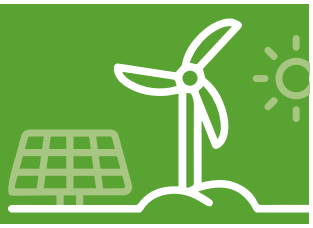
Cyfoeth Naturiol Cymru
Natural Resources Wales

Activity plan



# Wind speed investigation

## Time needed for activity

**40 minutes plus**

## Location

**Outdoors**

## Context

This activity looks at measuring wind speed and asks learners to consider how the placement and location of wind turbines in the landscape may affect the generation of energy.

Natural Resources Wales' purpose is to pursue the sustainable management of natural resources in all of its work. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

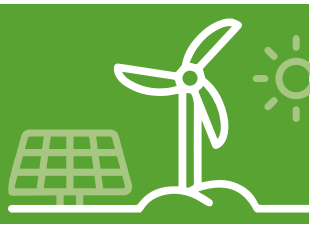
## Curriculum for Wales

| Mathematics and Numeracy | Humanities | Science and Technology | Health and Wellbeing |
|---|---|---|---|
| • **What matters** – The number system is used to represent and compare relationships between numbers and quantities.<br>• **What matters** – Statistics represent data, probability models chance, and both support informed inferences and decisions. | • **What matters** – Informed, self-aware citizens engage with the challenges and opportunities that face humanity and are able to take considered and ethical action.<br>• **What matters** – Our natural world is diverse and dynamic, influenced by processes and human actions. | • **What matters** – Forces and energy provide a foundation for understanding our universe.<br>• **What matters** – Being curious and searching for answers is essential to understanding and predicting phenomena. | • **What matters** – Our decision-making impacts on the quality of our lives and the lives of others. |

## Objectives

Learners will be able to:

- work together to complete a field-based trial.
- use their mathematical skills to analyse and predict wind speed.
- observe and consider how geographical features and environmental factors affect wind energy capture and use this knowledge to deliberate the placement of wind turbines and wind farms.



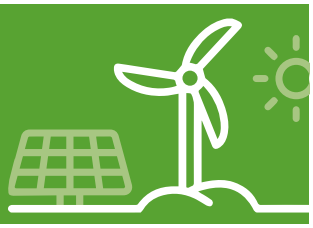
## Resources and equipment

- Information note – Energy (optional)
- Worksheet – Wind speed investigation
- Anemometers - An anemometer is a device that is used to measure wind speed. You will need one anemometer for each group. You can find online tutorials on making different types of anemometer such as a cup anemometer (Robinson anemometer) which your learners can undertake as a STEM activity prior to this field-based trial.
- Clipboards
- Writing materials
- Stopwatches

## What to do

Before beginning the practical elements of the activity, please discuss any health and safety considerations with your group.

1. Begin the session by asking the group to discuss the pros and cons of renewable energy. What is it? What types of renewable energy are there? What are the benefits and considerations of different renewable energies? To support this, check out our **Activity plan - Community energy supply**.
2. Explain to the group that they are going to observe and investigate wind speed. Discuss with them how they think wind power is used to create energy such as electricity. How is wind captured or harnessed to create energy? For example, wind turbines and windmills.
3. At a suitable, outdoor site, divide your learners into groups of 3, providing each group with a **Worksheet – Wind speed investigation**, anemometer, stopwatch, clipboard and a pencil or pen.
4. Ask each group to divide into 3 different roles:
   - Timekeeper – uses the stopwatch to start and finish the activity.
   - Rotation counter - counts each time the marked cup passes within the allocated time slot.
   - Anemometer holder - holds the anemometer at shoulder height and arm's length.
5. Explain that each group will use the anemometer to take 3 readings of 30 seconds duration at 3 different locations within your chosen site, recording their findings on the worksheet. The wind blowing into the cups of the anemometer causes the spindle to rotate. In standard instruments the design of the cups is such that the rate of rotation is proportional to the speed of the wind to a sufficiently close approximation.
6. Give each group time to select 3 locations to use as test sites. They can use maps or smart devices to find the grid reference of their chosen sites.
7. Discuss how your learners can ensure that this is a fair test and what factors could affect sampling. For example:
   - Does the altitude of their 3 locations matter? There is an extension task to measure the altitude of the sites but it can be done just from sight.
   - If learners are of different heights or have different length arms, does it matter?
   - If a reading is taken 0.2 metres off ground, 0.5 metres off ground and stood on a chair or tree stump, does the wind speed differ?
   - What is the impact of something such as a tree, shrub or building being close to an anemometer?
   - Does direction matter? If the anemometer is pointed north, does it get a better reading than if pointing south?



8. Ask your learners to predict what wind speeds they expect to record at each location before taking a reading. They should then compare their predictions against their actual readings. The normal unit of wind speed is **the knot** (nautical mile per hour = 0.51 m sec-1 = 1.15 mph). Wind direction is measured relative to true north, not magnetic north, and is reported from where the wind is blowing. For more information see **How we measure wind - Met Office**.
9. Once each group has had the opportunity to survey the three locations, ask your learners to calculate the average wind speed for each location sampled. Can your learners use their findings to work out the **Beaufort wind force scale** reading?
10. Now compare results across the groups.
11. What else apart from wind speed must be taken into consideration when deciding where to place a wind turbine or wind farm?
    - Is there an area that would produce more wind energy than the others if a turbine was placed there? Using their findings, where would be the best place for a wind turbine to be built?
    - Which area tested would be the least successful at producing wind energy?
    - What geographical features make the area a good/bad location for a wind farm?
    - What impact would a wind farm have on the natural environment and the local community if one was built on the most successful area? Can learners identify arguments for and against wind farms?
12. Following the practical activity, use the data to create maps and graphs, and combine to show the whole groups findings.

## Suggested key questions

- What is wind power?
- How can we capture wind to create renewable energy?
- What effect does the geography and topography of an area have on how we create renewable wind energy?

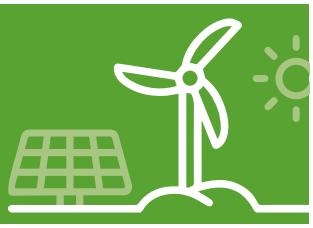
## Adapting for different needs or abilities

### More support

- Provide adult support for each group.
- Complete as an adult led, whole group activity.

### More challenge

- Complete as 1 of 2 activities, alongside the Solar collector investigation to build a bigger picture of renewable energy systems.
- Create charts and graphs to represent findings across the two investigation activities.
- Create a profile of geographical features most suited to the capture of each type of renewable energy.



## Follow up activity/extension

Try out our:

- Activity plan - Solar collection investigation
- Activity plan - Creating an enviro-vlog. Choose one type of renewable energy and create a media campaign to encourage people to use it.
- Use natural art to illustrate renewable energy sources.
- Investigate how renewable energy is stored.
- Measure the altitude of each location, this can be done using an altimeter app on a mobile phone or compass app or using altitude (contour lines or spot heights) on an OS map.
- Research the location of wind turbines and wind farms in the learners locality and collect the opinions of their friends and family regarding using wind as a source of energy.

## Additional Information

Find out more about Natural Resources Wales' work to address climate change at **www.naturalresourceswales.gov.uk**

**Natural Resources Wales/Climate change overview**

## Looking for more learning resources, information and data?

Please contact: **education@naturalresourceswales.gov.uk** or go to **https://naturalresources.wales/learning**

Alternative format; large print or another language, please contact: **enquiries@naturalresourceswales.gov.uk 0300 065 3000**