

Hazard Literacy Center

Hazard Literacy Education Program

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A Hotter Earth: Can Wind Be the Answer? Exploring Wind Power Systems



1. Program Overview

This program is designed to help students understand wind power as a system that combines scientific principles with social, economic, and environmental contexts, based on the need to respond to the climate crisis and transition to new energy sources. Students examine electricity use and carbon emissions in daily life and recognize how energy consumption affects the environment and our lives. They then explore the meaning of energy, energy transformation, and the need for renewable energy. Next, students investigate the principles of wind power and current installation conditions and examine how wind turbine installation is connected to various phenomena such as changes in power generation, reduced carbon emissions, noise, landscape changes, and ecosystem impacts. Finally, students represent relationships among these factors and phenomena using a systems map and explore how changes in one factor affect others. Through this process, students understand wind power not simply as a technological solution or a matter of being for or against it, but as a socioscientific issue that requires consideration of interactions among multiple factors and possible changes over time.

Grade Level	Grades 6	Instructional Methods	Lecture, Hands-on Activity, Discussion
Learning Environment	Classroom or an educational space suitable for drawing activities	Duration	120 minutes (40 minutes × 3 class periods)
Required Materials	Quarter-size drawing paper, colored pens		

2. Learning Objectives (Hazards Literacy Framework)

① Understand the background of the climate crisis and energy transition and explain the need for renewable energy.

② Examine various phenomena related to wind turbine installation and represent interactions among different factors on a map.

③ Understand wind power as an issue that requires consideration of interactions among multiple factors and possible changes over time.

Learning Objectives	Knowledge & Understanding		Reasoning & Skills					Values & Attitudes			Psychology & Emotion			Behavioral & Practical Enagement		
	A1	A2	B1	B2	B3	B4	B5	C1	C2	C3	D1	D2	D3	E1	E2	E3
Objective ①	O							O								
Objective ②		O	O													
Objective ③		O	O	O					O							

3. Key Concpets

· Relationship Between Greenhouse Gas Emissions and Global Warming

· Energy Transition and the Need for Renewable Energy

· Kinetic Energy of Wind and the Principles of Wind Power Generation

· Interactions Between Environmental and Social Systems Related to Wind Turbine Installation

4. Program Sequence

Learning Activities	
Introduction	·Recognize the meaning of responding to the climate crisis and practicing energy conservation through the Earth Hour case ·Identify relationships between energy consumption and environmental issues through examples such as everyday electricity use, carbon emissions, and power outages
Development 1	·Identify the meaning of energy and various forms of energy ·Understand energy transformation and explore the need for renewable energy ·Understand the scientific and social background of responding to the climate crisis and transitioning energy systems
Development 2	·Investigate the principles of wind power and current installation conditions ·Explore why wind power is needed and its meaning as a renewable energy source ·Analyze phenomena related to wind turbine installation, including changes in power generation, carbon emission reduction, noise, landscape changes, and ecosystem impacts
Development 3	·Represent interactions among multiple factors centered on wind turbines using a systems map
Wrap-up	·Discuss various issues surrounding wind power ·Review the systemic understanding of wind power and its meaning as a socioscientific issue

5. Theoretical Background and Activity Design for Disaster Education

The climate crisis and energy issues are representative complex disaster-related issues today. Energy production and consumption therefore need to be understood not simply as technological matters, but as issues in which environmental change and social responses are interconnected. In Jeju, the distribution area of Korean fir decreased by approximately 24% in 2021 compared with 2006, while the average annual sea-level rise over the past 10 years was reported as 5.11 mm, showing concrete impacts of the climate crisis on the local environment. Therefore, when understanding climate and energy issues, it is necessary to examine the structure in which multiple factors influence one another rather than considering causes, processes, impacts, and responses separately.

Accordingly, this program is designed to help students understand the need for energy transition through electricity use and carbon emissions and to explore the principles of wind power together with various phenomena that may occur when wind turbines are installed. In particular, students draw a systems map to effectively represent relationships among factors such as power generation, carbon emission reduction, noise, landscape changes, and ecosystem impacts. As shown in Figure 1, the systems map helps students understand these phenomena not as separate events but as a structure in which they influence one another. Through this process, students can consider wind power not simply as a technology or a matter of being for or against it, but as an issue involving interactions among multiple factors and possible changes over time.

