SCHOOLS GO GREEN

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Project number: 2020-1-DE03-KA201-077258

Energy Resources and Management

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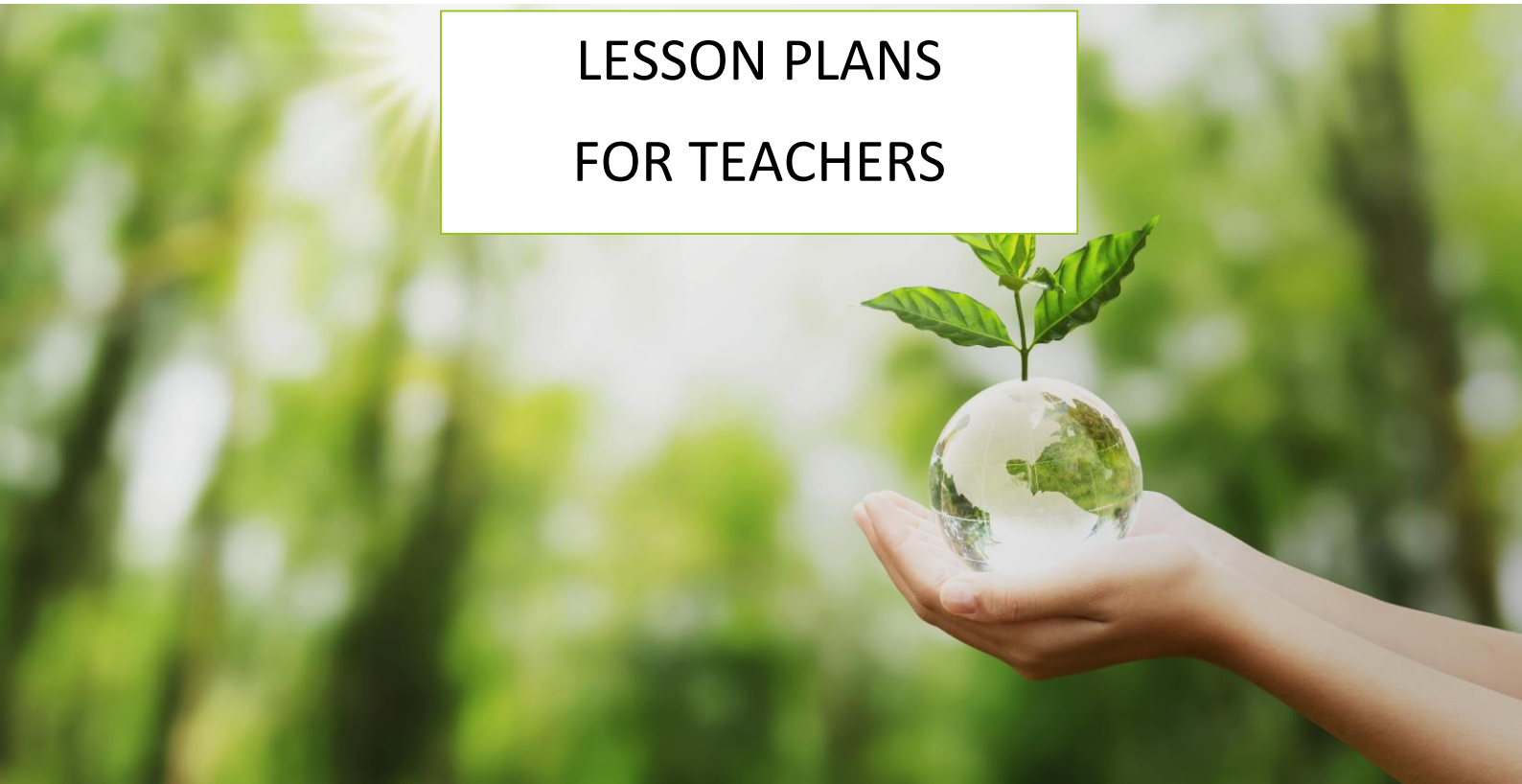
LESSON PLANS FOR TEACHERS



