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GREENLIGHT

Renewable energy sources and the processes of energy production

Students' Worksheets

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Project Partners

WORKSHEET S1: SOLAR ENERGY

1. In class, you have been learning about solar energy. Now, you are asked to think about what you learned and take a quiz.

   1.1. You should solve the quiz together with your small group colleagues.

   1.2. Start by reading each statement related to solar energy.

   1.3. Discuss it with your group colleagues to decide if it is a *True* or a *False* statement.

   1.4. Mark your choice in the table. Later, we will check together which answers are correct.

Quiz table

Statement	True	False
1. There is only one type of solar panel.		
2. Photovoltaic solar panels only work when the sun is shining directly upon them.		
3. Solar energy is a renewable energy.		
4. Photovoltaic solar panels do not work at all in winter.		
5. Solar energy can reduce electricity bills.		
6. Solar energy can be stored for later use.		
7. Photovoltaic solar panels require a lot of maintenance.		
8. The use of photovoltaic solar panels is completely pollution-free.		
9. Solar energy can power entire cities.		
10. Solar energy is too expensive compared to fossil fuels.		
11. Photovoltaic solar panels can be installed on rooftops and open fields.		
12. Using solar energy helps reduce greenhouse gas emissions.		
13. Photovoltaic solar panels stop producing electricity after 10 years.		
14. Photovoltaic solar panels work better in very hot climates.		
15. Solar energy is the fastest-growing renewable energy in use.		
16. Photovoltaic solar panels can produce electricity even at night		

2. After completing and discussing your Quiz, answer the following questions

2.1. Which statement surprised your group the most?

_____

2.2. Explain the reason for your surprise.

_____

_____

_____

_____

2.3. Can you think about any false statement that you believe people acknowledge as true?

_____

_____

2.4. Explain why they may acknowledge it as true and how it may affect people's opinions about Solar Energy.

_____

_____

_____

_____

WORKSHEET S2: SOLAR CITY

Scenario

Your municipality aims to increase its use of solar energy to 40% of its energy mix within 10 years. You are invited to advise on how they can do that.

1. In your group of 3–5 students, discuss and decide:

   1.1. Which types of solar technologies could be used (e.g., photovoltaic solar panels, thermal solar panels) and why?

   _____

   _____

   _____

   _____

   1.2. Where and how should solar panels (you can consider the different types of panels) be placed (e.g., rooftops, individual gardens, large fields, mountains, etc.) to best fulfil the goal of the municipality?

   _____

   _____

   _____

   _____

   1.3. What challenges may the municipality face and how can they be overcome, that is, what possible solutions do they have?

   _____

   _____

   _____

   _____

2. Fill in the table below (City Solar Energy Table) with your group's ideas. Be specific and justify your choices.

3. After completing the table, prepare a short presentation to share your ideas for your municipality to increase the mix of solar energy with the class.

Group Solar City Table

Proposed Solar Technology	Reason for Choice	Possible Locations	Challenges	Proposed Solutions

4. Now, you know the proposals of the other groups.

4.1. How happy do you feel with your group's proposal compared to the other groups'?

_____
_____
_____
_____

4.2. What is the most important thing you learned from this activity?

_____
_____
_____
_____

WORKSHEET S3: COOKING WITH SUNLIGHT?

Scenario

At your home, you use electricity, gas, or coal to cook your meals. Have you ever thought about using the sun to cook? Do you think it would be possible? If so, how would it work?

1. Discuss these questions with your group's colleagues and afterwards share your ideas in class. You can write down some key ideas.

_____

_____

_____

2. Now, your group is going to make a device to find out if your ideas work or not. You should follow the experiment steps below and record your observations, data, and reflections in the table provided.

Experiment

Materials Needed

Cardboard box
Aluminum foil
Clear plastic wrap
Black paper
Food item to cook (e.g., s'mores, marshmallows, or cheese on bread)
Thermometer
Timer
Notebook for observations

Experimental Steps

1. Line the bottom of the cardboard box with black paper.
2. Cover the inner sides with aluminum foil to reflect sunlight into the box.
3. Register the observable features of the food item you chose.
4. Place your food item inside and cover the top with clear plastic wrap.
5. Position the box under direct sunlight. Adjust the foil to direct maximum sunlight into the box.
6. Start the timer and measure the temperature inside the box every 5 minutes.
7. Observe any changes in the food (melting, cooking, softening).
8. Record all observations in the table below.

