

Erasmus+ Project 2015-17

***“Researching from the school library to
improve the environment”***

PROJECT NUMBER 2015-1-ES01-KA219-016063

WORKSHOP C4



“RENEWABLE ENERGIES”

San Marcello (Italy)
28 May-02 April 2017



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Researching from the
school library to help the
environment

Renewable energy

Croatia

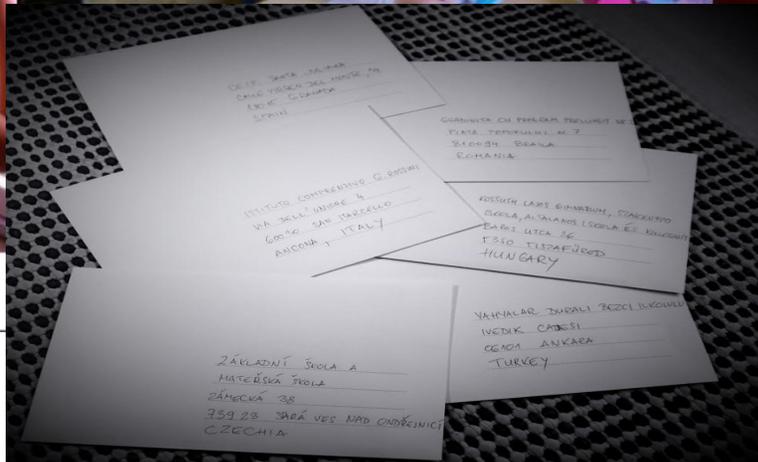


Erasmus+

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Christmas Cards

Dear friends, thank you all for the lovely Christmas cards we received. Our students enjoyed creating Christmas cards for all of you and writing down their good wishes!



ENTRY QUESTIONNAIRE ON RENEWABLE ENERGY SOURCES, PRIMARY LEVEL

PRIMARY LEVEL - entry questionnaire

1. Energy sources can be classified as:

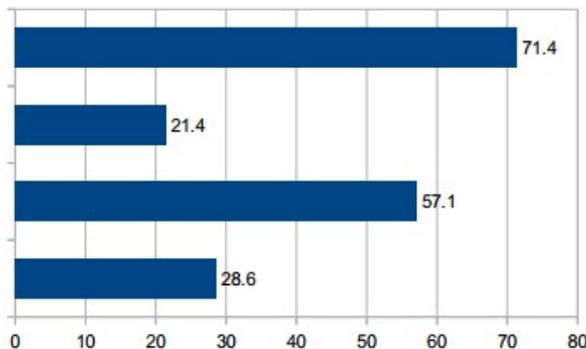
- renewable and non renewable energy sources	14	100%
- they cannot be classified		0%
- none of the above		0%



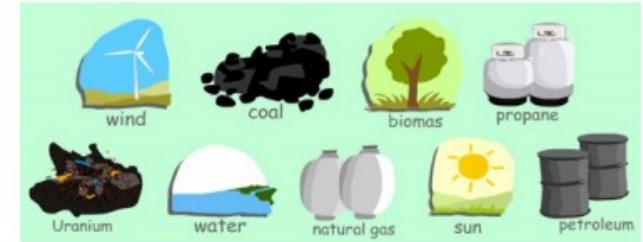
Illustration 1: 100%

2. Which of the following doesn't describe a renewable energy?

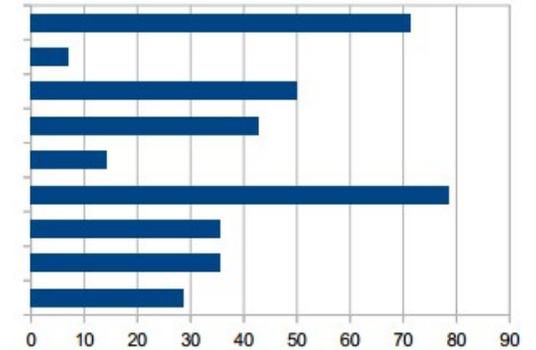
a. something which is clean and free	10	71.4%
b. something which can be quickly reproduced	3	21.4%
c. something which does not pollute	8	57.1%
d. something that can run out	4	28.6%



3. Tick the renewable energy sources.

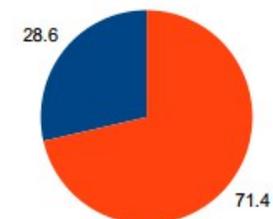


1	10	71.4%
2	1	7.1%
3	7	50%
4	6	42.9%
5	2	14.3%
6	11	78.6%
7	5	35.7%
8	5	35.7%
9	4	28.6%

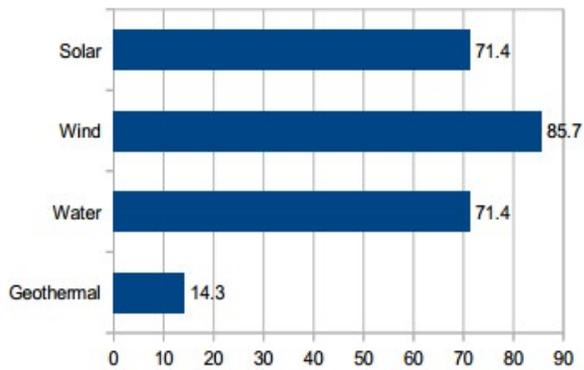


4. Are fossil fuels renewable?

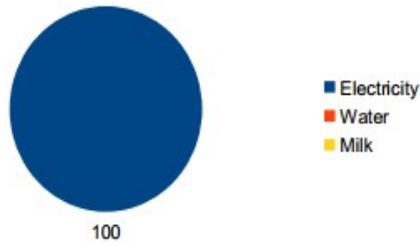
a. YES, they can be made again.	4	28.6%
b. NO, because of constant use they are gone, they cannot be used again.	10	71.4%



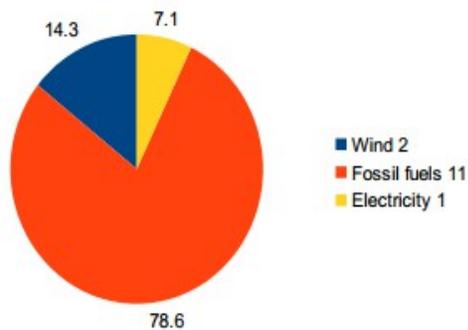
5. What are the sources of renewable energy you know? (circle right answer)



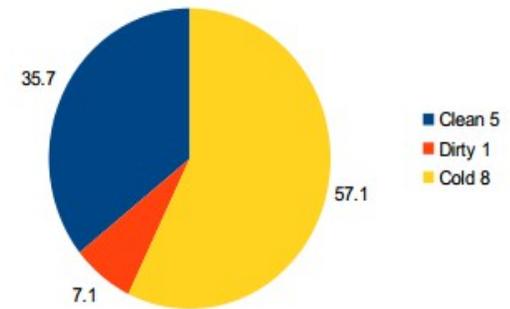
6. Complete: _____ powers many things in our homes, such as lights and computers.



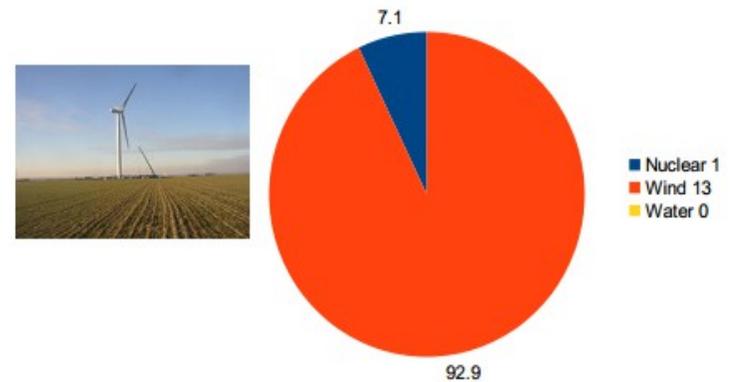
7. Complete: _____ comes from plants and animals.



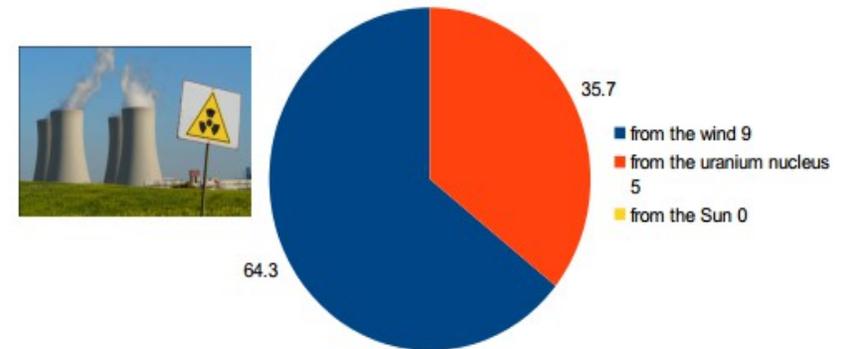
8. Complete: Wind power is a _____ source of energy.