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Project Information

PROJECT: Schools Go Green

PROJECT TITLE: DEVELOPING A WHOLE-SCHOOL APPROACH TO PROMOTE SOCIAL CHANGE AND SUSTAINABLE DEVELOPMENT AS A RESPONSE TO ENVIRONMENTAL CHALLENGES

ACRONYM: SCHOOLS GO GREEN

PROJECT WEBSITE: https://schoolsgogreen.eu/

PROJECT NO.: 2020-1-DE03-KA201-077258

PROJECT COORDINATOR: LEIBNIZ UNIVERSITAT HANNOVER, GERMANY

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Module: Energy Resources and Management

Topic 1 Title: Energy in a nutshell and energy production

Lesson Plan 1 – What is energy - Renewable and Non-Renewable Energy
(https://www.education.com/download/lesson-plan/renewable-and-non-renewable-energy/renewable-and-non-renewable-energy.pdf)
(https://www.golabz.eu/ils/renewable-energy-overcoming-cultural-barriers)
(https://www.golabz.eu/ils/renewable-energy-here-comes-the-sun)

Duration: 2 lessons of 45 minutes (approx. 100 minutes in total)

Short Description of the Lesson	Energy is an essential part of our daily lives, but the resources that power the Earth are being threatened. In this lesson, students learn about renewable and non-renewable resources, including those that need protection.
Learning Goals	• Students learn the definition of energy. • Students will be able to differentiate between renewable and non-renewable resources. • Students will be able to classify resources as renewable or non-renewable.
Green Competences Linked	• Can assess and question personal needs to carefully manage resources in the pursuit of longer-term goals and common interests. • Knows that damaging and exhausting natural resources can lead to disasters and conflicts. • Can identify processes or action that avoid or reduce the use of natural resources. • Knows the difference between short-, medium- and long-term approaches and their implications for sustainability scenarios.
Target Group	Primary school students aged 6-9 years old
Educational Approach	Explicit Instruction
Link to School Curricula (if applicable)	Science, Physical Science
Facility/ Equipment	• Classroom • Internet access • Projector • White board
Tools/ Materials	• Board markers • Worksheet 1a - Non Renewable Versus Renewable Energy • Worksheet 1b - Non Renewable - Renewable Energy Sort

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	• Worksheet 2 – Natural Resources Match And Mix • Worksheet 3 – Renewable Energy • Write and Draw paper • Notebooks or lined paper • Colored pencils • Teacher's Handbook • Student's Presentation
Main Tasks	**Task 1: Introduction to the EU Green Deal (5 minutes)** **You can show to your students the following video that explains the EU Green Deal goals:**  **Teaser: European Green Deal package:** https://www.youtube.com/watch?v=YEgS_97ltLQ (1 min, 24 sec)  **1.1 Introductory activity** Students identify repeated keywords in the above-mentioned video. A first cycle of discussions may start by asking students about this video, which are the repeated words, they are related to energy and why? Why do they think that energy is important? But wait, what is energy? **Use pg. 7 – 8 from the Teacher's Handbook and Slides 1 – 3 from the students' presentation to explain the EU Green Deal goals and why is important in terms of the energy topics.** **Task 2: Introduction to Energy**  **2.1 What is energy?** You cannot always see energy, touch it or hold it in your hand, but energy is everywhere! Energy is the ability to do work, to make things happen and to cause changes. Energy cannot be made or destroyed; it can only be changed into different forms. Can you name a form of energy? (Examples: Light, heat, electricity, sound.) From where do you think we get electricity? (Possible answers: Power plant, the outlet in the wall, food.)  **Video:** Energy | The Dr. Binocs Show | Educational Videos for Kids https://www.youtube.com/watch?v=Q0LBegPWzrg (4 mins and 13 sec.)  **Video:** What is Energy? Energy Types for Kids - Renewable and Non-Renewable Energy Sources https://www.youtube.com/watch?v=aFpC1vAIgNc (3 mins and 42 sec.)

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2.2 Renewable and non-renewable energy?

