the electricity and natural gas savings are multiplied by the average costs per kWh and therm, respectively.

Conversion Factors			
Energy source	Cost	Units	\$/degree/year
Electricity (WA)	\$0.07	\$/kWh	\$26.25
Electricity (US)	\$0.10	\$/kWh	\$37.50
Natural gas (WA)	\$0.12	\$/therm	\$1.16
Natural gas (US)	\$0.12	\$/therm	\$1.16
Fuel oil (US)	\$2.88	\$/gallon	\$27.80

CARBON DIOXIDE EMISSION FACTORS FOR CARBON-BASED ENERGY FUELS:

Fuel	Pounds of CO ₂ /therm
Natural Gas	11.7 lbs CO ₂ /therm
Oil	17.3 lbs CO ₂ /therm

Source: U.S. Department of Energy, Energy Information Administration:
<http://www.eia.doe.gov/oiaf/1605/coefficients.html>