

In collaboration with:



TEACHERS' TOOLKIT

Learning wind energy in **primary schools**

MODULE 1

LEARNING ABOUT ENERGY

OVERVIEW

This is an introduction to the definition of energy, renewable energy sources and wind energy in particular. By carrying out a research assignment, students will be able to identify the differences between the various types of energy sources. By watching and reflecting on free video resources, students can learn about different aspects of wind energy, such as permitting procedures, costs, and environmental aspects.

GRADES

5-6th Primary (10-12 yo)

TIME

- One (50-minute) class to define energy
- 5 days to research energy sources at home
- Two (50-minute) classes to learn about different aspects of wind energy

SUBJECTS

- Physics
- Geography
- History

LEARNING OBJECTIVES

At the end of this module, students will gain the following knowledge and competences:

Knowledge

- Understanding various types and sources of energy
- Key considerations for wind energy: administrative and permitting procedures; economic and environmental aspects

Competences

- To classify information by groups of definitions
- To select relevant information from a written document and transcribe it into their own words
- To organise information in a written document
- To present mental images/representations in the form of drawings and text
- To take down information from a video documentary in the form of drawings
- To take notes in the form of key words while watching a video

LESSON PLAN

MATERIALS

YouTube videos about: offshore wind turbines, administrative and permitting procedures; economic and environmental aspects of wind energy.

METHOD

PART I LEARNING ABOUT ENERGY

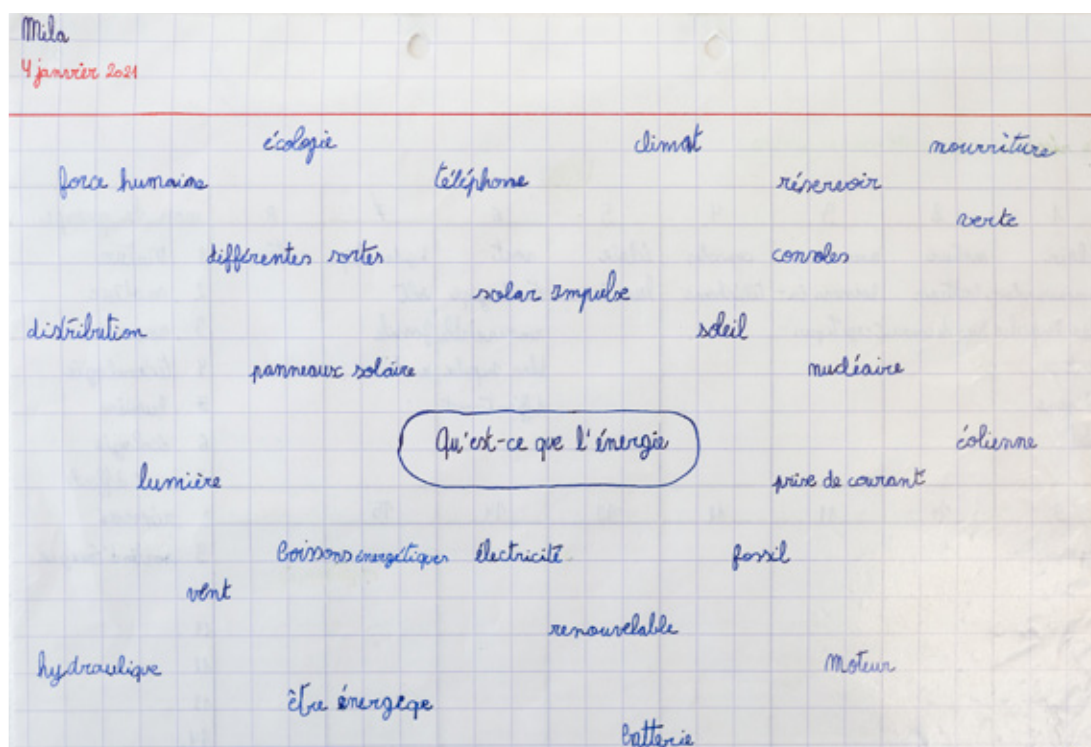
STEP 1

Introducing energy

- In the classroom, each student thinks of a few words that come to mind when they hear the word "energy"
- The teacher writes these words on the whiteboard, in no specific order
- The students copy all the words from the whiteboard into their notebook