9. Do you know by the picture, (according to the picture, do you know) what kind of power is it?



10. Nuclear power plant use(s) energy:



FINAL QUESTIONNAIRE ON RENEWABLE ENERGY SOURCES, PRIMARY LEVEL

PRIMARY LEVEL - final questionnaire

1. Energy sources can be classified as:

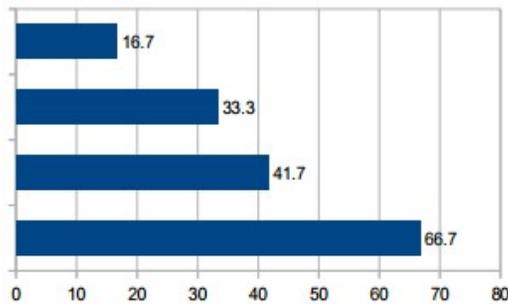
- renewable and non renewable energy sources	14	100%
- they cannot be classified		0%
- none of the above		0%



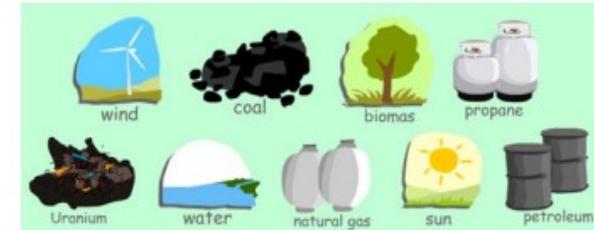
Illustration 1: 100%

2. Which of the following doesn't describe a renewable energy?

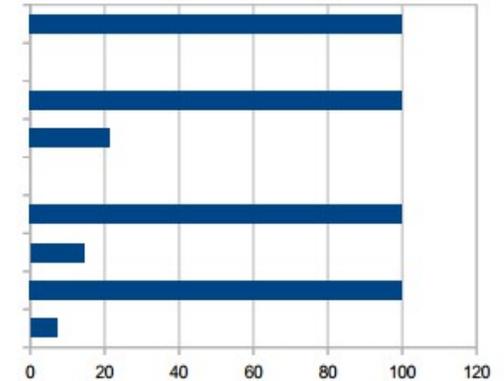
something which is clean and free	2	16.7%
something which can be quickly reproduced	4	33.3%
something which does not pollute	5	41.7%
something that can run out	8	66.7%



3. Tick the renewable energy sources.

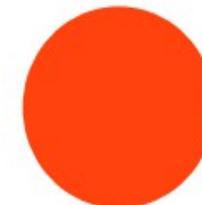


1	14	100%
2	0	0%
3	14	100%
4	3	21.4%
5	0	0%
6	14	100%
7	2	14.3%
8	14	100%
9	1	7.1%



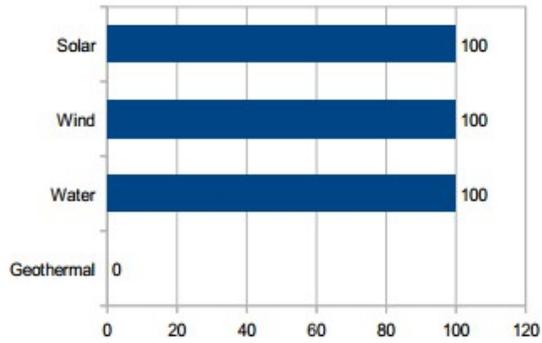
4. Are fossil fuels renewable?

a. YES, they can be made again.	0	0%
b. NO, because of constant use they are gone, they cannot be used again.	14	100%

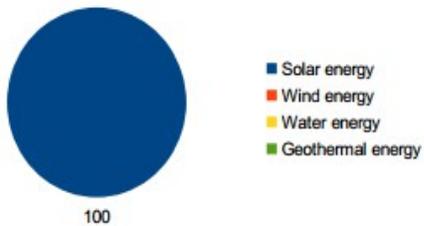


100

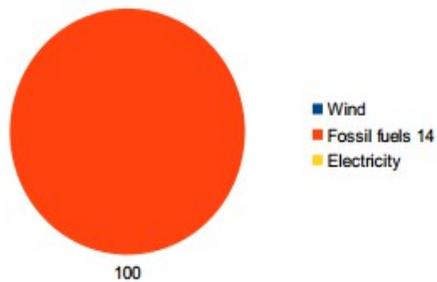
5. What are the sources of renewable energy you know? (circle right answer)



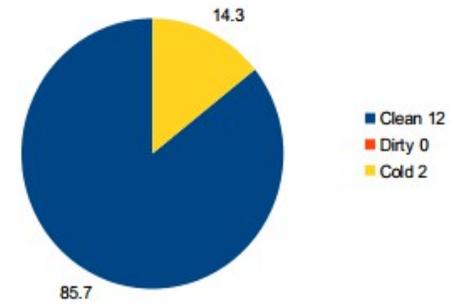
6. Complete: _____ powers many things in our homes, such as lights and computers.



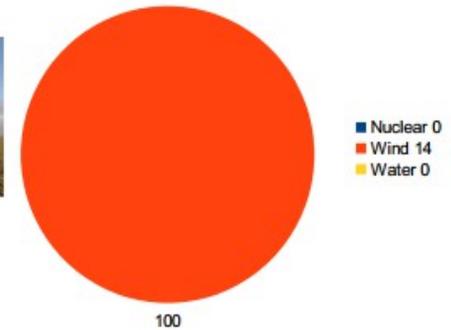
7. Complete: _____ come from plants and animals.



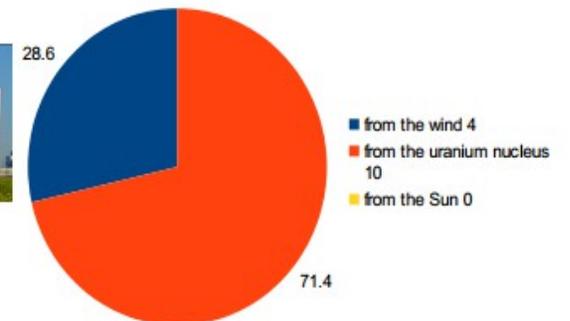
8. Complete: Wind power is a _____ source of energy.



9. Do you know by the picture, (according to the picture, do you know) what kind of power is it?



10. Nuclear power plant use(s) energy:

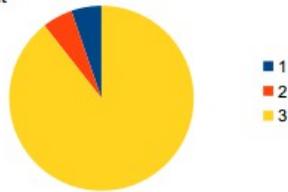


ENTRY QUESTIONNAIRE ON RENEWABLE ENERGY SOURCES, SECONDARY LEVEL

SECONDARY LEVEL. Entry questionnaire

1. What does „renewable“ mean?

- | | | |
|---------------------------------------------------|----|-------|
| 1. It is expensive | 1 | 5.3% |
| 2. It has an aggressive impact on the environment | 1 | 5.3% |
| 3. It never runs out | 17 | 89.5% |



2. What are the advantages of renewable energy sources over the non-renewable ones? (circle the wrong answer)

- | | | |
|--------------------------------------------------------|----|-------|
| 1. The renewable energy doesn't release air pollution. | 11 | 57.9% |
| 2. It is finite | 8 | 42.1% |



3. What is a wind farm?

- A wind farm is a power plant powered by the wind.
- A small wind-powered plant that generates electricity.
- A wind-powered electric power plant.
- A windmill turned by the wind that turns the wind into electricity.
- The wind.
- A wind farm is a power plant where energy is generated with the help of the wind.
- A device that, when under the influence of wind, generates electricity.
- A wind farm is a power plant that, with the help of windmills and the wind that moves them, generates electricity.
- A series of wind turbines placed close together and exposed to the same wind.

Wind-powered machines.

A wind farm is a series of wind turbines, usually of the same time, placed closely together, exposed to the same wind, and connected by a shared control device to the electric power distribution system.

A power plant that moves under the influence of wind and generates electric power.

Machines moved by the wind is.