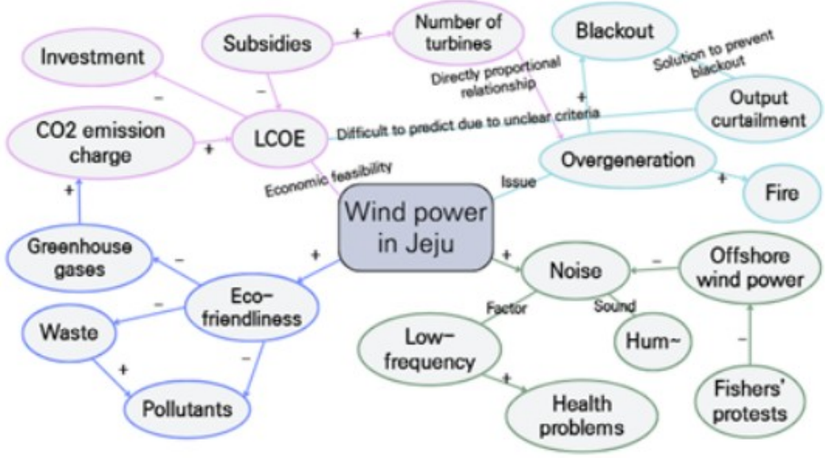


Figure 1. Systems map representing stakeholders and phenomena related to wind

6. Instructional Considerations

Teachers should avoid presenting the climate crisis and energy transition simply as reasons for emphasizing the need for renewable energy, and should guide students not to view wind power as an unconditional solution or merely as an issue to support or oppose. Students should explore how factors such as power generation, carbon emission reduction, noise, landscape changes, and ecosystem impacts influence one another so that they can understand wind power as an issue involving multiple interconnected conditions and phenomena. During systems map construction, students should not simply list factors. Questions such as “If this factor changes, what else will change?” and “How will this change affect another factor?” should be used to help them express relationships and directions of change. Teachers should also provide questions and feedback so that students move beyond connections within a single category or perspective and consider relationships across environmental, social, and technological aspects.

7. References

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- Blatti, J. L., Garcia, J., Cave, D., Monge, F., Cuccinello, A., Portillo, J., Juarez, B., Chan, E., & Schwebel, F. (2019). Systems thinking in science education and outreach toward a sustainable future. Journal of Chemical Education, 96(12), 2852–2862.
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Lesson 1: A Hotter Earth, Can Wind Be the Answer?

Theme	Exploring Wind Power Systems
What Will We Learn?	① Understand the background of the climate crisis and energy transition and explain the need for renewable energy. ② Examine various phenomena related to wind turbine installation and represent interactions among different factors on a map. ③ Understand wind power as an issue that requires consideration of interactions among multiple factors and possible changes over time.

1 Let's Think!

- Do you know about "Earth Hour"? Watch the related video and write why Earth Hour began and what you would like to do if you participate next year.

2 Energy and Energy Consumption

- Visit the Korea Climate & Environment Network website and find out how much carbon dioxide your household emitted over the past month. (https://www.kcen.kr/tanso/home.green)

- Look through your textbook and answer the questions below.

1) What is energy?

2) What forms of energy are there?

3) What is energy transformation?

3 What Is New and Renewable Energy?

- Why do we need new and renewable energy?

- What types of new energy are there?

- What types of renewable energy are there?

4 Draw a Wind Power Systems Map

- Why are wind turbines getting larger?
  (https://youtu.be/1UT2hD3osBs?si=lw7B9cDopFZUPOL8)

- Explain how a wind turbine works in terms of energy transformation and discuss why wind power is needed. (https://youtu.be/got_4oewoyA?si=vtPLFGoP7909lFav)

- Find out about the current status of wind turbine installations in Korea and identify what phenomena may occur when wind turbines are installed.
  (https://nr.energy.or.kr/k-winpis/space)
  (https://youtu.be/nRSvj-GgwdU?si=BGATO-sed0CyOksL)

- Represent these phenomena with your group using a "systems map".

* Materials
Quarter-size drawing paper, colored pens

* How to draw
① Draw a circle of an appropriate size in the center of the paper and write "Wind Turbine" in black pen.
② Write down phenomena that may occur in relation to wind turbines and connect them with arrows.
③ If one factor increases and another factor also increases, mark the relationship with +. If one factor increases while another decreases, mark it with −.