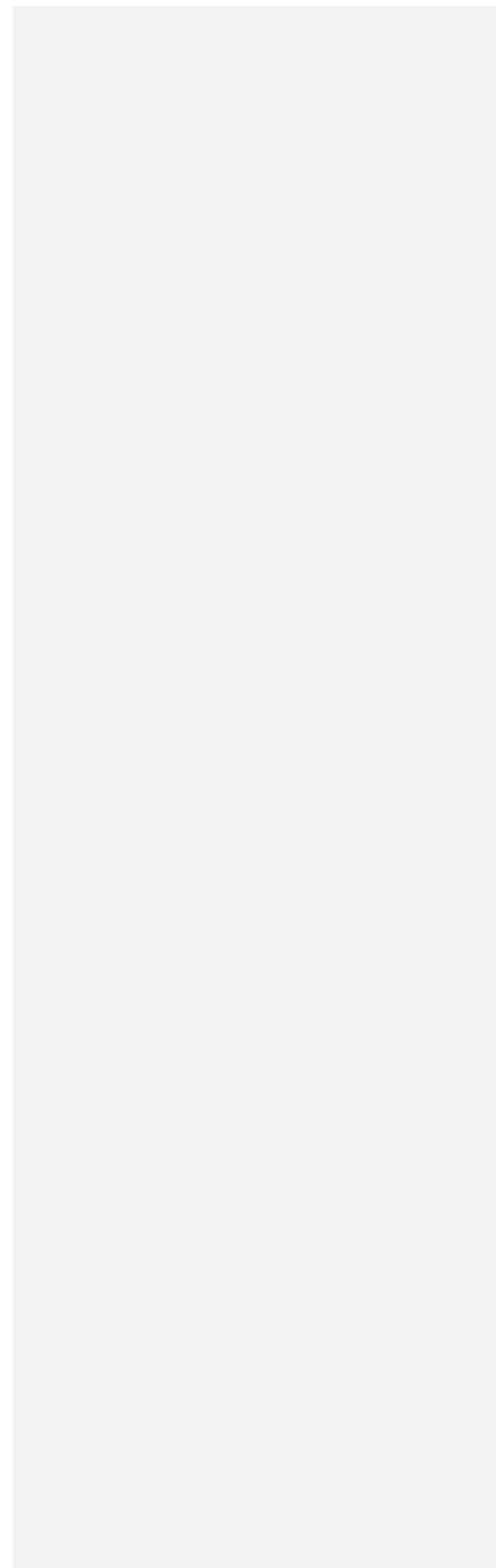


TRAINING LESSON 4 - Part 1

Title	○ Renewable energy
Part of the training course referred to in this lesson	○ X Part 1 General information about sustainability and CE Part 2 Specific Information about: <ul style="list-style-type: none"> <input type="checkbox"/> Wood sector <input type="checkbox"/> Plastic sector <input type="checkbox"/> Agrifood sector
EQF level	Level 3
Where the lesson was tested	During the lesson of Physics with 1st gimnasium class students at Kedainiai Vocational Educational Training Centre, https://www.prc.kedainiai.lm.lt/
General Learning objective(s) according to the Bloom Taxonomy	<input type="checkbox"/> Create Produce new or original work (design, assemble, construct, investigate, formulate) <input type="checkbox"/> Evaluate Justify a stand or decision (appraise, argue, defend, critique, select, support) <input type="checkbox"/> Analyze Draw connections among ideas (differentiate, organize, relate, compare, distinguish, test, experiment) <input type="checkbox"/> Apply Use information in new situations (execute, implement, solve, use, demonstrate, operate) X Understand Explain ideas or concepts (classify, discuss, describe, identify, locate, translate) <input type="checkbox"/> Remember Recall facts and basic concepts (define, duplicate, list, memorize, repeat)
Specific learning objective(s)	After the lesson: <ul style="list-style-type: none"> ● Students will recognize the energy source - fossil fuel; ● Students will understand the limitations of fossil fuel resources. ● Students will learn about an alternative to fossil fuels - renewable energy.
Cognitive, socioemotional and behavioural outcomes based on	SDG 4 Quality Education <u>Cognitive learning objectives:</u> <ul style="list-style-type: none"> ● The learner understands the important role of culture in achieving sustainability. ● The learner understands that education can help create a more sustainable, equitable and peaceful world.