4. Do you have any power plant in your neighbourhood that uses renewable energy sources?

- | | | |
|-----------------|---|-------|
| 1. Yes | 5 | 27.8% |
| 2. No | 9 | 50% |
| 3. I don't know | 4 | 22% |



5. Which of the following forms of energy is most common in nature?

- | | | |
|-------------------------|----|-------|
| 1. solar energy | 17 | 89.5% |
| 2. nuclear energy | 0 | 0% |
| 3. wind energy | 1 | 5.3% |
| 4. hydroelectric energy | 1 | 5.3% |



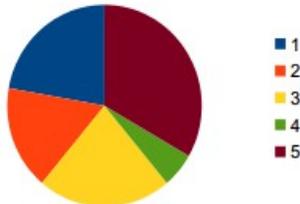
6. Connect the terms:

hydroelectric power plants	vulcans, geysirs
wind farms	the Sun
photovoltaic cells	water
biodiesel	wind
geothermal energy	biomass

	Hydro-electric power plants	wind farms	photovoltaic cells	biodiesel	geothermal energy
vulcans, geysirs	1 5.6%		3 16.7%	1 5.6%	14 73.7%
the Sun			14 77.8%	1 5.6%	4 21.1%
water	18 94.4%	1 5.3%		1 5.6%	
wind		18 94.7%	1 5.6%		1 5.3%
biomass				15 83.3%	

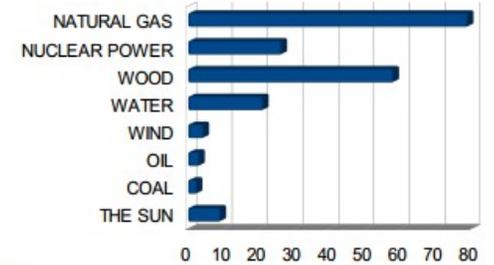
7. The state of use of renewable energy sources in our country is...

- | | | |
|---------------------------|---|-------|
| 1. poor. | 4 | 22.2% |
| 2. mostly unsatisfactory. | 3 | 16.7% |
| 3. mostly satisfactory. | 4 | 22.2% |
| 4. excellent. | 1 | 5.6% |
| 5. I do not know. | 6 | 33.3% |



8. Cross out what is not among renewable energy.

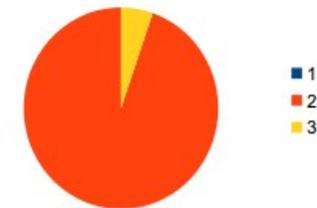
- | | | |
|-------------------|----|-------|
| 1. THE SUN | 5 | 26.3% |
| 2. COAL | 11 | 57.9% |
| 3. OIL | 12 | 63.2% |
| 4. WIND | 3 | 15.8% |
| 5. WATER | 4 | 21.1% |
| 6. WOOD | 11 | 57.9% |
| 7. NUCLEAR ENERGY | 5 | 26.3% |
| 8. NATURAL GAS | 15 | 78.9% |



9. According to the picture determines that the source of this device needs to generate energy (which source does this device need to...)



- | | | |
|--------------------------|----|-------|
| 1. wind | 0 | 0% |
| 2. Sun | 18 | 94.7% |
| 3. energy from the Earth | 1 | 5.3% |



10. Why is renewable energy more efficient than the classic? (circle the right answer)

1. The renewable energy doesn't release air pollution.	3	16.7%
2. The renewable energy has a non aggressive impact on the environment.	7	38.9%
3. The renewable energy are finite and limited amounts.	3	16.7%
4. When renewable energy sources are used, the demand for fossil fuels is reduced.	5	27.8%



FINAL QUESTIONNAIRE ON RENEWABLE ENERGY SOURCES, SECONDARY LEVEL

SECONDARY LEVEL. Final questionnaire.

1. What does „renewable“ mean?

- | | | |
|---------------------------------------------------|----|-------|
| 1. It is expensive | 1 | 5.3% |
| 2. It has an aggressive impact on the environment | 0 | % |
| 3. It never runs out | 17 | 95.2% |



2. What are the advantages of renewable energy sources over the non-renewable ones? (circle the wrong answer)

- | | | |
|--------------------------------------------------------|----|-------|
| 1. The renewable energy doesn't release air pollution. | 16 | 76.2% |
| 2. It is finite | 5 | 23.8% |



3. What is a wind farm?

- A power plant that turns wind energy into electric power.
- A wind farm is a plant that is powered by the wind and generates electricity.
- A WIND-POWERED ELECTRIC POWER PLANT.
- A wind farm is a plant that is powered by the wind and generates power.
- A power plant where wind power turns into electric power.
- A plant that turns wind power into electric power.
- A power plant where wind power turns into electric power.
- A wind farm - where wind energy turns into electric energy.
- A device that generates electricity with the help of wind.
- A wind farm is a plant that is powered by the wind and creates electricity.
- Wind farms and electric power plants generated by the wind.

A SMALL POWER PLANT THAT GENERATES ELECTRIC ENERGY WITH THE HELP OF WIND.

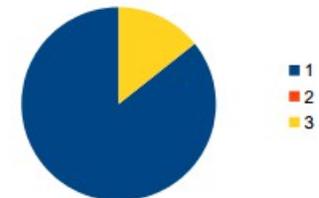
It is a power plant that uses wind to turn its turbine and get power.

A wind-powered plant.

A wind farm is a plant that turns wind energy into electricity.

4. Do you have any power plant in your neighbourhood that uses renewable energy sources?

- | | | |
|-----------------|----|-------|
| 1. Yes | 18 | 85.7% |
| 2. No | 0 | 0% |
| 3. I don't know | 2 | 14.3% |



5. Which of the following forms of energy is most common in nature?

- | | | |
|-------------------------|----|-----|
| 1. solar energy | 17 | 85% |
| 2. nuclear energy | 1 | 5% |
| 3. wind energy | 1 | 5% |
| 4. hydroelectric energy | 1 | 5% |



10. Why is renewable energy more efficient than the classic? (circle the right answer)

- | | | |
|------------------------------------------------------------------------------------|----|-------|
| 1. The renewable energy doesn't release air pollution. | 7 | 33.3% |
| 2. The renewable energy has a non aggressive impact on the environment. | 2 | 9.5% |
| 3. The renewable energy are finite and limited amounts. | 12 | 57.1% |
| 4. When renewable energy sources are used, the demand for fossil fuels is reduced. | 0 | 0% |



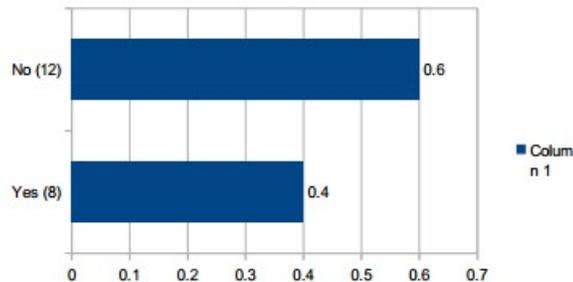
Our students also had their parents and neighbors fill in a **questionnaire** about their households' use of energy from renewable sources. Here are the results.

POLL - RENEWABLE ENERGY SOURCES

1. Can you name some renewable sources of electricity?

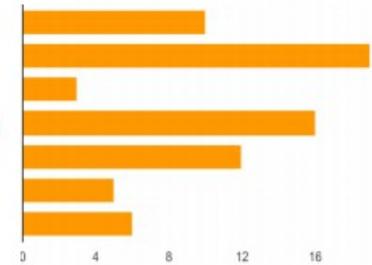
Sun, water, wind.
 Sun, wind, water.
 Solar.
 Solar energy panels, wind farms.
 Solar.
 The Sun.
 Photovoltaic cells, energy-efficient light bulbs.
 Sources of energy obtained from nature that can be renewed (wind, Sun, water).
 Water, wind, Sun.
 Water, Sub, wind, biomass.
 Biomass, wind, water, solar energy.
 Water energy, solar energy, biomass.
 Solar energy, water, biomass.
 Wind farms, solar energy, hydroelectric power plants.
 Sun, wind, water, biomass.
 Water, wind, sun, geothermal sources.
 Sun, wind, water, biomass, geothermal energy.

2. Does your household use renewable energy sources? (Photovoltaic cells, solar collectors for hot water, or something else).



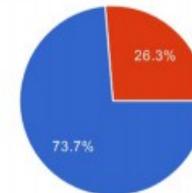
3. What does your household do to contribute to more rational use of renewable energy sources?

