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| **Project ID: 2021-1-CZ01-KA220-SCH-000034484**    **COURSE FOR ENVIRONMENTAL EDUCATION**  *e-Modules: Teaching Learning activities and their technology enhanced material set to develop*  ***DISCLAIMER***  *Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.*  **COURSE AUTHORS**   |  |  | | --- | --- | |  | Martyna Florkowska-Kardasz, Justyna Pająk-Jaroszewska |   **COURSE SHARING LICENSE**   |  |  | | --- | --- | | Une image contenant symbole, cercle, capture d’écran, Graphique  Description générée automatiquement | You are free to:   * Share — copy and redistribute the material in any medium or format for any purpose, even commercially. * Adapt — remix, transform, and build upon the material for any purpose, even commercially. | |

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| **MODULE 6** | **SUSTAINABLE DEVELOPMENT AND SOLUTIONS TO ENVIRONMENTAL PROBLEMS AND CLIMATE CHANGE** |
| **PART 5** | **RENEWABLE ENERGY SOURCES, GREEN TECHNOLOGIES** |
| **Lesson 2** | **Students explore emerging technologies for sustainable development and understand the role of innovation in addressing environmental issues and climate change.**  **Students construct arguments and discuss the benefits and challenges of adopting green technologies.** |

**SUMMARY**

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# 1. COURSE TIME, TARGET AND TOPIC

* **Age of target students:** 15+
* **Teaching time:** 1 hour
* **Disciplines:** foreign languages, ecology, biology
* **Title:** What are the benefits and challenges of adopting green technologies ?

# 2. COURSE OBJECTIVES

## Competences promoted in this lesson:

* Communication in foreign languages competency
* Digital competency
* Learning to learn competency
* Social and citizenship-related competencies

## Lesson objectives:

* The students explore emerging technologies for sustainable development and understand the role of innovation in addressing environmental issues and climate change
* They construct arguments and discuss the benefits and challenges of adopting green technologies

# 3. LEARNING – TEACHING PROCESSES

There are 4 activities in this lesson:

1. **ENGAGE:** Trailer watching – the students watch the trailer of Al Gore’s documentary entitled ‘An Inconvenient Sequel : Truth to Power’
2. **EXPLORE: Sustainable Technology Quest** – the students work at the stations in small groups and do tasks allowing them to explore green technologies
3. **EXPLAIN: Explanation time – students explain what they have discovered or learnt at the assigned stations**
4. **EXTEND: Fishbowl discussion** (exchange of the arguments presenting benefits and challenges of adopting green technology)

# 4. EVALUATION

The evaluation is described in the last part of document.

# 5. DOCUMENTS

### ENGAGE

### *Trailer watching*

Ask the students if the know who Al Gore is. If they do not, explain (an American politician and environmental activist, former vice president of President Bill Clinton, awarded with the Nobel Prize for peace for raising awareness about global warming. Source : [Al Gore | Biography, Education, Climate Change, & Facts | Britannica](https://www.britannica.com/biography/Al-Gore)) Ask the students to watch the trailer of Al Gore’s documentary entitled : An Inconvenient Sequel : Truth to Power (2017) : <https://youtu.be/huX1bmfdkyA?si=YDDIeiZv5UEmVWpf>

While watching, the students are to :

- write down the examples of green technologies shown in the trailer (suggested answers : wind turbines, solar panels)

- write down the name of a city in which an international treaty on climate change was signed in 2015: (suggested answer :Paris ; The Paris Agreement – an agreement to reduce global greenhouse gas emissions to well below 2°C. ([Key aspects of the Paris Agreement | UNFCCC](https://unfccc.int/most-requested/key-aspects-of-the-paris-agreement))

- write down the examples of catastrophies affecting human mankind due to the climate change. (suggested answers : flood surges, hurricanes/stronger winds, melting glaciers, wildfires, drought).

- write down what is right and wrong to do according to Mr Gore. (Suggested answer : It is right to save this humanity, it is wrong to pollute this earth, it is right to give hope to the future generations).

Write the students answers on the board. However, arrange them in a way that will greatly expose Al Gore’s quote. Ask the students what is needed to give hope to the future generations. The answers will vary, but it is the teacher’s role to suggest the use of new technologies if the students will not make this connection themselves.

Ask students to think about one benefit and one challenge of the green technology featured in the video. They write their responses on sticky notes and post them on the board.

### EXPLORE

### *Sustainable Technology Quest*

Group Work Setup: Divide students into small groups and assign each group a different green technology (solar power, wind energy, electric vehicles, green buildings, vertical farming, etc.).

Research: Provide printed articles and data sheets for each group. Students have 5 minutes to read and discuss the materials, identifying key benefits and challenges of their assigned technology.

Physical Exercise: After the research, have students stand up and do 10 jumping jacks to get their blood flowing before moving on to the next stage.

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**Station 1**

**Task**

At this station you will be exploring hydropower. Use the internet to find the uses of hydropower for sustainable development. Remember to relate to different spheres of human life. Write your answers down on a provided sheet of paper. Do not forget to write the name/number of your group.