Prompt the class to guess what the word renewable means. Explain that renewable refers to something that can be replaced.

Ask for a volunteer to tell you what the word non-renewable means, based on the use of the prefix non. If no one correctly defines it, explain that non-renewable refers to something that can't be replaced.

Interactive worksheets (Online):

Renewable energy

Non-Renewable energy

Hands-on worksheets:

- Pass out a copy of the Worksheet 1a of Renewable Versus Non-Renewable worksheet to each student.
- Alternatively, you can pass out a copy of Worksheet 1b Renewable and Non-renewable Energy Sort.

Task 3: Explicit Instruction/Teacher modeling (30 minutes)

3.1 Review the worksheet as a class, explaining why each example is renewable or non-renewable.

Encourage your class to come up with their own reasons as to why each source of energy is renewable or non-renewable.

3.2 Once several students have shared their input, explain to the class why each type of energy is classified the way it is. *For example: Solar energy is renewable since it comes from the sun. The sun provides energy every day for all living things, and it is inexhaustible. Petroleum is non-renewable, since there is a limited supply of it left on Earth. We use a lot of petroleum every day, in factories, in cars, and to heat our homes.*

Use pg. 9 – 14 from the Teacher's Handbook and Slides 6 – 10 from the students' presentation to explain the differences of Renewable and Non-Renewable sources.

Task 4: Guided Practice (20 minutes)

4.1 Pair off students in groups of two, either assigning each a partner or asking them to find a partner to work with.

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4.2 Assign each pair the Natural Resources Match And Mix (Worksheet 2) to complete together. Review the worksheet as a class.

4.3 Explain to class that based on each country's natural resources, we select what renewable energy to use to produce clean (or green) energy! For instance, in places worldwide with increased sunshine hours we select solar panels (i.e. near the equator or in the South Mediterranean countries, Central US etc.). In places with increased wind energy potential we select onshore and offshore wind farms (i.e. Baltic and North Sea, in mountainous area etc.).

4.4 LET'S TAKE A JOURNEY AROUND THE WORLD TO SEE SOME EXAMPLES!

Explore Google Earth Voyager map 1 AND Google Earth Voyager map 2 to discover low carbon energy projects from around the world, including offshore wind, solar and geo-thermal.

Hint: *Just click on the Present button on the bottom-left corner and the journey begins.*

Task 5: Independent working time (30 minutes)

5.1 Ask your students to complete the Renewable Energy worksheet (Worksheet 3) independently. As students work, walk around the class to answer questions and guide students toward the answers they are looking for through use of examples.

5.2 Once everyone has finished, review the worksheet as a class.

Task 6: Assessment (10 minutes)

5.1 Give each student a piece of Write and Draw paper. Instruct the class to write and draw one renewable resource and one non-renewable resource.

Task 7: Review and closing (15 minutes)

7.1 Ask your students to share ways they use renewable energy every day. *Great answers include: drinking water, taking a shower, and riding a bicycle. Invite the class to share ways they use non-renewable energy each day. Great answers include: heating their home, riding in a car, and cooking dinner.*

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ADD HERE https://www.golabz.eu/ils/renewable-energy-overcoming-cultural-barriers

Module: Energy Resources and Management

Topic 2 Title: Energy Consumption, Efficiency and Renovation wave

Lesson Plan 1 – Energy Trip Ticket, Energy Vampire Calculator and Renovation Game (https://www.watt-watchers.com/activity/energy-trip-ticket/)

Duration: 5 days on going during class periods/breaks + 120 minutes at the end of the week