We recycle waste and create biomass 10
 We use energy-saving light bulbs 18
 We use photovoltaic panels for electricity 3
 We turn off the lights when we leave the room 16
 We take showers instead of baths 12
 We use paper bags 5
 We use cloth bags 6



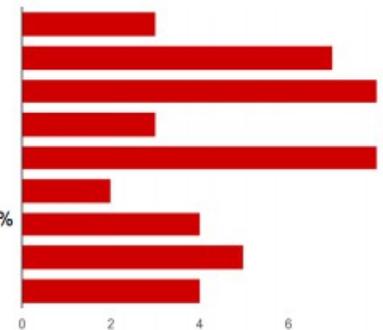
4. Production of electricity from renewable energy sources today is in most cases more expensive than production from conventional sources (oil, gas, coal). Would you personally be willing to pay a higher price for energy from renewable sources?

YES 14 73.7%
 NO 5 26.3%



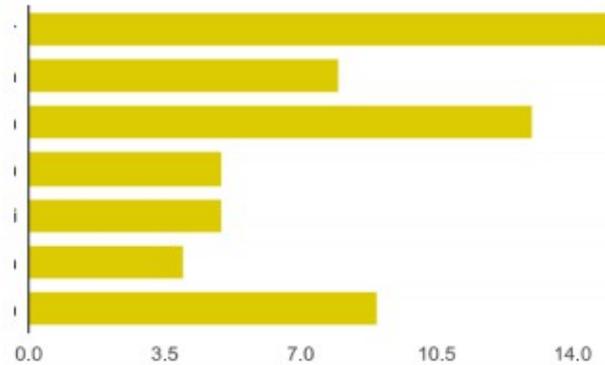
5. From what source comes the energy that you use to heat your home? (More than one answer may apply.)

biomass 3 15%
 natural gas 7 35%
 solar energy 8 40%
 geothermal energy 3 15%
 wood 8 40%
 coal 2 10%
 electricity from a gas- or coal-powered power plant 4 20%
 other 5 25%
 do not know 4 20%



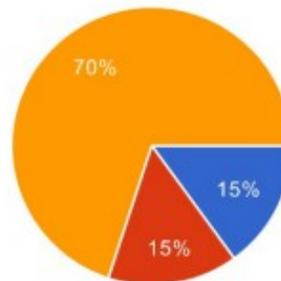
6. Which ones of these renewable energy sources do you think will be important in the future?

wind	15	75%
water energy	8	40%
solar energy	13	65%
tides	5	25%
waves	5	25%
geothermal energy	4	20%
biomass	9	45%



7. To what extent do you think Croatia should use renewable energy sources to generate electricity?

less than today	3	15%
to the present extent	3	15%
more than today	14	70%



Pleternica Hydroelectric Power Plant and Brodski Drenovac Hydroelectric Power Plant

On Thursday, 2 March 2017, three eighth-graders and three fourth-graders from our branch school, accompanied by their teachers Sandra Sekulić and Ivana Tunjić, members of the Erasmus + team, visited the Hydroelectric Power Plant in Pleternica and a privately owned hydroelectric power plant in Brodski Drenovac. Heading for Pleternica, like



true little explorers, they had no idea what lay ahead.

They were expecting to see a large hydroelectric power plant, but what they found was a tiny, yet fully functional hydroelectric power plant. They were delighted to peek around every corner and find that the operation blended nicely into the surroundings and did not generate

noise. Playing host to them was Deputy Mayor of Pleternica, Mr. Domagoj Kantić, who welcomed them, showed them around the power plant, and explained how it worked.



The Pleternica mHE (mini hydroelectric power plant) is a small hydroelectric power plant located on the Orljava River (in Pozega-Slavonia County), the first hydroelectric power plant owned by a local government unit in Croatia (the town of Pleternica) and also the first small hydroelectric power plant built since Croatia's independence. The investment is worth 4.8 million Croatian kuna (HRK); the town of Pleternica provided 50%, the Fund for Environmental Protection and Energy Efficiency HRK1.7 million, and the Ministry of Regional Development HRK500,000.

The plant has an output power of 220 kW; according to plan, it will produce an annual 1.1 million kWh of electricity (enough to power street lighting in all of the area's 35 settlements) and contribute an additional HRK850,000 to the city budget every year. The mHE Pleternica's equipment was installed by the Koncar Electrical Industry enterprise. By the way, there are about ten more places on the Orljava that are suitable for the construction of small hydroelectric power plants.

The mHE Pleternica has virtually no impact on the environment and uses the natural drop of a waterfall. The construction began on 7 August 2011 and was completed in 2012.



Having thanked their host, the Erasmus team headed to Brodski Drenovac, 10 km down the road, where they visited a hydroelectric power plant owned by Mrs. Ljiljana Soch.

Ljiljana Soch, formerly employed abroad, engages in eco-agriculture and environmental protection and says that the latter was exactly why she decided to build a hydroelectric power plant. Of course, making a profit by selling electricity comes in handy. The mini hydroelectric power plant's output of 110 kW of electricity per hour will go directly into the Croatian Electricity Board's network, whereas the Soch family is to receive electricity at a subsidized price, minus the amount of the grant they have already received from the Fund. She



expects to make a profit selling electricity and at the same time protect the environment by lowering the carbon footprint. The hydroelectric power plant is expected to produce up to 680,000 kW of electricity annually, which means 205,632 kilograms of carbon dioxide less than emitted by a coal-powered thermal power plant producing the same amount of electricity. Ljiljana also explained that freshwater shells had been found at the location, which meant that sand mining was no longer allowed and that the riverbed had to be preserved in its natural form.

The investment is worth about HRK3 million; Mrs. Ljiljana received a HRK700,000 grant from the Environmental Protection and Energy Efficiency Fund. She invested some of her own savings in preparing for the construction and also took out a HRK1.5-million loan.

It should also be noted that preparations are under way for the construction of three more mini hydroelectric power plants on the Orljava between the flour mill in Drenovac and the mini hydroelectric power plant in Pleternica.



Having inspected the interior and exterior of the hydroelectric power plant, the Erasmus team were left speechless by the beauty and power of the Orlijava. The enlightening experience ended with our thanking our hosts for their lovely hospitality!



Creating an energy map

Our students researched the use of energy from renewable sources in our country and found that only 4.4% of our primary energy production came from them.

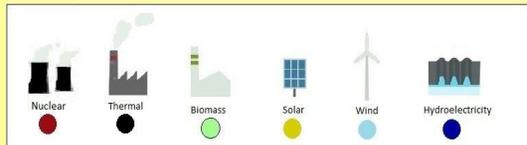
The situation is much better we add the electric energy we get from water, usually often considered to be a conventional source: 36.5% of all energy produced in Croatia comes from hydroelectric power plants of various sizes.

We came across various interesting information and maps online, from a map of all electric car charging stations in our country to a map of power stations running on renewable sources of various kinds.

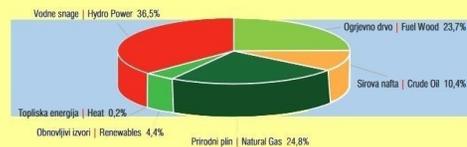


We also found that, according to the figures, the situation regarding the use of renewable energy is improving from year to year!

CROATIA ENERGY MAP



Udjeli u proizvodnji primarne energije | Shares in primary energy production



Proizvodnja primarne energije | Primary energy production

	2009.	2010.	2011.	2012.	2013.	2014.	2014./13.	2009.-14.
	PJ						%	
Ogrijevno drvo i biomasa Fuel Wood and Biomass	52,48	56,20	59,01	60,39	61,45	57,67	-6,2	1,9
Sirova nafta Crude Oil	33,07	30,69	28,37	25,62	25,71	25,38	-1,3	-5,2
Prirodni plin Natural Gas	93,50	93,88	85,02	69,19	63,11	60,52	-4,1	-8,3
Vodne snage Hydro Power	72,32	87,24	47,58	47,32	84,92	88,99	4,8	4,2
Toplinska energija Heat	0,54	0,63	0,61	0,62	0,63	0,53	-15,9	-0,5
Obnovljivi izvori Renewables	1,30	2,63	2,97	5,66	7,70	10,69	38,8	52,3
UKUPNO TOTAL	253,21	271,26	223,56	208,80	243,52	243,77	0,1	-0,8