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Possible answers: electricity generation, flood control, irrigation support, affordable, marshy areas reclaim, climate protection, etc.

**Station 2**

*Instruction to the teacher: At this station the students are supposed to arrange the following events in the chronological order. Cut them into pieces. The timeline sheet is provided as a separate attachment to the lesson plan. The answer key is provided at the end of this lesson plan.*

**Task**

Green technologies timeline. Arrange the events in the chronological order. Once you have finished the task use the answer key to check your answers. Remember to put the answer key back with the clean side facing up after completing the task.

Early windmills developed in Persia. I First Hydropower Plant (on the Fox River in Appleton, Wisconsin, USA).

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Charles Fritts installed the first solar panels on New York City rooftop.

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First Modern Wind Turbine (The first megawatt wind turbine was constructed in Vermont, USA.)

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Invention of the First Practical Solar Panel - Bell Labs developed the first practical photovoltaic cell.

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Development of Bioenergy Technologies - Significant advances were made in converting biomass into energy during the energy crisis. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

First Commercial Wind Farm - The first wind farm, consisting of 20 turbines, was installed in New Hampshire, USA.

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Introduction of Electric Vehicles I The world’s first offshore wind farm is installed in Denmark.

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Breakthrough in LED Lighting. THE LUMENS **-** LEDs with 100 lumens per watt are first created in this year and their efficiency could only be outmatched by gas discharge lamps.

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First Algae Biofuel Powered Flight. I Record Growth in Renewable Energy.

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Paris Agreement - The international treaty on climate change was adopted to limit global warming.

Solar Power Becomes the Cheapest Energy Source - Solar power reported to be the cheapest form of new electricity generation.

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Hydrogen Fuel Cell Technology Advances - Significant advancements were made in hydrogen fuel cell technology for both vehicles and industrial applications.

**Station 3**

**Task**

**Wind Turbine Building Challenge**

You are going to build a simple model wind turbine that can catch the wind and spin. Test the turbines by blowing on them or using a fan.

Use the provided materials for building a simple wind turbine (e.g., paper, straws, tape, scissors, paper clips, plasticine).

While doing the task, discuss the principles of wind power and how real wind turbines generate electricity.

**Station 4**

*Instruction to the teacher: the word search puzzle and the answer key are attached separately.*

**Task**

Find and circle 8 words related to the use of solar energy in the word search puzzle.

Once all words are found, discuss their meanings and relevance to solar power. If you are not acquainted with some terms, feel free to use the internet for explanation.

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**Station 5**

*Instruction to the teacher: provide the students with some samples of edible seaweed as they are going t0*  *learn about the benefits of seaweed as a sustainable food source by tasting and analysing it.*

**Task**

Seaweed Superfood Tasting

1. Taste each type of seaweed and rate them based on flavor, texture, and appearance.
2. Discuss the benefits of seaweed as a sustainable food source and its potential uses in sustainable development.

*Possible answers: high in essential vitamins and minerals, requires no fresh water or fertilizers to grow, absorbs CO2, helping to mitigate climate change.*

**Station 6**

**Task**

Write a fascinating and romantic short story (about 20 sentences) in which you will portray the benefits of using hydropower (Include at least three of them).

*Possible included phrases: flood control, a dam, cheap, clean and affordable energy, irrigation support.*

**Station 7**

**Task**

Take the piece of paper and write the answers to the following questions:

1. Which vice-president received an Oscar for a documentary dealing with environmental issues?
2. When was the first Earth Day celebrated?
3. What is the most iconic dam in the world?
4. What is burning and why in the famous song by a famous Australian rock band Midnight Oil?
5. Name three environmental organizations.
6. What is the name of the first National Park? Where is it situated? (Country, state.)
7. Choose the name of the famous geyser located in Yellowstone?
8. Young Faithful
9. Old Faithful
10. Middle-aged Faithful
11. How many national parks are there in Poland, Lithuania, Czech Republic, Austria, Iceland, France and Turkey?
12. Which animal can you see in the logo of WWF?
13. What does WWF stand for?

Answer Key:

1. Al Gore, 2. April 22, 1970, 3. Hoover Dam, 4. Beds, due to the global warming, 5. E.g. Greenpeace, Rainforest Alliance, WWF, 6. Yellowstone in the USA, Wyoming, Montana and Idaho, 7. B, 8. In order: 23, 5, 4, 6, 3, 11, 48, 9. A giant panda, 10. World Wildlife Fund.

**Station 8**

*Instruction to the teacher: Print and cut the pieces with quotes and the names of their authors separately. Provide one answer sheet to be available at this station. Ask the students to check their choices with it.*

**Task**

Match the environmental quotes with their authors. When you finish check your answers with the answer key. When you finish, make the station available for the group coming after you, which means: mess the quotes 😉

“I only feel angry when I see waste. When I see people throwing away things we could use.”

—Mother Teresa, a nun

“Progress is impossible without change, and those who cannot change their minds cannot change anything.”

-George Bernard Shaw, poet and writer

“The Earth will not continue to offer its harvest, except with faithful stewardship. We cannot say we love the land and then take steps to destroy it for use by future generations.”