Short Description of the Lesson	Students will learn about wasting energy, conserving energy, energy crisis and what to do about this by doing a hands-on, minds-on, classroom activity throughout the week.
Learning Goals	This activity will help to: • understand energy consumption and energy conservation patterns and principles worldwide, • make students aware of their energy usage by making them "pay" for each energy trip they make throughout the day, • get students thinking about ways they can conserve or eliminate energy use by making them look at their day. • make students work on real-life solutions by changing their daily habits.
Green Competences Linked	
Target Group	Primary school students aged 6-9 years old
Educational Approach	Experiential learning - Hands on, minds on, classroom activity
Link to School Curricula (if applicable)	Science, Math, Social studies
Facility/ Equipment	• Classroom • Internet access • Projector
Tools/ Materials	• Computer lab • Printables no.3 and no.4 • Pencils/Pens • Teacher's Handbook • Student's Presentation
Main Tasks	**Task 1: Introduction to energy consumption (30 minutes)**  Explain to your students what energy consumption is! Linked to the previous Lesson Plan you may wonder:

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Ok now that we know how the energy is produced how can we quantify how much energy is needed for our daily activities, at a country level or globally?

Video: How much electricity does it take to power the world?
https://www.youtube.com/watch?v=tjwrG4Debc4 (5 min and 1 sec)

Video: Cities & Rising Energy Consumption 101 - Matt Ferrell x Student Energy
https://www.youtube.com/watch?v=7itJt8c0V8M(6 min and 4 sec)

Energy consumption background info and useful maps and graphs may be found in the Teacher's Handbook on pg.18 – 22. In addition, you may let the students navigate and explore the following data: You can use the graphs and maps in pg. 18 – 21 to illustrate energy consumption patterns and numbers worldwide.

In addition, students may use these interactive maps to see the energy consumption per country and per source of energy production.

https://ourworldindata.org/energy-production-consumption

Hint: In order to be easier for the students the amount of energy used globally you can show to them the following example comparing the energy consumption (mean) per household and globally. You don't have to explain the units, just to show the differences in terms of zeros used after each number to understand the huge difference.

2 – 8 MWh / year **500.000.000 – 10.000.000.000 MWh / year**

At this point, you can use pages 22-23 of the Teachers Handbook to explain how the total energy consumption is highlighted above is distributed per sector (i.e. household, transport, industry etc.). Speaking of that, 28% of the total energy

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consumption is linked to the energy we are using in our houses (i.e. the 2-8 MWh/year).

But all this energy is enough for everyone? Now the challenge begins!

Task 2: Understanding energy consumption and energy conservation (45 mins/day during breaks)

2.1 Give each student 15 Energy Trip Tickets (Printable no.3) and announce that for the next five days, every trip will cost one ticket. At the end of each day, record the number of tickets each student has left on a large chart for all to see.

Who is wasting energy? Conserving it? How are they doing it?

Discuss energy-saving strategies such as combining several errands on one ticket and "pencil pooling" (rotating the task of pencil sharpening within a small group of students). By the third day, the room will be abuzz with talk of the impending "energy crisis."

- **1 trip to pencil sharpener by 1 student = 1 ticket**
- **1 trip to pencil sharpener by 5 students = 5 tickets**
- **trip to pencil sharpener followed by trip to restroom = 2 tickets**
- **trip to pencil sharpener combined with trip to lunchroom combined with trip to restroom = 1 ticket**

2.2 Discuss with the students (at the end of the week)

Ask your students what effect the crisis is having on their standard of living. Now they are ready to devise some real-life conservation strategies.

Developing conservation strategies can be fun, especially when your students know the priceless reward of their knowledge of energy conservation.

LET'S HAUNT SOME ENERGY VAMPIRES!

Task 3: Mapping Vampire Energy (45 mins)

3.1 Visit the following webpage:

https://www.saveonenergy.com/learning-center/mapping-vampire-energy/

At first, you may ask students what they think that Energy Vampires are? (10 minutes)

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Go through Slides 18-20 (Energy consumption module)

Explain to students what Energy Vampires are. You can use all info presented on Teachers Handbook (pg.19-21)

Present Energy Vampires photo (Slide 19) on the projector about energy consumption of energy vampire devices at home and ask them to go through the pages 9 and 10 of their Presentation (see Photo 1) (15 minutes)

3.2 Estimate your Energy Vampires at the school classroom, labs etc. (45 minutes)

At the bottom of the **Energy Vampires website**, you may find vampire energy calculator has the potential to help you see which devices are costing you the most. Using this tool, students will better understand how much of their school money is wasted on the electronic devices they don't use.