FIG. 4

In this example, the words students came up with when thinking about energy: ecology, climate, food, human strength, telephone, reservoir, green, different types, consoles, distribution, sun, solar panels, nuclear, light, socket, wind turbine, energy drinks, electricity, fossil, wind, renewable, engine, to be energetic, battery.



STEP 2

Defining energy

The students and the teacher try to define energy and summarise their conclusions as follows:

- Energy is invisible but we can see the reaction it provokes
- We need energy to make things work
- Energy can change form

STEP 3

Energy types

The teacher gives an overview of the two types of energy: kinetic and potential (table 2). Based on this discussion, the students work in pairs to classify energy in the table below, using the words they have copied into their notebooks in step 1.

TABLE 2

KINETIC ENERGY	POTENTIAL ENERGY
Mechanical energy: makes an object move	Chemical energy: comes from molecules
Electrical energy: comes from an electric charge	Nuclear energy: stored in the nuclei of atoms
Thermal energy: based on heat	

STEP 4

Energy sources

The teacher discusses the meaning of renewable energy and fossil fuels with the students. Together, they make the following table using the words added to the whiteboard in step 1.

TABLE 3

RENEWABLE ENERGY	FOSSIL FUELS
Wind energy	Gas
Solar energy	Coal
Hydro energy	Oil

STEP 5

Researching energy sources

Each student selects one type of energy and carries out a research assignment at home over the course of the week, in which he/she summarises these three main elements on a single poster:

- Where does the energy come from?
- Is it renewable or not?
- What are the advantages and disadvantages of this type of energy?

STEP 6

Presenting the research work

- Each student presents his/her poster to the rest of the class
- A copy of each poster is distributed to all the students, so they have a summary of all the other types of energy to learn from

FIG. 5

Student poster comparing onshore wind turbines with offshore wind turbines, which states that offshore wind turbines are smaller than onshore turbines. In reality the reverse is true.