Observation Table

Time (minutes)	Temperature inside the device(°C)	Food changes observed	Notes/Reflections

Data analysis and conclusion

3. Based on the data collected, what do you think happened to your food?

_____

_____

_____

4. What happened to the sunlight that hit your device? Why do you say that?

_____

_____

_____

5. Which part of your device design worked best and why?

_____

_____

_____

6. What changes would you make to increase cooking efficiency?

_____

_____

_____

7. What sort of device did you build? Why do you say that?

_____

_____

_____

Knowledge application

8. Can it be practical in real life? If yes, where and how?

_____

WORKSHEET W1: ENERGY DOMINO GAME

You are invited to join your small team (3 to 5 students) to play a domino game about wind energy. To do so, you will receive a set of wind domino cards (e.g., Wind, Turbine, Generator, Grid, Homes, Storage, etc.).

1. Arrange the cards to show the correct energy flow sequence.

2. Write your sequence below (in the order you arranged the cards). Complete the following sentence

Our sequence is:

3. Explain in 2–3 sentences why you chose this sequence. Complete the sentence:

We believe this is the correct order because: _____

_____

_____

_____

Annex to Worksheet W1

Cards for the Domino Game

1 	Generator → Converts mechanical energy into electricity
2 	Kinetic Energy → Energy of moving air (wind)
3 	Wind → Natural moving air
4 	Blades → "Capture" the wind's kinetic energy
5 	Homes → Electricity for families
6 	Electric Grid → Distribution network
7 	Storage Batteries → Store excess of electricity for later use

WORKSHEET W2: QUICK WIND ENERGY REVIEW

You have been learning about wind energy. In the next table, you can find statements about wind energy. You are invited to read and think about them.

1. Mark each statement as True or False.

Number	Statement	True	False
1.1	Wind energy is a renewable energy.		
1.2	Wind turbines convert kinetic energy from the wind into mechanical energy only		
1.3	Offshore wind farms are located in the sea		
1.4	Wind energy produces greenhouse gas emissions while generating electricity		
1.5	The blades are the first part of the turbine to move		
1.6	Wind turbine's generator converts mechanical rotation into electricity.		
1.7	The location that generally has stronger and more consistent winds for turbines is deserts.		
1.8	The main advantage of wind energy is that it generates a lot of heat.		

2. Explain why you marked some statements as false.

_____

_____

_____

_____

_____

_____

WORKSHEET W3: MINI-POSTER ON WIND ENERGY

You have learned many things about wind energy, which is a renewable energy. Now you are asked to prepare a mini-poster to show people the most important facts and ideas about wind energy.

1. Create a mini-poster titled “Wind Energy - Powering the Future”. You can use paper and markers or Canva if digital devices are available.

2. Include the following elements:

   2.1. Key Statistic

   Write one important fact or number about wind energy. Example: “Wind energy supplied 16% of the EU’s electricity in 2022.”

   Statistic: _____

   2.2. Benefit

   Write one positive aspect of using wind energy. Example: “It generates electricity without emitting greenhouse gases.”

   Benefit: _____

   2.3. Challenge

   Write one challenge related to wind energy. Example: “Wind turbines can impact local wildlife if not carefully placed.”

   Challenge: _____

   2.4. Visuals

   Draw or add an image/icon that represents wind energy.

   Notes for visuals: _____

   2.5. Optional Reflection

   Explain how wind energy can contribute to a cleaner future in your city or country?

   Reflection: _____

3. Share the mini-poster with the class.

WORKSHEET W4: THE PINWHEEL EXPERIMENT

Probably, you have already seen a pinwheel. Do you know how it works? Today, you will investigate how wind (from a fan) can make a pinwheel spin and how different distances and angles affect its rotation.

1. Your group is going to make a pinwheel and carry out the experiment described below. You are asked to record your observations, data, and reflections in the table provided.