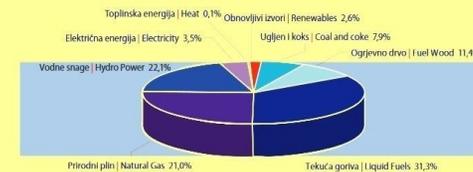
Izvor | Source: EHP

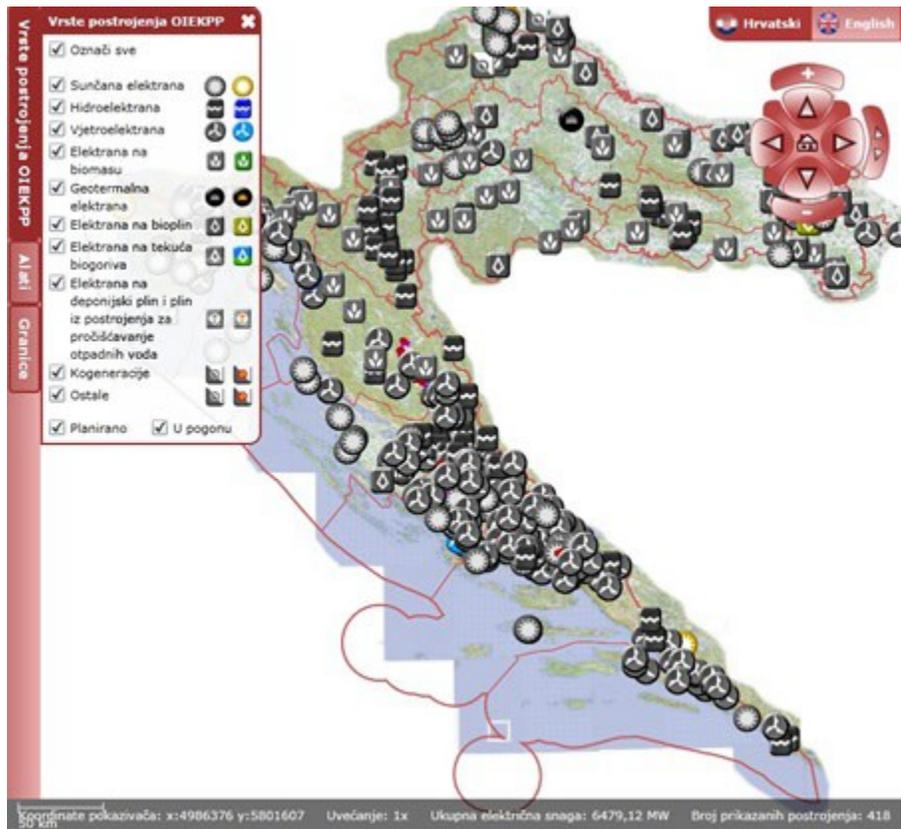
Ukupna potrošnja energije | Total Primary Energy Supply

	2009.	2010.	2011.	2012.	2013.	2014.	2014./13.	2009.-14.
	PJ						%	
Ugljen i koks Coal and Coke	24,66	30,92	31,66	28,37	32,18	31,59	-1,8	5,1
Drvo i biomasa Biomass	48,93	52,29	51,50	52,10	51,67	45,82	-11,3	-1,3
Tekuća goriva Liquid Fuels	178,04	152,54	149,30	134,17	128,37	125,80	-2,0	-6,7
Prirodni plin Natural Gas	102,15	111,37	108,60	101,78	95,54	84,62	-11,4	-3,7
Vodne snage Hydro Power	72,32	87,24	47,58	47,32	84,92	88,99	4,8	4,2
Električna energija Electricity	18,01	14,28	25,76	26,75	13,93	14,23	2,2	-4,6
Toplinska energija Heat	0,54	0,63	0,61	0,62	0,63	0,53	-15,9	-0,5
Obnovljivi izvori Renewables	1,39	2,24	2,83	5,72	7,80	10,64	36,4	50,2
UKUPNO TOTAL	446,05	451,50	417,84	396,84	415,04	402,22	-3,1	-2,0

Izvor | Source: EHP

Udjeli u ukupnoj potrošnji energije | Shares in total primary energy supply







U Hrvatskoj trenutno postoje 63 punionice za električna vozila, od čega je čak 28 na području Grada Zagreba.

Trenutačne lokacije punionica za električna vozila u RH



Renewable energy in history

A water mill or a river mill is a structure that uses a waterwheel to grind corn and other grains into flour, saw wood, process textiles, and accomplish other tasks. It is powered by the water of a stream or a river. In prehistoric and ancient times only manual mills and animal-powered mills were known. The principle of using the power of running water was known in the first centuries A. D., but was not applied before the Middle Ages, when the construction of the mills began throughout Europe, especially after the 12th century.

The 12th century saw floating mills appear on our rivers; they had been developed in Byzantium. By the 18th century there were colonies of mills dotting our rivers; our rivers and streams were very suitable for small water mills, which, put together, represented an important production potential, which is why they were found in the vicinity of towns and cities.

There are two basic types of mills: those that use a vertical axis on the waterwheel and those that use a horizontal axis.

Water mills or river mills used water power, a form of clean renewable energy. They did not pollute the environment in any way. They are traditional business facilities typical of the pre-industrial era.

The owners of the mills, millers, were often the paragon of wealth.

Nowadays, water mills often become tourist attractions or are used to house mini

hydroelectric power plants.

Several different types of mills from different Croatian regions:



A tourist attraction in Osijek, on the Drava. A newly built floating mill.



Gašpina Mill in Solin before reconstruction:



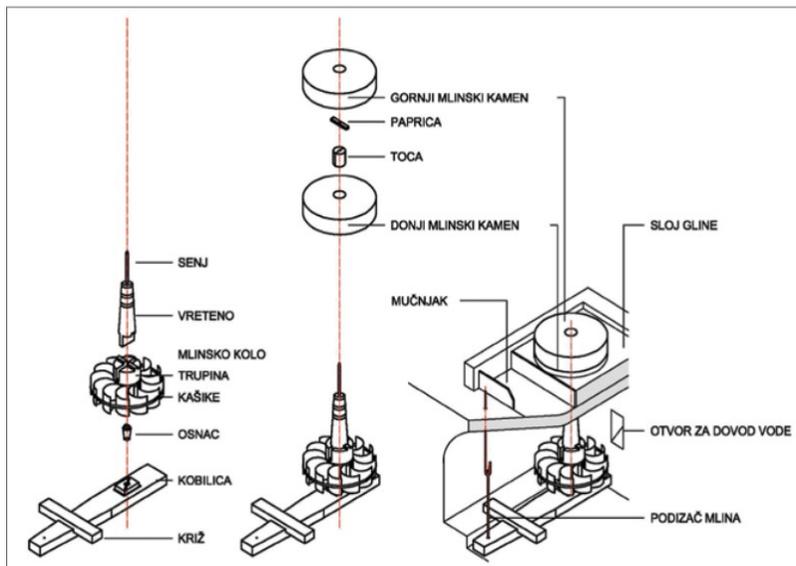
6 Gašpina mlinica 2001. godine – pogled sa zapada (foto: Ivo Miloš, 2001.)
Gašpin's watermill, 2001 – view from the west (photo by Ivo Miloš, 2001)

The interior and the mechanism in Gašpina Mill:



26 Obnovljeno mlinsko postrojenje u južnoj kući Gašpine mlinice u jesen 2008. godine (foto: Sanja Buble, 2008.)

Reconstructed mill mechanism in the southern structure of Gašpin's mill in autumn 2008 (photo by Sanja Buble, 2008)



14 Dijelovi mlinskog postrojenja (crtež: Sanja Buble, 2008.)
Parts of the mill mechanism (drawing: Sanja Buble, 2008)

In the area around our city, Slavonski Brod, river mills or water mills were located mostly on the Sava and the Orljava.

The use of the water capacity of the Orljava intensified in the late 18th century with the development of agriculture. Orljava once powered twelve river mills, at the beginning of the 19th century five of them in the villages of Ciglenik and Becic. The Adrović Mill, built in 1817, is thought to be the oldest. The mill was renovated in 1909 and has since been owned by the Žakić family.



On the Sava, floating water mills prevailed.

According to the records of Johann Pichler, the commander of the Brod Regiment from 1818 to 1829, there were 283 water mills on the Sava in the Regiment area at the time. At the end of the 19th century, as industrial production increased, a big steam-powered mill was built in Slavonski Brod. There were 16 water mills for grinding grain on the Sava in the Brod area at the time; in 1900 there were six.

The last water mill disappeared from the Sava, from the Poloj area, in 1971.