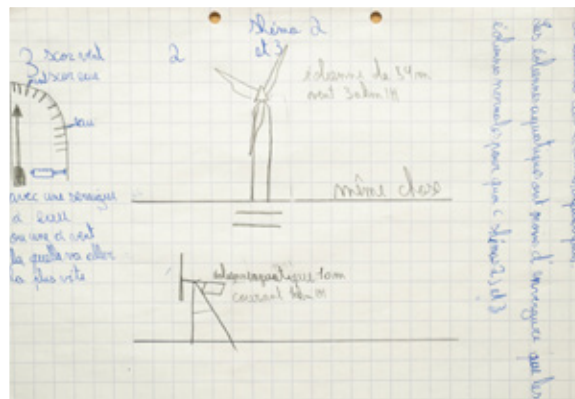


FIG. 6

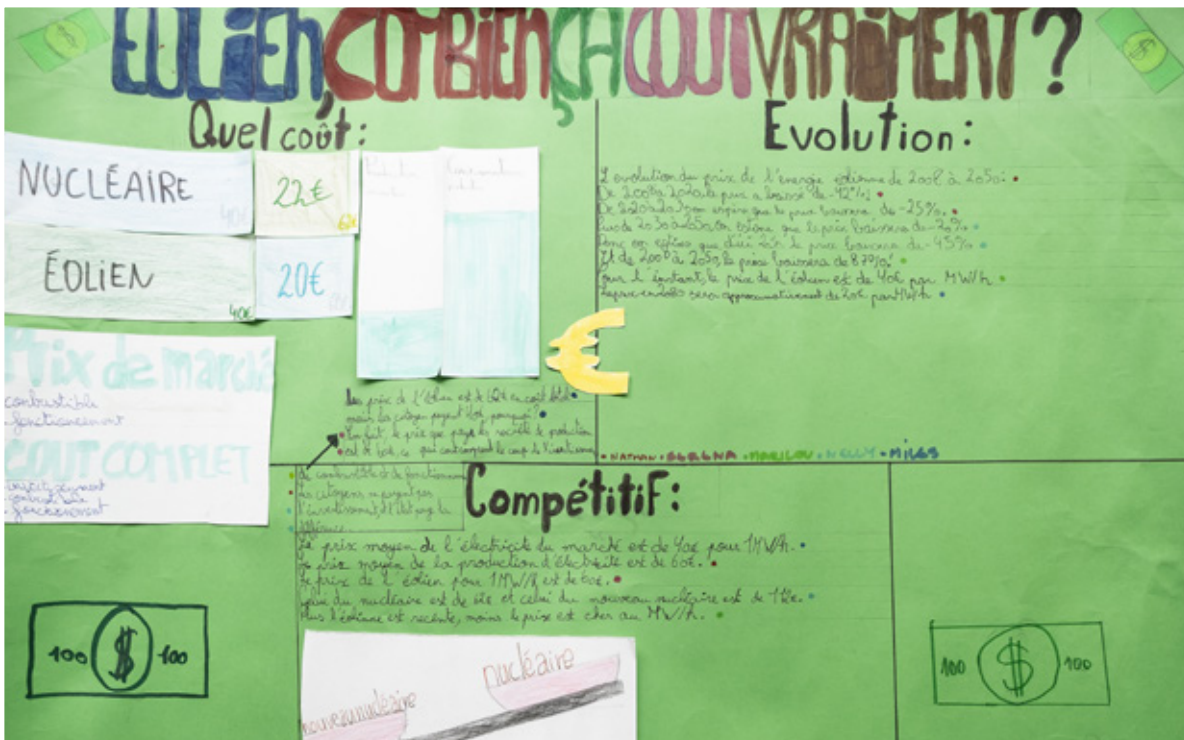
Student poster on gas: where it is produced; when was it discovered for the first time; how is it produced; what is it made of; advantages and disadvantages of gas.