This application is already set-up for the United States; therefore, you can alternatively ask from students to find a city/state in the US that is located at the same parallel with their city, using the following maps:

Google Maps

Interactive map

(you make drag US cities on top of Europe)

By selecting the appropriate State in the app (1st selection), students may start monitoring for 30 minutes different plugged and unplugged devices in their school.

You can use **Printable no.4 (Students Worksheet). They can work in groups of 2 – 5.**

When the students finish their energy vampires monitoring, they can start adding all devices in the online app in order to estimate their total savings!

Task 4: Renovation wave (45 minutes)

4.1 Introduction to the renovation wave in Europe (20 minutes)

You may start this activity with the following videos explaining the targets and the goals of buildings renovation in Europe during the next years.

Remember that one of the most crucial aspects of buildings renovation has an enormous societal impact (i.e. reduce energy poverty) and this must be

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highlighted. Energy efficiency measures have not only economic benefits!

Video: EU Renovation Wave Strategy *(1 min and 16 sec.)*
https://www.youtube.com/watch?v=gGK_kPaieXo

Video: Green sustainable and healthy buildings explained *(2 mins and 25 sec.)*
https://www.youtube.com/watch?v=dDATY3av_48

You may use Printable 5, pages 23-26 from the Teachers Handbook and Slides 21-23 from the students' presentation to explain what building renovation is, why is it important and what options do we have!

4.2 How to deep renovate your house (25 minutes)

Energy Renovation is fun! 4RinEU launches an online game to teach young students the benefits of deep energy renovation.

This educational game has been designed to engage with citizens and, ultimately, drive behavioural change in their communities. What does deep energy renovation mean? How can I manage the budget to renovate my home? What are the most suitable technologies? Play with us and find out!

The tool is based on simulations of the energy performance of a single-family house before and after the renovation.

Upper primary school students can either play alone or try it in class with their teachers and friends. The game offers a great starting point to discuss about energy efficiency and how the choices we make at home may have an impact on the environment …and on our wallet!

How to deep renovate your house?

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Extracurricular Activities	Find a list of items related to energy use and conservation in your home. This scavenger hunt is designed to teach children and families about energy and energy conservation while keeping them on their feet and entertained! How? By «hunting» energy vampires in their home! **Optional Activity:** Have students photograph the scavenger hunt items in their home and use the photos in a presentation about the items, where they were, and their connections to saving energy or water.

Module: Energy Resources and Management

Topic 3 Title: Light Pollution

https://www.voyageurs.org/light-pollution-lesson

Lesson Plan 1 – Light Pollution hunters	
Duration: 2 school hours (45 + 45 minutes). Introduction to Light Pollution (30 minutes) Mapping light pollution (45 minutes) Experimental activity (45 minutes)	
Short Description of the Lesson	Students will gain an understanding of what light pollution is, how it impacts our environment and how we can reduce it. Also, students realize how light pollution is directly linked to energy consumption patterns and energy conservation.
Learning Goals	• Describe different types of light pollution • To recognise some sources of light pollution and describe how these affect how we see stars in the night sky • Identify sources of light pollution around you • Develop a plan to reduce light pollution around you • To conduct an experiment to find out how artificial light can be directed and which materials and shapes would help do this
Green Competences Linked	
Target Group	Primary school students aged 6-9 years old
Educational Approach	Inquiry-based learning
Link to School Curricula (if applicable)	Earth and Space science

