

Energy Audit: TEACHER'S NOTES

National Curriculum

Geography, mapping, collecting and analyzing geographical data

Science, logical thinking, interpretation of results

Citizenship, improving the environment of the school

Aims

To make the students aware of how energy is used in the school building

To encourage creative ways to reduce energy consumption

Resources

Copies of the recording sheets one for each group. Arrange with the admin staff and site managers to expect a visit from the students and also give them an idea roughly of the sort of questions the students will be asking.

Timing

1 hour for the collection of the information

30 mins research (possibly homework)

1 hour for the interpretation and reporting of their results.

Task

1. Divide the class into 4 groups and ask each team to investigate one aspect of the energy audit.
2. Send each group off to find out either by observation or by interviewing the relevant staff member and fill in their record sheet.
 - Team 1 may need access to site manager.
 - Team 2 may need thermometers in order to measure the room temperatures and access to the site manager.
 - Team 3 will need access to the office and admin staff.
 - Team 4 will need access to the site manager.
3. At the end of the survey each team will need to assess the importance of their observations for the school's energy consumption (3rd column).
4. The teams should then use the internet (eg www.carbontrust.org) in order to consider what changes are feasible and effective.

5. The students could then follow one of two routes:
 - a) Each team presents their findings to each other. A classroom discussion of the relative benefits of each proposed change follows. The class then draws up a table of their Top Ten changes the school could make to reduce its energy consumption.
 - b) One member of each team could join a Reporting Team. Together, using their observations and comments from their own investigations, the Reporting Team should compile one written report for the attention of the School Governors.

Differentiation

The whole activity is differentiated as the more able students will be able to extrapolate the information they receive and ask more in-depth questions of the staff.

Team 1 Building Envelope

Architects and engineers talk about the outside layer of the building as its ‘envelope’. This should be designed to protect the occupants from the weather and also keep the heat in the building, and sometimes to let in natural light as well. But most buildings are quite ‘leaky’.

Your task is to look at the school’s building envelope and think about how it might affect the building’s energy consumption:

	Observation	Comment on how this affects energy consumption
EXAMPLE: Do external doors close easily?	<i>Yes. Science block doors especially draughty; all others are fine</i>	<i>Heat leaks out. This block is usually cold – might explain why!</i>
Can you feel air gaps around the external doors when closed?		
Can you feel air gaps around the windows when closed?		
Are there any broken or cracked windows?		
Can opening windows be closed properly?		

Is the roof in good repair?		
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<p>Do sky lights close properly?</p>		
<p>Do the roof lights close properly?</p>		
<p>Look at duct coverings (grills)</p> <p><i>A duct is a tube that runs through the building and blows in fresh air or sucks stale air out.</i></p> <p>Do the duct covers close properly?</p> <p>Are they obstructed by any furniture?</p>		
<p>Is the roof insulated? How many cm of insulation is there?</p> <p><i>You may need to ask the caretaker or estate manager if you can't access it to measure it</i></p>		
<p>What are the external walls of the school made of?</p> <p>Are they well-insulated?</p> <p><i>You may need to make different observations for different buildings.</i></p>		

Team 2

Heating and hot water

Your task is to look at the heating and hot water system in your school, comment on how this affects the school's energy consumption and then write a report based on what you have found.

These systems can be quite complex, so start by making all the Observations for each of the two sections. It might help to mark your results onto a rough map of the school buildings (or your school office might be able to give you one). Then, once you have understood how the systems work, get together to brainstorm what the consequences are for your school's energy consumption.

	Observation			Comment on how this affects energy consumption
EXAMPLE Are the central heating pipes insulated?	<i>The central heating pipes in the science block are not insulated.</i>			<i>A lot of energy will be wasted as the heat in the pipes escapes.</i>
THE BOILER/HEATING <i>You may need to ask the caretaker for some of these answers</i>				
Does the school boiler run on gas, oil or biomass? How old is it? How often in the past 5 years has it been serviced?				
Does the boiler run on a timer? If so, is it programmed to match the building's use? <i>The table here will help you find out</i>	school hours weekday eve weekends holidays	On/off	In use?	
Is the whole school heated for after-school activities?				
Is it possible to control				

<p>the heating in different sections of the building?</p>		
<p>Are the heating pipes insulated? <i>Check in each classroom and the corridors</i></p>		
<p>What is the temperature of the building supposed to be?</p>		
<p>Are some of the classrooms hotter than this? Or too cold? <i>You may need to place thermometers in rooms in order to measure the temperature.</i></p>		
<p>Do children complain of being too hot? If so, where?</p>		
<p>Do children tend to wear their jumpers during the day or take them off?</p>		
<p>Are there any thermostatic valves fitted to radiators? If yes, do they work? Are they obstructed by furniture or displays?</p>		
<p>THE BOILER/HOT</p>		
<p>Is there a hot water tank? If so, is it well insulated?</p>		
<p>How far does the hot water have to travel to supply the hot taps?</p>		