	<p><u>Socio-emotional learning objectives:</u></p> <ul style="list-style-type: none"> • The learner is able to recognize the intrinsic value of education and to analyze and identify their own learning needs in their personal development. • The learner is able to recognize the importance of their own skills for improving their life, in particular for employment and entrepreneurship. • The learner is able to engage personally with ESD. <p><u>Behavioural learning objectives:</u></p> <ul style="list-style-type: none"> • The learner is able to contribute to facilitating and implementing quality education for all, ESD and related approaches at different levels. • The learner is able to use all opportunities for their own education throughout their life, and to apply the acquired knowledge in everyday situations to promote sustainable development. <p>SDG 13 Climate Action</p> <p><u>Cognitive learning objectives:</u></p> <ul style="list-style-type: none"> • The learner understands the current climate change as an anthropogenic phenomenon resulting from increased greenhouse gas emissions. • The learner knows which human activities – on a global, national, local and individual level – contribute most to climate change. • The learner knows about the main ecological, social, cultural and economic consequences of climate change locally, nationally and globally and understands how these can themselves become catalyzing, reinforcing factors for climate change. <p><u>Socio-emotional learning objectives:</u></p> <ul style="list-style-type: none"> • The learner is able to explain ecosystem dynamics and the environmental, social, economic and ethical impact of climate change. • The learner is able to encourage others to protect the climate. • The learner is able to collaborate with others and to develop commonly agreed-upon strategies to deal with climate change. • The learner is able to understand their personal impact on the world's climate, from a local to a global perspective. <p><u>Behavioural learning objectives:</u></p> <ul style="list-style-type: none"> • The learner is able to evaluate whether their private and job activities are climate friendly and – where not – to revise them. • The learner is able to act in favor of people threatened by climate change. • The learner is able to promote climate-protecting public policies. 						
<p>Green skill(s) addressed</p>	<table> <tr> <td><input type="checkbox"/> Creative problem-solving</td> <td><input type="checkbox"/> Management skills</td> </tr> <tr> <td><input type="checkbox"/> Forward-thinking</td> <td><input type="checkbox"/> Impact quantification</td> </tr> <tr> <td><input type="checkbox"/> Monitoring skills</td> <td><input type="checkbox"/> Life-cycle management</td> </tr> </table>	<input type="checkbox"/> Creative problem-solving	<input type="checkbox"/> Management skills	<input type="checkbox"/> Forward-thinking	<input type="checkbox"/> Impact quantification	<input type="checkbox"/> Monitoring skills	<input type="checkbox"/> Life-cycle management
<input type="checkbox"/> Creative problem-solving	<input type="checkbox"/> Management skills						
<input type="checkbox"/> Forward-thinking	<input type="checkbox"/> Impact quantification						
<input type="checkbox"/> Monitoring skills	<input type="checkbox"/> Life-cycle management						





	<input type="checkbox"/> Analytical skills <input checked="" type="checkbox"/> Lean production <input checked="" type="checkbox"/> Maintenance and repair skills <input type="checkbox"/> Pollution prevention <input type="checkbox"/> Eco-design	<input type="checkbox"/> Science skills <input checked="" type="checkbox"/> Waste management <input checked="" type="checkbox"/> Environmental auditing <input type="checkbox"/> Ecosystem management <input type="checkbox"/> Other_____
Duration	20 min	
Structure and content of the lesson	<p>INTRODUCTION</p> <p>Renewable energy is energy that is taken from natural sources. Sunlight and wind, for instance, are such sources that are regularly restored. There are plenty of renewable energy sources in the environment.</p> <p>Fossil fuels - coal, oil and gas are non-renewable sources that take hundreds of millions of years to form. Burned fossil fuels produce energy, causing harmful greenhouse gas emissions, such as carbon dioxide.</p> <p>Used renewable energy creates lower emissions than burning fossil fuels. Transition from fossil fuels, that currently produces the biggest amount of emissions, to renewable energy is a key factor to address climate change.</p> <p>Sources of renewable energy are now cheaper in most countries, and generate three times more jobs than fossil fuels.</p> <p>TOPIC 1: MAIN TYPES OF ENERGY</p> <ul style="list-style-type: none"> • Definition of the concept of energy, main types; <p>Energy - property of an object determined by nature. Thermal, chemical, electromagnetic, nuclear, mechanical</p> <ul style="list-style-type: none"> • Main sources of energy: floods, wind, sun, nuclear power plants, biofuel, tidal energy, hydroelectric plants, coal, geothermal energy. • Types of energy by sources; <p>Non-renewable energy - its sources are characterized by the fact that it is impossible to replenish them after use. This includes fossil fuels.</p> <p>Renewable energy- its resources are characterized by natural replenishment in a relatively short time. As a result, they are always available.</p> <p>Non-renewable energy sources: oil, coal, gas, nuclear fuel.</p> <p>Renewable energy sources: wind, sun, geothermal energy, biomass (plants), water.</p> <p>TOPIC 2: THE ADVANTAGES AND DISADVANTAGES OF RENEWABLE AND NON RENEWABLE ENERGY</p> <ul style="list-style-type: none"> • The advantages and disadvantages of Energy; <p>Non-renewable energy - disadvantages: Produces greenhouse gases; By-products affect the environment; May pose a risk to human health; Responsible for acid rain;</p> <p>After using up - it is not easy to refill.</p> <p>Renewable energy – advantages: Creates less pollution; Doesn't run out because they are from unlimited resources; Geopolitical conflicts are less likely; Can reach remote parts of the planet.</p> <ul style="list-style-type: none"> • Definition of renewable energy, perspectives, conclusions; 	