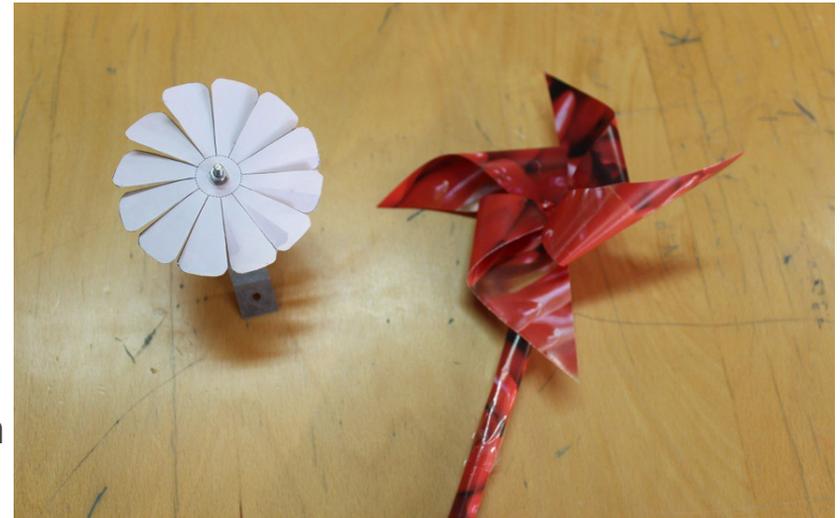


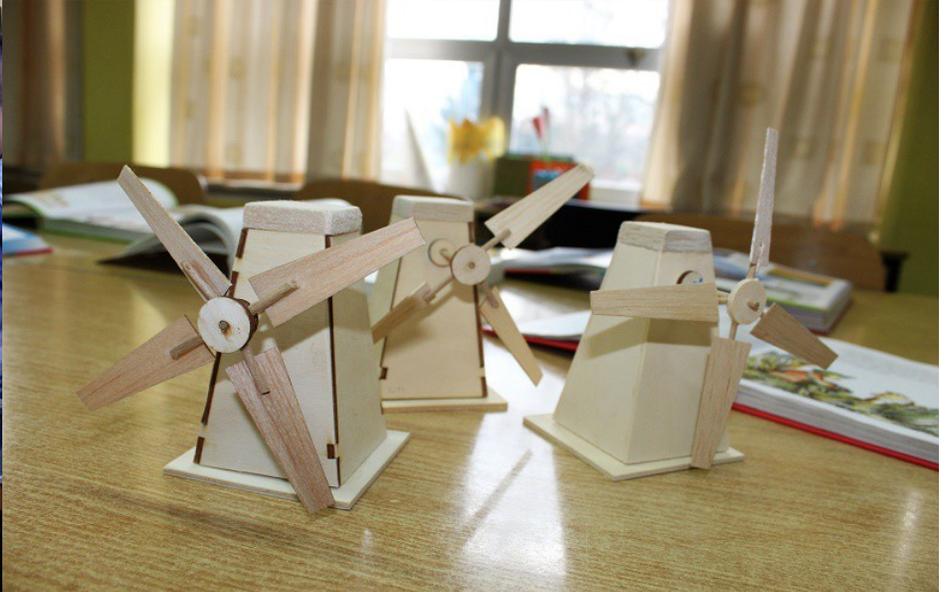
Windmill models

While researching the use of renewable energies in the past at our school library, our students, supervised by their librarian Tanja and teacher Ivana, created beautiful and imaginative models of historical machines, such



as windmills, out of readily available materials. Some looked purely utilitarian, others artistic.







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This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



START

1 2 3 4 5 6 7 8 9 10 11

12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62

FINISH

63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200

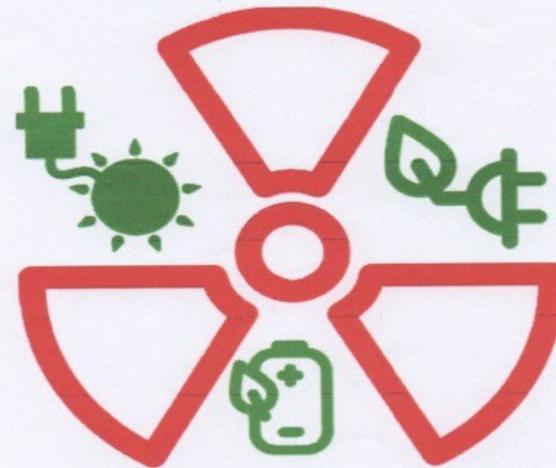
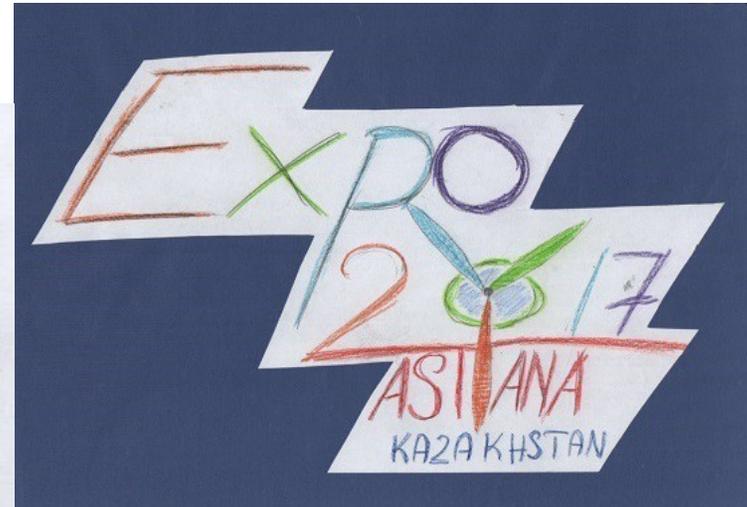


Here are our **questions** for the game:

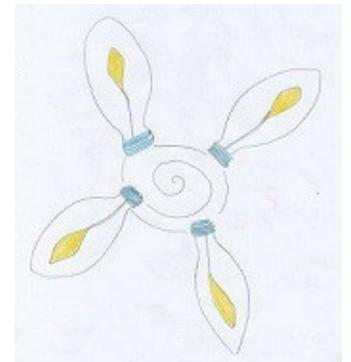
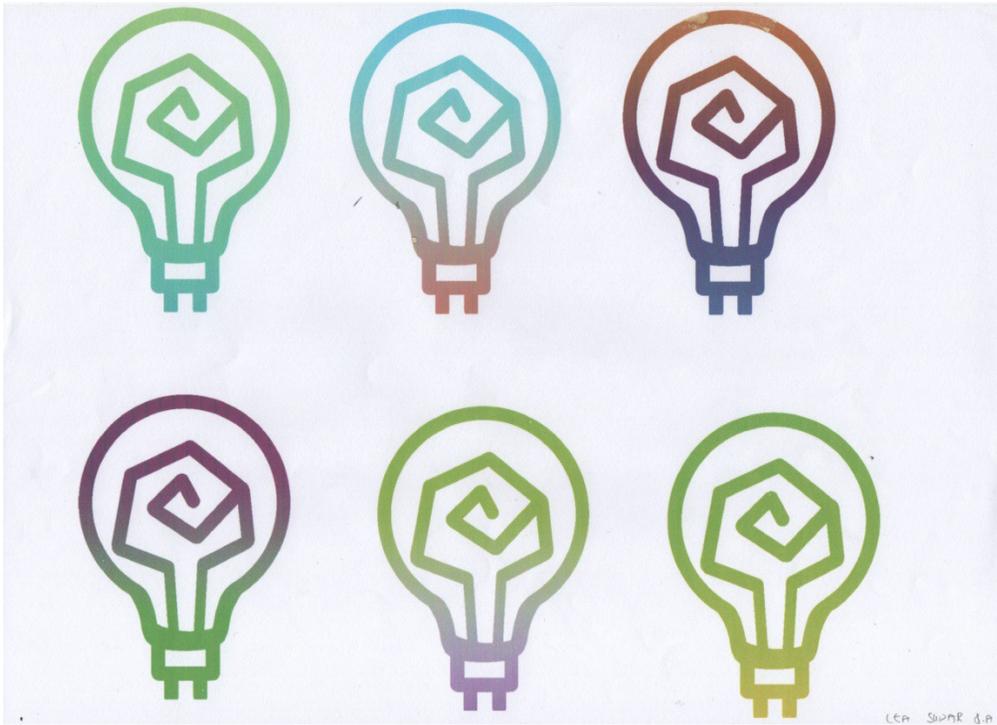
1. Name three renewable sources of energy.
2. Name three unrenovable sources of energy.
3. Is coal a renewable source of energy?
4. Is wind a renewable source of energy?
5. Is water power a renewable source of energy?
6. Is solar energy renewable?
7. Is petroleum a renewable energy source?
8. Is natural gas a renewable source of energy?
9. Does the use of coal pollute the environment?
10. Does water power pollute the environment?
11. Does wind energy pollute the environment?
12. Does solar energy pollute the environment?
13. Does geothermal energy pollute the environment?
14. Is biomass a renewable source of energy?
15. Does the combustion of fossil fuels pollute the environment?
16. Can biodiesel be made from wood?
17. Can biodiesel be made from vegetable oil?
18. Can biodiesel be made from algae?
19. Name a region in Croatia that is geographically suited for windfarms.
20. Which region in Croatia has the most biogas power plants?
21. Can biogas be produced from municipal waste and sewage?
22. Can tidal energy be converted into electricity?
23. Can geothermal energy be converted into electricity?
24. Is geothermal energy renewable?
25. Is nuclear energy considered to be a renewable source?
26. When is biomass considered to be a renewable source?
27. When is wood considered to be a renewable source?
28. Does the combustion of wood pollute the environment?
29. Name one danger of nuclear energy.
30. Name one disadvantage of solar panels.
31. Name one objection to windfarms.
32. Where are tidal power plants located?
33. Is tidal power a clean energy source?
34. Is natural gas a clean energy source?
35. Can biogas be explosive?