Experiment

Materials Needed

A4 paper
Straws
Pins
Glue
Scissors
Desk fan
Stopwatch

Experiment Steps

1. Build a simple paper pinwheel following the teacher's demonstration.
2. Place the pinwheel in front of the fan at a chosen distance and angle.
3. Turn on the fan. Use a stopwatch to count the number of rotations in 15 seconds.
4. Record the result in the table below.
5. Repeat for at least 3 different distances and 3 different angles.

Observation Table

Trial	Distance from Fan (cm)	Angle (degrees)	Number of Rotations (15 sec)	Observations / Notes
1				
2				
3				
4				
5				

Data analysis and conclusion

2. Which distance produced the most rotations? _____
3. Which angle produced the most rotations? _____
4. How does changing the distance or angle affect the pinwheel's movement? _____
5. What design adjustments could improve rotation efficiency? _____

WORKSHEET W5: WIND ENERGY REFLECTION

Today, we finished working on the topic of Wind Energy. Take a few minutes to reflect on what you learned about wind energy. Answer the questions below.

1. Write down one advantage of using wind energy.

   _____

   1.1. Explain why it is an important advantage.

   _____

   _____

2. Write down one disadvantage of using wind energy.

   _____

   2.1. Explain why it is an important disadvantage.

   _____

   _____

3. Write down one challenge of installing wind turbines in a city or rural area.

   _____

   3.1. Explain why it is an important challenge.

   _____

   _____

4. Share the personal thought or idea about wind energy that you found most interesting.

   _____

   _____

5. How do you think the advantages and disadvantages of solar and wind energy compare?

   _____

   _____

   _____

   _____

WORKSHEET H1: HYDROELECTRIC ENERGY PROCESS PUZZLE

You are learning about hydroelectric energy. Now, you are invited to solve a puzzle on the hydroelectric energy generation process.

1. Arrange the cards to show the correct sequence of how hydroelectric energy is generated.

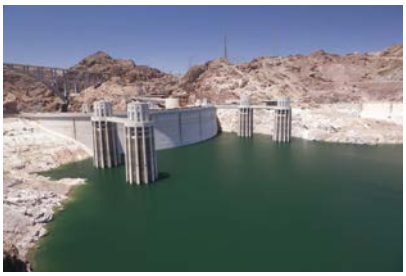
2. Write your sequence below (in the order you arranged the cards).

3. Write short notes on what happens in each step of the sequence.

4. Explain in 2 or 3 sentences why you chose this sequence.

Annex to Worksheet H1

Cards for the puzzle on the hydroelectric energy generation process

1 	Turbine	
2 	Transmission Lines	
3 	Penstock	
4 	Reservoir	
5 	Generator	

WORKSHEET H2: BUILD A MEDIUM DAM?

Scenario

"Imagine that your local authorities want to increase the mix of hydroelectric energy. One possibility of achieving that goal is to build a dam in the region. Should our region build a medium dam?"

1. Working in a small group (5 students), think about the main groups of people who would be affected by the decision to build a medium dam. Write down in the table what you think each of them would think and why. Consider their priorities, concerns, and goals regarding a proposed dam. Try to use evidence to support your arguments.

Group	**You think that each group would think**
Residents	
Government	
Environmental groups	
Energy companies	
Tourism agents	
Safety agents	
Other (specify)_____	

2. And you? What do you think? Fill in the table below.

Advantage	**Risk or challenge**

3. After a small group discussion, write your group's opinion.

Do you think that a dam should be built in your region?
___ Yes ___ No

3.1. Why do you think that?

_____

_____

_____

WORKSHEET B1: BIOMASS ENERGY PRODUCTION

You are already familiar with biomass and Biomass energy. Now, you are going to conduct an experiment about biomass energy production.

1. With your small group colleagues, carry out the experiment described below. You are asked to record your observations, data, and reflections in the table provided.

