

Today I Learned About Cleaning Up Clean Tech

Description:

Solar panels, wind turbines, and other 'green' technologies are an important part of a low-carbon future. What are the environmental and human impacts of these technologies, and how can we reduce or eliminate them? Students investigate the United Nation's Sustainable Development Goals and the concept of supply chains.

Skills & Objectives

SWBAT

- Name a few of the UN's Sustainable Development Goals
- Explain what a supply chain is
- Understand why it is important to study supply chains

Skills

- Mind-mapping
- Making connections
- Map-reading

Students Should Already Know That

- Every item we use must be made from raw materials that are sourced or created, processed, manufactured, assembled, shipped, etc.

Standards Alignment:

HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources have influenced human activity.

HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

RST.11-12.9 Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept.

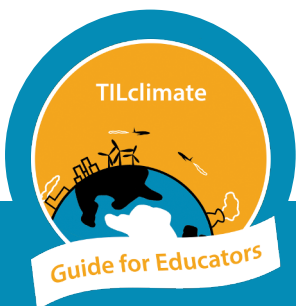
Disciplinary Core Ideas:

ESS2.D Weather and Climate

ESS3.A Natural Resources

ESS3.C Human Impacts on Earth Systems

ESS3.D Global Climate Change



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How To Use These Activities:



Pages with the circular “TILclimate Guide for Educators” logo and dark band across the top are intended for educators. Simpler pages without the dark band across the top are meant for students.

Each of the included activities is designed to be used as a standalone, in sequence, or integrated within other curriculum needs. A detailed table of contents, on the next page, explains what students will do in each activity.

A Note About Printing

All student pages are designed to be printable in grayscale.

The worksheets do not leave space for students to answer questions. Students may answer these questions in whatever form is the norm for your classroom – a notebook, online form, or something else. This allows you, the teacher, to define what you consider a complete answer.

Podcasts in the Classroom: Throughout these Guides for Educators, we invite students to think about how they would share their learning with family and friends. One way to do this is to encourage your students to create their own podcasts - they're shareable, creative, and have multiple options for embedded assessment. We would love to hear any podcasts or see any other projects you or your students create! Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.

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Detailed Table of Contents

Page	Title	Description	Time (min)
	Podcast Episode	Students listen to TILclimate: TIL about cleaning up clean tech, either as pre-class work at home or in the classroom. https://climate.mit.edu/podcasts/e9-til-about-cleaning-clean-tech	10-15
1-2	While You Listen: UN Sustainable Development Goals	While students listen to the podcast episode, they note which of the United Nations Sustainable Development Goals are related to the issues brought up by the expert.	15-20
3-4	Mind Map: UN Sustainable Development Goals	In groups, students mind map their observations from listening to the podcast episode and make connections between the US SDGs and their own interests.	20-30
5-8	Supply Chains	Students explore the concept of a supply chain and map a possible supply chain for a solar panel.	30+



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Season 2 Collection

Season 2 of TILclimate from MIT covers a series of interrelated energy subjects. The associated teacher guides are structured for maximum flexibility. Each episode's activities could be done as a whole class or as small-group work while other teams work on other topics and share back in a jigsaw. Some activities also can be enrichment or homework, and many as asynchronous assignments for remote work. Activities of similar length could also be set up as rotating stations, with a group discussion at the end of class.

- Introductory activities are quick (15-25 minutes) and require no internet.
- Dive Deeper activities are longer (30-60 minutes) and require internet access.

The City of the Future overall project is flexible in terms of time, space, and materials. It will be engaging whether students have completed all activities in the collection, or just one. If teams of students have been working on one topic each, the City of the Future process will help them share their learning with the rest of the class.

Supply Chains and Development Goals

This Educator Guide includes worksheets and instructions. Educators may pick and choose among the pieces of the Guide, as suits their class needs.

Parts of this Guide may align with the following topics:

- Physical science: Abundance and distribution of elements and minerals.
- Life/environmental science: Impacts of mining and other activities on natural systems.
- History/social science: Impacts of mining and other activities on human systems.
- ELA/literature: Connections to stories about mining or extraction.
- ELA/nonfiction: Explaining complex technological topics.

MIT Resources

We recommend the following as resources for your own better understanding of climate change or as depth for student investigations. Specific sections are listed below:

- Climate Science, Risk & Solutions, an interactive introduction to the basics of climate change. <https://climateprimer.mit.edu/>

Chapter 02 The greenhouse effect and us

Chapter 07 Understanding risk

Chapter 10 What can we do?

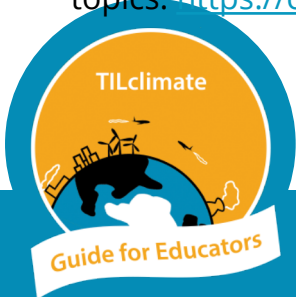
- MIT Climate Portal Explainers are one-page articles describing a variety of climate topics. <https://climate.mit.edu/explainers>

Mining and Metals

Greenhouse Gases

Freight Transportation

Renewable Energy



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Wrap-Up Discussion Questions

- Have you heard about or imagined a solution that is related to one of the Sustainable Development Goals? Solutions could be behavior, design, technology, or some combination.
- How would you explain the Sustainable Development Goals to someone who was not familiar with them?
- What is one solution you have heard of or you can imagine for the supply chain problems associated with green technology?
- What are some environmental or human impacts associated with other energy sources (coal, oil, natural gas, hydroelectric, nuclear, or wind)?

Climate Solutions

Climate solutions can be thought of as falling into four categories outlined below. Across all categories, solutions at the community, state or federal level are generally more impactful than individual actions. For example, policies that increase the nuclear, solar and wind mix in the electric grid are generally more effective at reducing climate pollution than asking homeowners to install solar panels. For more on talking about climate change in the classroom, see “How to Use This Guide”.

• Energy Shift

How do decision-makers make the switch from carbon-producing energy to carbon-neutral and carbon-negative energy?

• Energy Efficiency

What products and technologies exist to increase energy efficiency, especially in heating and cooling buildings?

• Adaptation

How can cities and towns adapt to the impacts of climate change?

• Talk About It

Talking about climate change with friends and family can feel overwhelming. What is one thing you have learned that you could share to start a conversation?

What solutions are the most exciting in your classes? We would love to hear from you or your students! Images, video, or audio of student projects or questions are always welcome. Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.