<p>Are the hot water pipes insulated? <i>Check in each classroom and the corridors</i></p>		
<p>Can the cleaners access hot water throughout the school or do they collect it from a single point?</p>		
<p>Are there any water heaters at point of use e.g. washing sinks, toilets and areas far from hot water storage tanks?</p>		

Team 3 Office Equipment

Office equipment accounts for some 15% of energy used in the UK, and is expected to rise to 30% by 2020, according to the Carbon Trust. Your task is to look at the office equipment, comment on the following and then write a report based on what you have found:

	Observation				Comment on how this affects energy consumption
EXAMPLE Does the photocopier have a standby mode?	<i>The photocopier is old and does not have a standby mode.</i>				<i>This machine wastes a lot of energy because it is on permanently even at weekends.</i>
How many computers are there in school? How much power do they consume, including the monitors?		Wattage per unit	No. units	Total Power	
	Laptops				
	Desktops				
	Monitors				
Are computers, monitors and printers switched off when not in use?	Computers				
	Monitors				
	Printers				
How many printers are there? How many of these have a low power standby mode?	No. printers		No. with standby mode		
How many photocopiers are there? Does the photocopier have a standby mode?	No. photocopiers		No. with standby mode		

<p>Is the photocopier switched off every day? At what time? Who is responsible for this?</p> <p><i>You may need to monitor this as well as asking appropriate staff.</i></p>		
<p>Are documents always double-sided?</p>		
<p>What happens to used office paper?</p>		
<p>What alternatives to printers and photocopiers are used to circulate information?</p>		
<p>Do the staff have personal kettles or water boilers/communal urns?</p>		

Team 4

Lighting

Your task is to look at the Lighting in your school, comment on how this affects the school's energy consumption and then write a report based on what you have found.

	Observation	Comment on how this affects energy consumption
<p>EXAMPLE</p> <p>Are lights turned off in unoccupied areas?</p>	<p><i>Lights are generally switched off in empty classrooms but not in the corridors, toilet or staff rooms.</i></p>	<p><i>The lights waste energy when they are left on in unoccupied rooms.</i></p>
<p>What kind of light bulbs are used ...</p> <ul style="list-style-type: none"> - in classrooms? - in corridors? - in communal areas? - as emergency lights? - outside? 		
<p>Are the lights turned off when not needed ...</p> <ul style="list-style-type: none"> • in empty classrooms ? • in corridors? • in communal areas? • emergency lights • outside? 		
<p>Are the light fittings, roof lights</p>		

and windows cleaned regularly?		
Are there any bulbs that flicker?		
Are there lights that provide more light than necessary (both in themselves and in relation to the daylight)		

Note on lighting:

In considering your recommendations, you might like to research the benefits of the following measures:

- *tungsten filament (incandescent) as compared with compact fluorescent lamps*
- *fluorescent tubes as compared with alternative narrow fittings*
- *for security or external lighting, high-intensity discharge (HID) lamps as compared with sodium lamps*

Monitoring Energy Consumption

After you have looked at both Lighting and Office Equipment, carry out the following exercise. Your observations might help you answer Question 6.

1. Ask to see an electricity bill and find out where the meter is.
2. On Friday before the end of school:
 - a) Copy the 6 digit number High Peak consumption
 - b) Is there a low peak meter (usually just above the high peak meter reading)? If there is make a note of this too.
3. On Monday morning take another reading. Subtract the first High Peak figure from the second High Peak figure. This is the amount of electricity the school has used over the weekend.
4. Do the same for the low peak figure if there is one. This is the amount of electricity the school has used off-peak.
5. Ask the site manager how much the school pays for each unit of electricity.
6. Multiply your answers by these amounts and you will see how much money the school has spent on energy at the weekend
7. What could have been using this electricity? Are there different meters for different areas of the school that could help you work this out next weekend? If not, how could you find out?

Extension: Try this again at home using your latest energy bill, or find out where you can borrow an Energy Display Meter.

Regular meter reading will help to:

- check the accuracy of fuel bills
- keep an eye on spending and identify periods of exceptional consumption compare current costs with previous years
- measure how consumption has been affected by new equipment or energy awareness campaigns
- identify where investment can achieve energy savings e.g. energy efficient lighting, window repairs or improvements to heating systems.