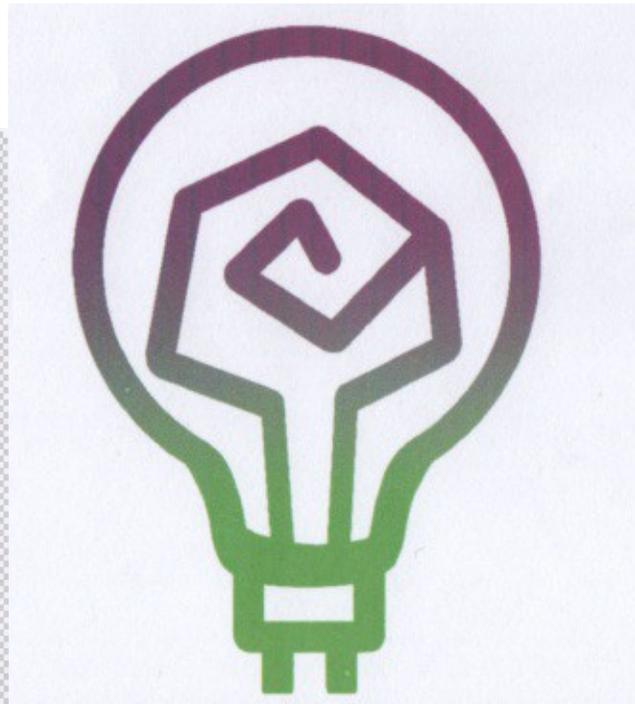
World Expo 2017 logo

A selection of our students' work:

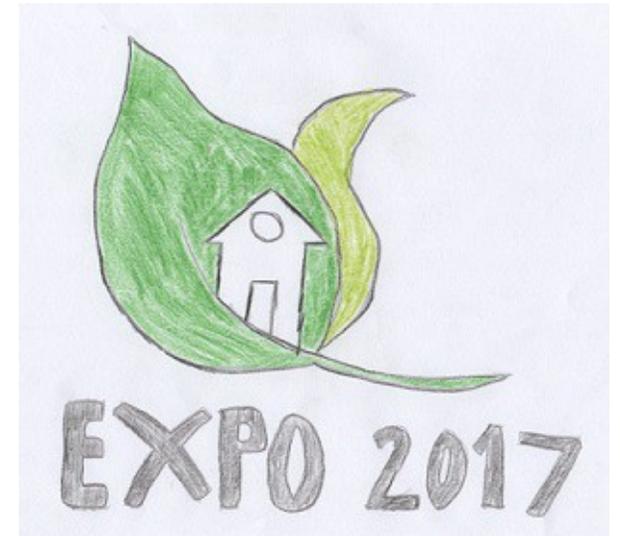
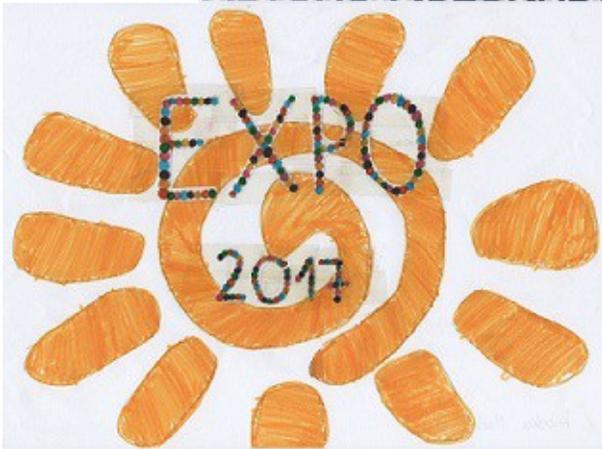


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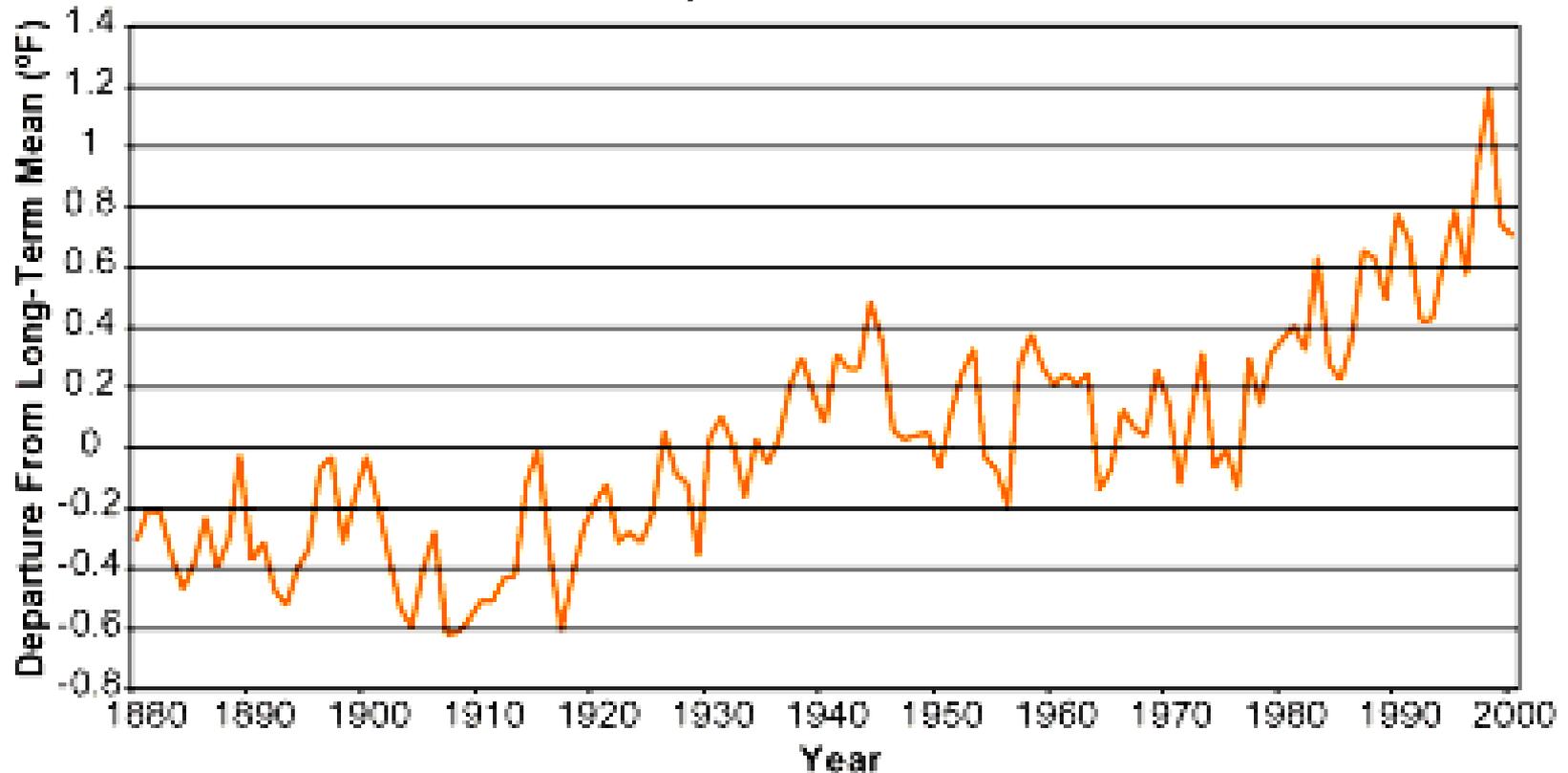
**Erasmus+: “Researching
from the school library to
improve the environment”**

Italy, 28.3. – 2.4. 2017..

