

Wind Turbines and the Environment Teacher Notes - Where should we build a windfarm activity instructions

Where should we build the wind farm?

A decision-making activity using role play.

A role play approach will be used to encourage pupils to think about a suitable site for an offshore wind farm and what impacts such a development might have on the local environment (particularly the plants and animals in the local area) if the wrong site were to be chosen.

Wind-generated electricity is an important form of renewable energy (clean energy that doesn't produce greenhouse gases). Offshore windfarms have the potential to provide us with large amounts of energy, but as with any development there are potential environmental impacts. The biggest concerns focus on birds and marine mammals. Some experts have suggested that offshore windfarms could cause birds to be displaced (lose their feeding/breeding grounds) or collide with the spinning turbine blades. Other issues include the noise associated with construction and operation. The turbines are supported on large steel poles called monopiles. These are hammered deep into the seabed in a process called pile-driving which generates a very loud noise. Marine mammals like porpoises, dolphins and seals are very sensitive to loud noise and can be injured or disturbed by certain types of sound. COWRIE has commissioned reports looking in detail at these potential impacts, and the findings have been summarised in the attached 'background information' pages. More information can be found on the COWRIE website if required, available at:

<http://www.offshorewind.co.uk/Pages/COWRIE/>

In this activity the pupils are told that a new offshore wind farm is going to be built in Windy Bay, a hypothetical site based on real-life information. The wind farm will comprise 30 wind turbines, each rated at 2 megawatts. This development should generate enough electricity to meet the demands of approximately 40,000 homes. The wind farm will cover an area of about 10 km².

The location must be chosen according to a variety of different specifications including relatively shallow water (up to about 12 metres depth), seabed conditions, adequate wind speeds and proximity to shore to transport electricity. It must also minimise any potential impacts on the local environment.

The children will be divided into four groups, each playing a separate role. Group 1 will be geoscientists who know which seabed type and water depth would be most suitable for the wind farm site. Group 2 will be ornithologists who know about the local birds. Group 3 are marine mammal experts who know about the local marine mammals. Group 4 are engineers who know about the costs involved in transferring the electricity to shore and how much wind is needed to generate electricity. The groups must use the available information to decide on a suitable location within Windy Bay which minimises any adverse effects to wildlife whilst ensuring adequate wind speed and proximity to shore for energy transfer.

The pupils will be provided with an A3 base map of Windy Bay, and there will also be a large map on the backdrop. The groups will be given further maps and fact sheets with information about their specialist area. For example:

- Group 1: Seabed type and water depth data and associated map.
- Group 2: Seabird data and map of breeding/wintering populations.
- Group 3: Marine mammal data and map of recorded observations.
- Group 4: Wind velocity data and information about the cost of transferring energy to shore.

The additional maps will be identical in scale to the base maps, but each will show further detail, such as the variation in seabed type and water depth, feeding grounds and migration routes of the common scoter, distribution of marine mammals or how the wind speed varies. The fact sheets will contain everything the pupils need to know to make an informed decision on the position of the wind farm. By copying data from each relevant map onto their base map, and discussing the possible impacts, groups will be expected to decide where to site the windfarm and how to avoid environmental impacts.

The children will have ten minutes to discuss this data within their groups, and to decide on the most suitable site according to their expertise. Each group will then present their site map and explain their decision to the rest of the class. The best site for one group will not necessarily be suitable for another group, and so the children then re-group (out of 'character' but in the same groups) with this additional information and re-evaluate their decision. They should now have all the information they need to decide on the best available location. Following this, the class comes together again to offer their new suggestion. As the groups defend their decisions, a class discussion should develop about what would be the best place and why.

It will become apparent that:

- The windfarm cannot be too far from shore because of the costs associated with transferring electricity to shore.
- Water depths must be within the range of 7 – 12 metres.
- Faults and hard rock under the seabed should be avoided.
- Minimum wind speeds must be present.
- The position of the wind farm will not affect marine mammals except for during construction, and mitigation measures are available to avoid disturbance during this time.
- Construction may have to be avoided at certain times of year, and the chosen location must not affect the common scoter population.