



the **gaia** project
realistic environmentalism

Project Guide: Energy Audit

The Gaia Project

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Energy Audit

A guide to conducting an energy audit and conservation project as part of a sustainability plan in your classroom.

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The Gaia Project is a charitable organization dedicated to providing project based learning opportunities in the areas of energy, environment and sustainable engineering.

We develop projects, provide professional development, technical support and ongoing project support for teachers and students. Our projects aim to incorporate three key principles, which symbolise our focus on realistic environmentalism.

1. **Data Informed Decisions** – We want students to be able to explain why, and quantify the effect of each decision they made along the way to their final solution.
2. **Economic Assessments** – We expect students to be able to assess the cost effectiveness of their solutions, and be able to optimize their projects with limited budgets.
3. **Environmental Impact and Lifecycle Assessments** – We need students to take a holistic view to their projects. This means looking at their projects from cradle to grave, as opposed to just examining the use phase, and acknowledging that greenhouse gas reduction is not the only environmental issue at stake.

For more information, please visit www.thegaiaproject.ca

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Energy Audit

Energy is used in our buildings for a variety of tasks and it can come in a variety of forms, and it can represent a major budgetary item. At the same time, it's an area that people often fail to track and manage in the same way as they would any other expenditure—it is as if we have no control over it.

That of course isn't true - we just have to know what we are looking for.

Virtually all buildings will use electricity, whether it comes from the local utility or is produced locally from renewable resources (solar, wind, hydro).

Natural gas and oil are two other likely sources of energy used in buildings, typically for heating.

Some newer buildings may even use solar, or geothermal for building heat (and even cooling).

It's important to remember that **all** sources of energy have an environmental impact. It's easy to think of that impact when we are talking about a coal-fired power plant producing electricity with all the mining and emissions, but it also applies to renewable technologies such as wind and solar. Even though no emissions are produced during operation, they probably were during construction - where did the raw materials come from? How much land is required to be cleared?

We can divide the way we use energy in buildings into three main categories:

- Heating
- Lighting
- Plug-in loads

We could also divide a large building into several smaller geographic areas, either by wing or by room type, such as:

- Gymnasium
- Cafeteria
- Standard Classroom
- Lab
- Workshop

Discussing with your class

Challenge students to begin considering different ways to divide energy use at the school. Within these groupings, where are we using energy? Can you easily identify areas of wasted energy?

This project guide has been separated into four sections to examine at the different ways we use energy in a building.

Essential Resources

Recent Energy Bills

We have access to these for every school in New Brunswick for the past three years. Please contact us, or go directly to your school district.

Sustainability Plan: The Gaia Project

<http://www.thegaiproject.ca/projects/sustainability-planning>

Heating: The Gaia Project

<http://www.thegaiproject.ca/sites/default/files/teacher-resources/project-guides/heating-audit.pdf>

The heating project guide looks at how to determine energy usage from bills and compares monitoring across the three main heating sources in New Brunswick: oil, natural gas and electricity. This guide also examines

how to experimentally estimate energy use due to heating by examining the building envelope.

Degree Days: Heating: The Gaia Project

<http://www.thegaiaproject.ca/sites/default/files/teacher-resources/project-guides/degree-days.pdf>

Degree days is a measurement that allows us to calculate the amount of heating or cooling required in a given period. We can use this to fairly compare building heating and cooling requirements from period to period regardless of outdoor temperature. This guide describes the factors involved in calculating degree days.

Lighting: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainability-planning/energy-audit/lighting>

The lighting project guide examines how to inventory and monitor the lighting load at the audit site. This data can be combined with user surveys to determine whether lighting levels are comfortable.

Plug-In Loads: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainability-planning/energy-audit/plug-in>

Plug-in load is the amount of energy being consumed by devices that are intermittently or constantly plugged in at your site. This guide covers how to determine the power requirements of the electrical devices at your site and estimate their times of use.