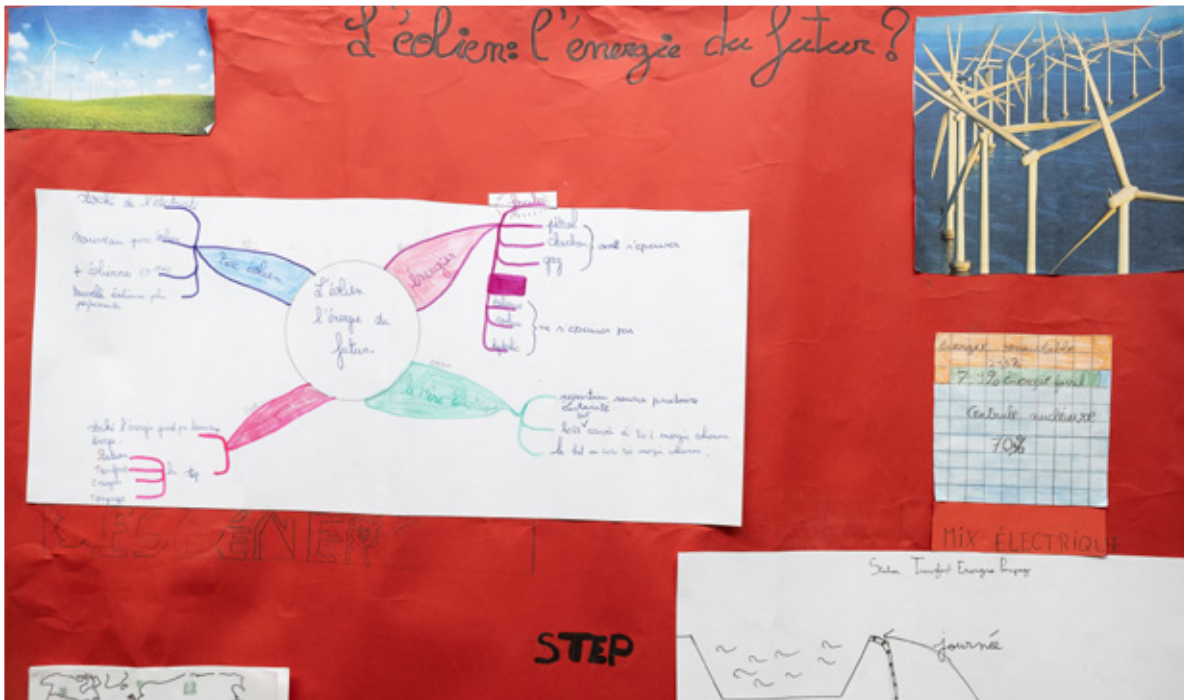
PART II LEARNING ABOUT DIFFERENT ASPECTS OF WIND ENERGY

- The teacher picks a number of videos from YouTube which deal with different aspects of wind energy: administrative and permitting procedures; the economic and environmental aspects of wind energy.
- Students are divided into four groups. Each group watches a different video about a particular aspect of wind energy (they are in French but they are only meant to give you a broad outline):
 - › **Group 1: How offshore wind turbines work**
<https://www.youtube.com/watch?v=iSfeRPa2EuU>
 - › **Group 2: Permitting regulations and views on the impact of wind turbines on the landscape**
<https://www.youtube.com/watch?v=LG40lrxYnqs>
 - › **Group 3: The cost of wind energy**
<https://www.youtube.com/watch?v=0nWM2Wj3YYM>
 - › **Group 4: Is wind the energy of the future**
<https://www.youtube.com/watch?v=7tvX4OJd8Nc>
- Each group puts together a poster in the classroom based on what they have learnt about a specific aspect of wind energy and gives a presentation to the rest of the class.

Student poster about the cost of wind energy: how much does it cost compared to nuclear energy? The evolution of wind energy prices; and the competitiveness of wind energy prices.



Student poster on the energy of the future: or wind being the energy of the future, it requires new wind farms to be built, including offshore, and new and more efficient wind turbines and energy storage.



SUPPORT MATERIAL FOR THE TEACHER

This Toolkit offers support material for the teacher to help implement the curriculum. It was prepared by wind energy experts and is meant to inform the teacher about the subject area of each module. This will help the teacher to plan out his/her lesson and to help them pass on this knowledge to the students. Activities in this material should make use of recycled and affordable material.



The support material contains the following and can be downloaded here



Theoretical aspects

- The concept of energy, its types and forms
- The concept of aerodynamics, how it explains the shape of wind turbine blades and their interaction with wind
- The concept of air and atmospheric pressure
- The European Wind Atlas
- How do we measure wind?
- Basic components of a wind turbine

Classroom activities & experiments

- Forms of energy
- Energy transformation
- Atmospheric pressure and wind formation

Classroom discussions

- Renewable versus non-renewable sources of energy; their advantages and disadvantages

YouTube videos

- Virtual tours inside and outside a wind turbine

Step-by-step guides and instructions

- Building a cup anemometer and taking measurements
- Building a wind turbine and making it spin
- Making a wind vane and finding the wind direction

To find out more you can use the following resources:

School resources:

- Wind with Miller
- Alliant Energy Kids
- Energy student resources
- NEED Curriculum Resources
- Wind for Schools

WindEurope LearnWind free resources:

- **Let the wind blow** book & video
Explains climate change & wind energy
- **When I Grow up** book
Inspires young adults to consider a career in clean energy
- **Wind Energy Basics** animation
Teaches users about wind energy technology
- **Offshore Wind 4 Kids** workshops
Demonstrates how offshore wind turbines work