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Facility/ Equipment	• Classroom • Internet access • Projector
Tools/ Materials	• Computers with internet access • Printed worksheets • Pencils/Pens • Worksheet 1 • Teacher's Handbook • Student's Presentation
Main Tasks	**Task 1: Introduction to light pollution (15 minutes)**  **1.1 Start the lesson with a video** https://www.youtube.com/watch?v=5gYIeT6GrkA (3 mins) Discussion questions for the video (10 mins) • Explain what Light Pollution is, its reasons and effects • Ask students *'What if we close the lights every day for 1 hour? Isn't it that a solution?'* **Go through Slides 24-25 (Light pollution module)**  **1.2 Show to students the following video** https://www.youtube.com/watch?v=h1PZd6rA_eU (5 mins) Explain to students that turning off the lights for 1 hour is not a viable solution. But what can we do? LET'S FIND OUT! **Task 2: Understanding light pollution (15 mins)**  **2.1** Provide your students with sticky-notes and ask them to provide answers to the following: ***(see worksheet 1-online)*** • What is light pollution? • Which are the sources of light pollution? • Can you define the types of light pollution? **See PowerPoint presentation slides 24 – 26 (Light pollution module)** **Task 3: Light pollution monitoring and mapping (45 mins)** **1.1 Monitoring light pollution from space. Is that possible?** (10 minutes) You can ask students if we can see Light Pollution from space! Is this possible and how? Use the following video as an introduction

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Video: Light Pollution mapping *(2 mins and 25 sec.)*
https://youtu.be/ZYGd-llxHJE

1.2 Using online tools to identify light pollution from space! (10 minutes). Now let's use an online Geographic Information Systems platform to monitor light pollution at a global scale!
You can use the Light Pollution Map web platform in the following link:

Light Pollution Map

Let the students to navigate on the map and identify different areas of increased light pollution.

1.3 Discuss with the students (10 minutes) their thoughts and if any correlation exists between the sites of increased light pollution and the number of people live there (big cities, industrial areas, roads etc.). This map is real, however, is a little bit enhanced in terms of the light pollution distribution, spread and colours.

1.4 Pre Activity - Light Pollution - Map Exploration (Worksheet 2) (15 minutes)

1.5 How to reduce light pollution in our area game (15 minutes)

Use the following link:

Light Pollution Simulator

Ask from students to test the game, for instance, to click on the screen in order to turn on the lights in the house, add light bulbs etc. They will be able to see the impact on the night sky by turning on the lights, adding light bulbs.
The main question is:
What can we do to reduce the over-illumination in order to be able to see the stars?
Turn off the lights? Reduce the light bulbs on the streets? Shield our light bulbs? Lower light bulbs height?

Task 4: Light pollution mitigation measures (Light pollution hunters) (45 minutes)

Let's take a look at the outdoor lights we have around us.

Activity steps:

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		4.1 Divide participants into groups of 2 - 4. **4.2 Provide each group with an outdoor lighting survey form**, **outdoor lighting ID form (also below), clipboard, and writing utensil**. Colored pencils work well to allow groups to distinguish types of lights on their maps (e.g. walkway or streetlights, lights on buildings, floodlights). Provide insect viewers and gloves if a dead insect survey is possible around outdoor lights. **4.3 Divide the available outdoor space** into areas each group is responsible for surveying. **4.4 Encourage groups to look high and low, and imagine how the area would look at night.** Review survey form together. Conduct survey in groups. **4.5 Bring the groups back together** to share their findings, one at a time. Facilitator will collate recommendations on how to reduce light pollution. Useful recommendations for dark sky-friendly outdoor lighting are available here. **4.6 Discuss these ideas as a larger group.** Make an action plan on priority steps.

ANNEXES

Energy Production - Teacher_Answers

Energy Production - Worksheet_1a_renewable-and-non-renewable-energy_attachments_renewable-versus-non-renewable-energy

Energy Production - Worksheet_1b_renewable-and-non-renewable-energy_attachments_renewable-versus-non-renewable-energy

Energy Production - Worksheet_3_renewable-energy

Energy Conservation and Efficiency - Energy-Trip-Tickets

Energy Conservation and Efficiency - Printable_1_vampire-energy_1

Energy Conservation and Efficiency - Printable_2_vampire-energy_2

Light Pollution - Worksheet_1a_Outdoor Lighting ID Form

Light Pollution - Worksheet_1b_Outdoor Lighting Survey Form

Light Pollution - Worksheet 2_Light Pollution - Map Exploration

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