

Energy Tracker

Unit 3 Overview



Unit 3 Energy Tracker

In this Unit, students develop skills and experience using engineering design methods to create a more efficient wind turbine, and to redesign their home to improve energy efficiency. The energy efficiency project is a multi-week extended activity using real time data from students home via the Green Ninja's Energy Tracker. Students develop engineering design experience using data from their homes.

Introduction



CHALLENGE

Lower the energy use in your home to reduce climate change.



PHENOMENA

Realize that home energy data is a largely unexplored resource for understanding behavior.



SCIENCE METHODS

Use engineering design concepts to design, create, and test a home energy conservation plan.



CULMINATING EXPERIENCE

Present on the success of the design to reduce energy use in your home.

NGSS Mapping

20 LESSONS

PERFORMANCE EXPECTATIONS

- ESS3-3
- ETS1-1, ETS1-2, ETS1-3, ETS1-4

SCIENCE & ENGINEERING PRACTICES

- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Asking Questions and Defining Problems
- Developing and Using Models
- Engaging in Argument from Evidence

DISCIPLINARY CORE IDEAS

- ESS3.D Global Climate Change
- ESS3.C Human Impacts on Earth Systems
- ETS1.A Defining and Delimiting Engineering Problems
- ETS1.B Developing Possible Solutions
- ETS1.C Optimizing the Design Solution

CROSCUTTING CONCEPTS

- Influence of Science, Engineering, and Technology on Society and the Natural World
- Cause and Effect



Background

Designing Effective Climate Solutions: The climate is changing, and scientists have identified that the major contributor to its warming is the emissions of heat-trapping gases like climate carbon dioxide (CO₂). If carbon emissions continue at the same rate over the next few decades, life on this planet will become more difficult and challenging for people in every country of the world. However, if we can significantly reduce emissions, we can stabilize the climate so humans can better adapt to its changes with fewer negative impacts.

So, we have a real problem, and some of the best minds in the world are working to figure out a solution. How can we support 7 billion people with clean air, clean water, and reliable energy without damaging the climate? This problem will not be solved overnight—it represents one of humanity’s greatest challenges. Let’s start thinking about how engineers solve problems and how we can use these techniques to solve problems related to the changing climate.

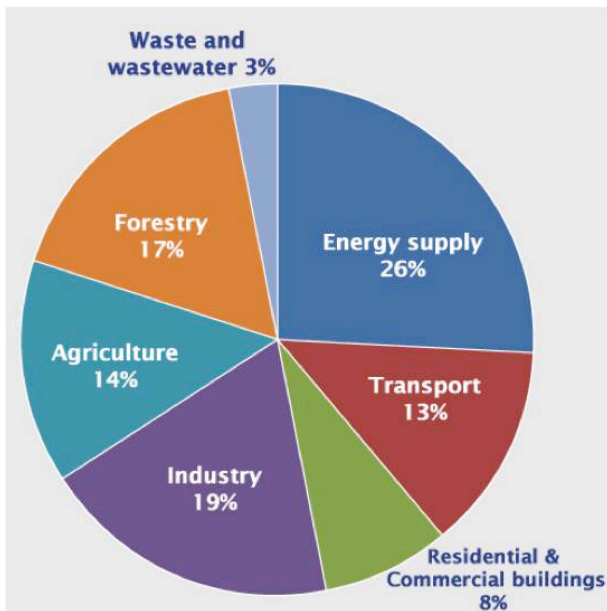


Fig. 1. Global greenhouse gases by source (IPCC 2007)

Engineering in Action

Designing solutions to reduce climate change requires data such as Fig. 1. This chart provides estimates of the sources of global greenhouse gases. Engineers can use this information to design new ways to provide the same services with lower greenhouse gas emissions. Your students can use charts like this to develop their own areas of climate solutions, as each source area is a major part of our society and economy.

Green Ninja Connections

Green Ninja Story

The mission of this unit is for students to redesign their homes to reduce carbon emissions. The Professor introduces the unit and challenges students to be creative and smart when designing their solutions. He shares with students about using the Energy Tracker and designing methods of reducing energy use in their homes. Students use engineering design thinking approaches to create the most effective designs possible.

This unit relies heavily on the Green Ninja Energy Tracker and builds on Green Ninja videos like *Footprint Renovation* to help students develop plans for reducing energy use at home.

Energy Tracker

The Green Ninja Energy Tracker is an online tool that allows teachers and their students to monitor and track their home energy use (electricity and natural gas) over a period of time. Teachers can monitor individual students and classroom averages, while students can see their own data and the data of their classmates (presented anonymously).



This shows one of the views from the Energy Tracker during the baseline period (before any design changes) and the conservation period (when students are implementing their designs). The individual student's data is shown in red, while the classroom average is shown in black.

Schedule

Mon	Tue	Wed	Thu	Fri
Energy Tracker Lessons				
3.1 - Introduction to Wind Energy	3.2 - Building a Wind Turbine	3.3 - Design Challenge Part I	3.4 - Design Challenge Part II	3.5 - Design Challenge Competition
3.6 - Introduction to Smart Meter Data Collection	3.7 - Power Meter Activity	3.8 - The Green Ninja Energy Tracker	3.9 - Energy Tracker Design Challenge: Data Analysis Practice	3.10 - Energy Tracker Design Challenge: Planning
1-4 Weeks Data Collection (Start Unit 2 Lessons 1-15)				
3.11 - Energy Tracker Design Challenge: Data Analysis Conservation Period I	3.12 - Energy Tracker Design Challenge: Home Energy Student Presentations	3.13 - Power Meter: Home Investigation	3.14 - Energy Tracker Design Challenge: Brainstorming Design Ideas	3.15 - Energy Tracker Design Challenge: Energy Reduction Plan Revision
1-4 Weeks Data Collection (Continue Unit 2 Lessons 16-25)				
3.16 - Energy Tracker Design Challenge: Data Analysis Conservation Period II	3.17 - Energy Tracker Design Challenge: Performance Assessment	3.18 - Energy Tracker Design Challenge: Presentations Prep I	3.19 - Energy Tracker Design Challenge: Presentations Prep II	3.20 - Energy Tracker Design Challenge: Student Presentations
Complete Unit 2 Lessons 26-44				