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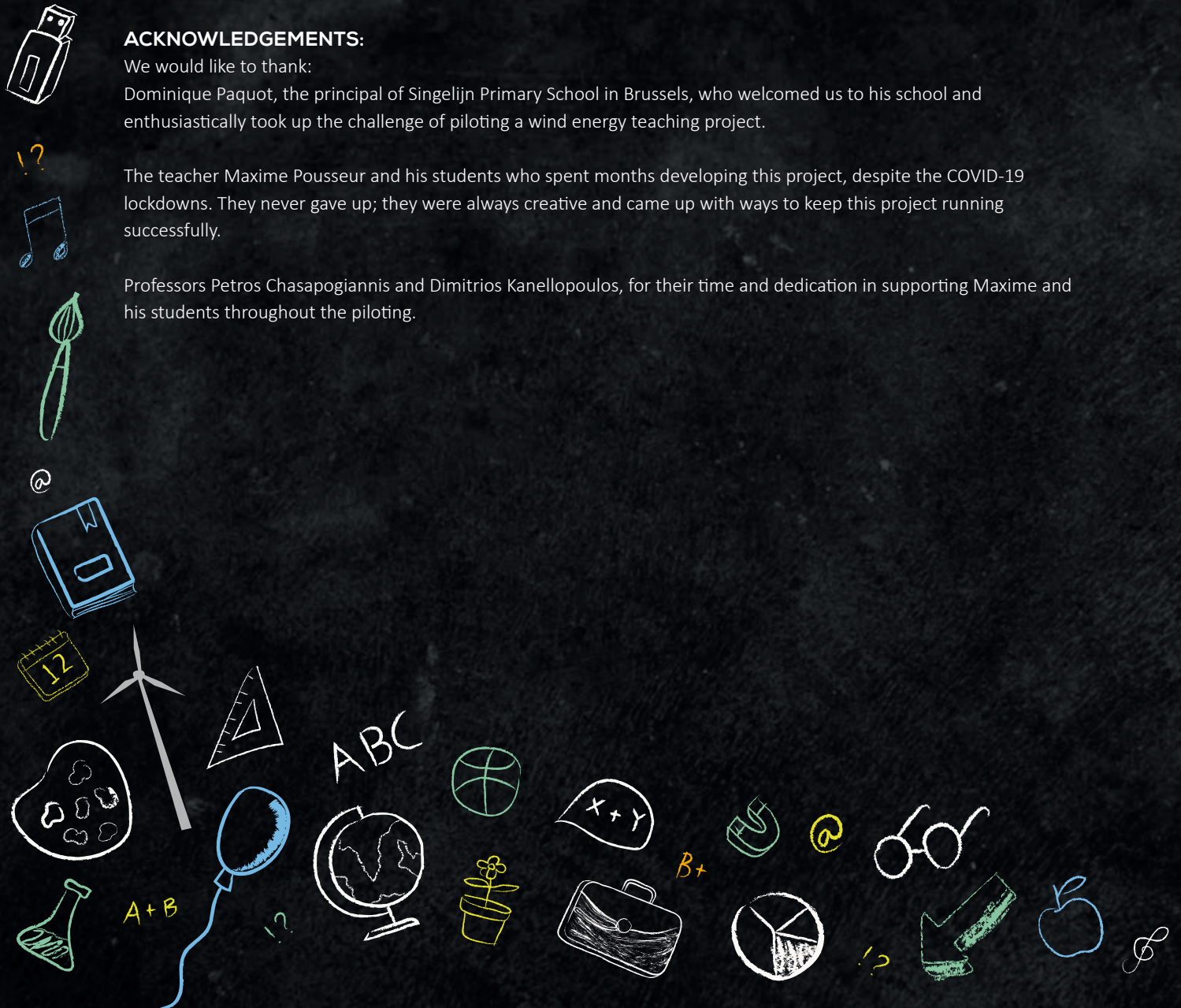
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If you are a teacher implementing this plan in your school, we would be happy to receive your feedback at yamina.guidoum@windeurope.org.



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