Experiment

Materials Needed

Clear plastic bottle

..Balloon

..1 teaspoon of sugar

..2 teaspoons of yeast

..Warm water (enough to fill the water bottle 1 inch or 2,54 centimeters from the bottom)

Experiment Steps

1. Fill the water bottle with warm water (approximately 1 inch or 2,54 centimeters)
2. Add the yeast, and gently swirl
3. Add the sugar, swirl again
4. Stretch out the balloon so that it can inflate easily
5. Place the balloon over the opening of the bottle
6. Observe the bottle and the balloon at five and 10 minutes
7. After minute 10, try to change a variable of this experiment (such as the surrounding temperature)
8. After each change, observe the bottle and the balloon.

Observation table

Time (min)	Variable changed	Bottle	Balloon
0			
5			
10			

Data analysis and conclusion

2. What did you notice throughout this experiment?

_____

_____

_____

3. What happened to the balloon?

_____

_____

_____

4. What environmental conditions yielded the most change?

_____

_____

_____

5. What is the role of the yeast, sugar, and water in the experiment?

_____

_____

_____

6. What can you conclude from this experiment?

_____

_____

_____

WORKSHEET B2: BIOMASS BINGO

You are already familiar with biomass and Biomass energy. Now, you are going to play a Biomass Bingo game.

Instructions

1. Take your 16-item Biomass Bingo cards.
2. The cards contain biomass and non-biomass items.
3. When the teacher calls out an item, you should:
   - Mark it ✅ if you think it is suitable for biomass energy.
   - Leave it blank or erase ❌ if it is not suitable for biomass energy.
4. First student to complete a row, column, or diagonal shouts “Biomass Bingo!”
5. To win, you must also explain your choices correctly.

Annex to Worksheet B2

The «Biomass Bingo» Cards

Card 1

Corn Husks	Plastic Bottles	Manure	Coal
Olive Pits	Wood Chips	Natural Gas	Food Waste
Straw	Gasoline	Glass	Sawdust
Sugarcane Bagasse	Aluminum Cans	Steel Scrap	Oil

Card 2

Manure	Aluminum Cans	Corn Husks	Oil
Food Waste	Glass	Olive Pits	Coal
Steel Scrap	Wood Chips	Straw	Natural Gas
Gasoline	Sugarcane Bagasse	Sawdust	Plastic Bottles

Card 3

Straw	Oil	Plastic Bottles	Food Waste
Sugarcane Bagasse	Aluminum Cans	Corn Husks	Sawdust
Coal	Olive Pits	Glass	Gasoline
Steel Scrap	Manure	Wood Chips	Natural Gas

Card 4

Wood Chips	Gasoline	Food Waste	Plastic Bottles
Manure	Sugarcane Bagasse	Aluminum Cans	Straw
Natural Gas	Olive Pits	Oil	Glass
Sawdust	Coal	Corn Husks	Steel Scrap

Card 5

Olive Pits	Sawdust	Plastic Bottles	Corn Husks
Coal	Manure	Glass	Wood Chips
Aluminum Cans	Food Waste	Gasoline	Steel Scrap
Oil	Straw	Sugarcane Bagasse	Natural Gas

WORKSHEET B3: DESIGN YOUR MINI BIOGAS SYSTEM

You have been learning about Biomass energy. Now, you will assume the role of a project maker and plan a simple biogas system.

1. Your task is to take an A3 sheet of paper and design a simple biogas system.

Requirements of the biogas system

Parts to include in the biogas system

...Inputs (types of waste)

...Digester

...Gas output

...Fertilizer byproduct

...Storage

...Possible uses (heating, cooking, electricity)

Use arrows, icons, and labels to show the flow of energy and materials.

2. Step-by-step guide to help you design a system that meets the requirements.

2.1. Inputs: What materials go into the system?

- Food waste: _____
- Garden waste: _____
- Manure/other: _____

2.2. Digester: How do we process the waste?
Draw the digester in the center of your system. Add arrows showing how waste goes in.

2.3. Gas Output: What happens next?

- Where does the gas go? _____
- How is it moved/stored? _____

2.4. Fertilizer Byproduct

- What solid/liquid is left over? _____
- How could it be useful? _____

2.5. Storage & Uses

- How can we store the gas? _____

_____

- What can we use it for in our school/community?
  - Cooking: _____
  - Heating: _____
  - Electricity: _____

3. Get the "Exit ticket", by completing the following sentence:

Biomass energy production works best when ……. but

we must watch out for……..