	<p>Renewable or regenerative "green" energy is energy that comes from natural sources that are replenished at a rate that exceeds its consumption. Examples of such renewable sources include sunlight and wind.</p> <p>The main principle of using renewable energy is to extract it from environmental processes or renewable organic resources and provide it for technical use.</p> <p>Renewable energy sources or renewable energy resources are energy resources in nature, the occurrence and renewal of which are determined by natural processes.</p> <p>TOPIC 3: FUTURE ENERGY SOURCES</p> <p><i>Hydrogen energy.</i> <u>Advantages:</u> Hydrogen is the most common chemical element on Earth that is able to replace energy production, areas of transmission and consumption, help to solve transport, environmental issues. Hydrogen is an ecological, non-polluting fuel.</p> <p><u>Problem:</u> Expensive production and storage.</p> <p><i>Nuclear fusion.</i> <u>Advantages:</u> Nuclear fusion, a reaction during which nuclei of light elements such as hydrogen combine isotopes - deuterium and tritium. A large amount of energy is released during the reaction, no radioactive waste is released, greenhouse effect pollutants.</p> <p><u>Problem:</u> The problem of fusion reactors is to maintain a continuous synthesis reaction in high temperature.</p> <p>CONCLUSIONS</p> <p>Renewable sources and energy efficiency can ensure that CO2 emissions associated with energy production are reduced by nine tenths.</p>
<p>References</p>	<p>https://news.stanford.edu/news/2014/february/fifty-states-renewables-022414.html</p> <p>https://e-seimas.lrs.lt/portal/leqalAct/lt/TAK/9bf1ba80d76211ecb1b39d276e924a5d?i_fwid=yymmqa5y</p>
<p>Interactive questions for R3</p>	<ol style="list-style-type: none"> The most promising new generation energy source: <ol style="list-style-type: none"> helium; hydrogen; oxygen. Which of the following is known for its dependence on meteorological conditions, time of day and high price? <ol style="list-style-type: none"> wind power plants; hydroelectric plants; solar batteries. What will be the effect on greenhouse gasses if people would reduce their use of fossil fuels, increase the energy saving, and improve the thermal insulation of buildings? <ol style="list-style-type: none"> would not change; increase;




Commented [1]: These questions were not included in the Power Point presentation. now I fixed it, but please add the two slides related to the interactive questions also in the translated version of the PPT.
 @z.kapocius@prc.kedainiai.lm.lt

Also, it is not indicated which one is the correct one.
 Assigned to Žilvinas Kapočius

	<p>c) would reduce.</p> <p>4. The beginning of the energy path on Earth:</p> <p>a) The sun; b) Moon; c) Mars.</p>
Keywords	energy, fuel, resources
Questions for reflection	<ol style="list-style-type: none"> 1. Group energy sources into renewable (R) and non-renewable (N): wind energy (R), nuclear power (N), oil (N), solar power (R), natural gas (N), water power (R), geothermal energy (R); coal (N). 2. Draw a circular cycle and indicate the energy transformations: sun – plants – animals – manure – gas – power plant. 3. Reclamation, fossil fuels, deforestation, increase of the greenhouse effect. How will you comment on this? 4. Solar energy is used to heat water and premises. (a) What is the simplest device used for this purpose? b) The metallic surface of those panels is black and lustreless. Explain why? c) Do you think the pipes that circulate the water should be made of plastic or copper? Why?
Additional resources	<p>Advantages and disadvantages of different energy sources https://www.youtube.com/watch?v=CRyhs6jybiY</p> <p>GCSE Physics - Advantages and Disadvantages of Energy Resources https://www.youtube.com/watch?v=Y5Wr1F1jrmQ</p> <p>Renewable Energy 101 https://www.youtube.com/watch?v=T4xKThicKaE</p> <p>Renewable Energy Sources - Types of Energy for Kids https://www.youtube.com/watch?v=Giek094C_l4</p> <p>Shinn L. (2022). Renewable Energy: The Clean Facts https://www.nrdc.org/stories/renewable-energy-clean-facts</p> <p>Solar Energy Advantages and Disadvantages - Solar to the People https://www.youtube.com/watch?v=MDWs5ESAxYQ</p> <p>Types of Energy Energy Forms Energy Sources and Uses https://www.youtube.com/watch?v=63t0Y2ACoh4</p> <p>Types of energy Physics Animation https://www.youtube.com/watch?v=jhKejoBqiYc</p> <p>Forms of Energy https://www.youtube.com/watch?v=E3MnZ-bj1lw</p>



Funded by
the European Union

<p>Icons & related info for the hints of the PowerPoint presentation</p>	<p> This hint is used to show sources on further information according to the topic.</p> <p> This hint indicates that something important is written.</p> <p> This hint indicates a question/task for reflection.</p>
<p>Author(s)</p>	<p>Alma Valonienė, Kedainiai Vocational Educational Training Centre, Lithuania</p>