—John Paul II, Pope

“Like music and art, love of nature is a common language that can transcend political or social boundaries.”

—Jimmy Carter, American President

“You cannot get through a single day without having an impact on the world around you. What you do makes a difference and you have to decide what kind of a difference you want to make.”

—Dame Jane Goodall, the world’s foremost expert on chimpanzees

“Environmentally friendly cars will soon cease to be an option … they will become a necessity.”

—Fujio Cho, Honorary Chairman of Toyota Motors

“It is right to save this humanity. It is wrong to pollute this Earth. It is right to give hope to the future generations.”

—Al Gore, Vice president to President Bill Clinton

“A cry for survival comes from the planet itself. A cry that can't be any more desperate or any more clear.”

—Joe Biden, American President

“One touch of nature makes the whole world kin.”

— William Shakespeare, *Troilus and Cressida*

“Climate change is real. It is happening right now, it is the most urgent threat facing our entire species and we need to work collectively together and stop procrastinating.”

— Leonardo Di Caprio, American actor, in his acceptance speech for best actor at the 2016 Oscars

Water moves, new world order rules

Through hurricanes, the pain is made audible

Sound waves, sci-town graves, dug deep

Water dirty like the police that flood streets

Blood on the beach

Sandstorms on the streets

A man's form could be transformed with the heat of the moment

We think like our opponent

Is overseas

But we're messing with mother meatus ovaries

It's a cruel winter

Summer don't know itself - by Common, American rapper and actor

I say get green (…)

Source:

[Earth Day: 23 of the Greatest Environmental Quotes - Earth911](https://earth911.com/inspire/earth-day-23-quotes/)

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**Station 9**

**Task**

Use the internet and find a song which best relates to the environmental issues. Write down its title, listen to it and write a short summary of the text on the piece of paper provided. Do not forget to write the name/number of your group.

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**Station 10**

**Love-yourself-to-the-moon-and-back station**

The members of the team lide down on the blanket or yoga mats and relax for at least 3 minutes.

**Task**

On the floor there are special relaxation mats. Lie down for at least 3 minutes. Do not talk, do not use your phone. Just close your eyes and think how wonderful the planet earth is.

### EXPLAIN

### *Explanation*

After completing the game stations, each group will present their findings and experiences from one of the stations. Assign each group a different station to ensure all topics are covered. Encourage students to explain the key concepts they learned, how the activities helped them understand those concepts, and any surprising or interesting facts they have discovered.

### EXTEND

### *Fishbowl discussion*

Prepare two sets of small cards differing in colour, e.g. 10 green and 10 pink cards. They will be used to divide the students into 2 groups – an inner and outer circle. Ask them to think about the benefits and the challenges of adopting green technologies. Give the students 6-7 minutes to construct their arguments individually.

Set up the classroom : arrange the chairs in an inner and outer circle. The smaller one is a fishbowl and it discusses while the outer circle listens. Instruct the outer circle to remain quiet, observe and take notes on the content and process of the inner circle’s discussion.

Ask for or select the first group to be in the “fishbowl.” Only the students in the fishbowl are allowed to talk. Students in the outer circle prepare one question or counterargument for the fishbowl.

Allow them to talk and elaborate on/exchange their arguments for 5 minutes. In the first round the benefits are to be presented. After this time ask the students to swap their seats and this time present the challenges for 5 minutes.

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### EVALUATE

Exit Ticket: On a sticky note, students write one compelling argument they heard during the lesson and post it on the board as they leave.

**Station 2 Answer Key**

500-900 - Early windmills developed in Persia.

1882 - First Hydropower Plant (on the Fox River in Appleton, Wisconsin, USA).

1884 - Charles Fritts installed the first solar panels on New York City rooftop in 1884

1941 - First Modern Wind Turbine (The first megawatt wind turbine was constructed in Vermont, USA. )

1954 - Invention of the First Practical Solar Panel - Bell Labs developed the first practical photovoltaic (PV) cell.

1970s - Development of Bioenergy Technologies - Significant advances were made in converting biomass into energy during the energy crisis.

1980 - First Commercial Wind Farm - The first wind farm, consisting of 20 turbines, was installed in New Hampshire, USA.

1990s - Introduction of Electric Vehicles - The 1990s saw the reintroduction of electric vehicles (EVs) in the market, with models like the GM EV1.

1991 – the world’s first offshore wind farm is installed in Denmark.

2006 - Breakthrough in LED Lighting. THE LUMENS **-** LEDs with 100 lumens per watt are first created in this year and their efficiency could only be outmatched by gas discharge lamps.

2010 - First Algae Biofuel Powered Flight

2015 - Paris Agreement - The international treaty on climate change was adopted to limit global warming.

2017 - Solar Power Becomes the Cheapest Energy Source - Solar power reported to be the cheapest form of new electricity generation.

2020 - Record Growth in Renewable Energy - Global capacity for renewable energy grew at its fastest rate in 2020.

2021 - Hydrogen Fuel Cell Technology Advances - Significant advancements were made in hydrogen fuel cell technology for both vehicles and industrial applications.

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