Renewable energy resources

Chapter 10

In the last 100 years, the Earth warmed up
by $\sim 1^\circ\text{C}$



**100 years is nothing by geological time
scales!**

Renewable energy resources

Wave

Solar cells

Wind

Biomass

Hydroelectric

Nuclear

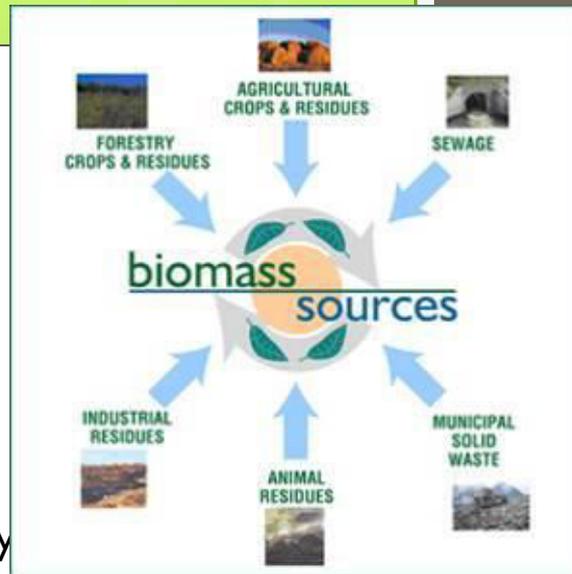
Solar power

Tidal

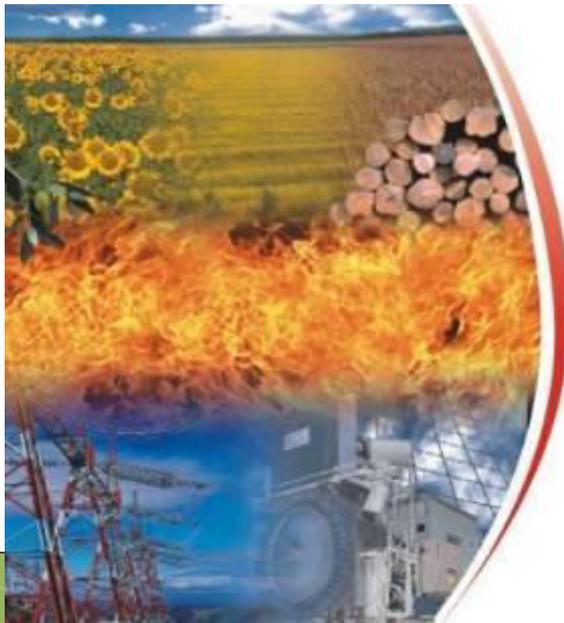
Geothermal

What is it?

- Biomass, is a renewable energy source made of biological material from living, or recently living organisms.
- Energy is released by combustion (burning).



Biomass



Disadvantages

- Inefficient (only 30% efficiency).
- Releases harmful solid carbon particles into the atmosphere.

Advantages

- Produces less pollution than fossil fuels.
- Does not cause acid rain.
- Can be found locally.
- It is renewable.

What is it?

- Radiation is released from the nuclei of metal atoms.
- The radiation can be used to generate electricity.



Disadvantages

- Harmful radioactive waste is created.
- Uranium supplies may only last for another 50 years.
- Non-renewable
- Radiation may cause cancer

Nuclear



Advantages

- Green House gases are not made.
- Only a small amount of fuel is needed to create a lot of energy.

What is it?

- Wind turbines are used to generate electricity from the wind.
- The wind turns the large blades and the blades turn a generator.



Wind



Disadvantages

- Lots of wind turbines are needed to produce enough power.
- Turbines can only be put in windy areas.
- It is not always windy.
- Some people don't like the look of the turbines.

Advantages

- Wind is renewable.
- Wind is free.
- No greenhouse gases are made.
- There are few safety risks.

What is it?

- Solar power uses energy from the Sun.
- Solar panels transfer the Sun's energy to heat water.



Solar power



Disadvantages

- Solar panels are expensive.
- When it is cloudy or at night there is not enough light.
- Some people don't like the look of solar panels.

Advantages

- The energy from the Sun is free.
- The sun does not produce greenhouse gases.
- The sun will always be there during our lifetime.

What is it?

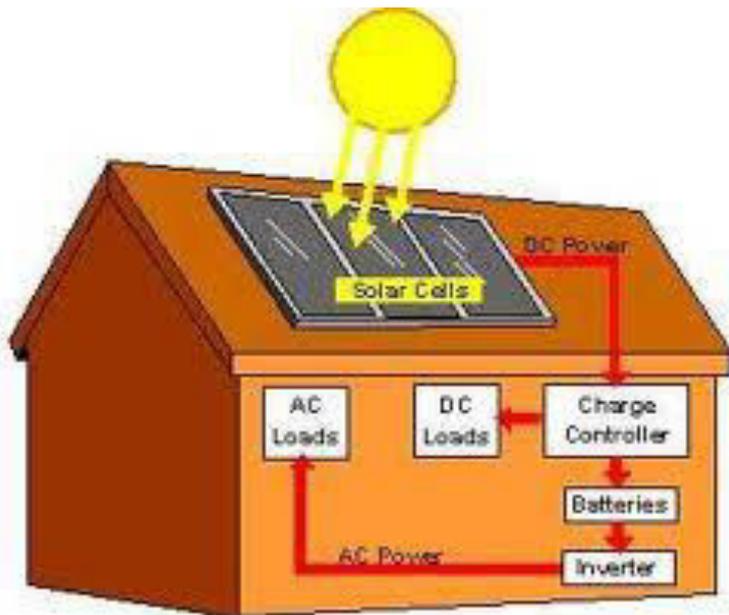
- Solar cells use energy from the Sun.
- Solar panels transfer the Sun's energy directly into electricity.



Disadvantages

- Solar cells are expensive.
- They take up lots of space.
- They only work in Sun light

Solar cells



Advantages

- The energy from the Sun is free.
- The sun does not produce greenhouse gases.
- The sun will always be there during our lifetime.

What is it?

- Rocks under the ground are hot.
- Water can be pumped through these hot rocks and warmed up



Disadvantages

- There are not many places where we can build geothermal power stations.
- Harmful gases and minerals may occasionally come up from the ground below. These can be
- difficult to control.

Geothermal



Advantages

- Geothermal energy does not produce greenhouse gases.
- The energy source is free and will not run out.

What is it?

Flowing water is used to turn a turbine which generates electricity.



Hydroelectric



Disadvantages

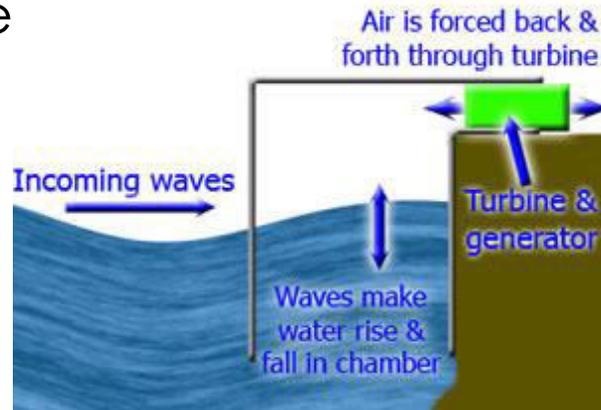
- The dam is expensive to build.
- By building a dam, the nearby area has to be flooded and this could affect nearby habitats.
- If it does not rain much we may not have enough water to turn the turbines.

Advantages

- When the electricity is generated, no greenhouse gases are made.
- The water used is free.
- It is a renewable energy source.

What is it?

- Waves force air in and out of a chamber.
- The air causes a turbine to generate electricity.



Wave

Disadvantages

- Small waves generate small amounts of electricity.
- Electricity needs to be transported from the sea onto the land.
- The equipment is expensive

Advantages

- Waves are free and will not run out.
- Wave power does not produce greenhouse gases.
- There are very few safety risks.



What is it?

- Solar power uses energy from the Sun.
- Solar panels transfer the Sun's energy to heat water.



Tidal

Disadvantages

- A dam to make the water flow through the generators might be needed.
- Plants and animals that live nearby might get harmed
- The tides only happen twice a day, so can only produce electricity at that time.

Advantages

- Tides are free and will not run out.
- No greenhouse gases are produced.
- It is reliable because we know exactly when the tides happen.



The end!

Thank you for your attention!



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