



the environment, society and the economy

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2 Energy: production, efficiency and conservation

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Aim: To examine the unsustainable nature of current energy production practice in Ireland, to explore renewable energy and to underline the importance of energy efficiency and conservation in future planning.



SYLLABUS STATEMENT

Elective Unit 4.5 – Environmental impact

Students should study:

- > the use of renewable and non-renewable resources in the economy
- > the impact of burning of fossil fuels and the use of alternative energy sources

OUTCOMES

Having completed this unit students should be able to:

- > identify the major problems for the environment arising from over-dependence on fossil fuels for energy production
- > be aware of the potential of renewable energy sources, especially wind power, in the Irish context
- > outline the importance of energy conservation/efficiency, especially with reference to energy use in houses.

the video clips

1 CURRENT ENERGY PROBLEMS IN IRELAND

From ECOEYE, series 1, programme 2

2 IRISH WIND POWER – OFFSHORE AND ONSHORE

From ECOEYE, series 1, programme 4

3 WIND ENERGY IN GERMANY

From ECOEYE, series 2, programme 3

4 SOLAR ENERGY IN AUSTRIA AND IRELAND

From ECOEYE, series 2, programme 5

5 THE HOUSING BOOM AND ENERGY USE IN IRELAND

From THE STATE WE'RE IN, series 2, programme 5



Current energy problems in Ireland

- 1 Name the two types of indigenous fossil fuel energy resource available to Ireland.

- 2 Energy consumption in Ireland has doubled over the last ten years, and dependence on imported fuel has also increased. In 1990 our dependence on imported fuel was 65%. What was the percentage given in the video (in 2003)?

- 3 How much does Ireland spend on energy per annum?

- 4 List the environmental problems of burning fossil fuels for energy production.

- 5 When Ireland signed the Kyoto Protocol in 1998, it agreed to limit its greenhouse gas emissions to 13% above 1990 levels by 2008 – 2012. When Ireland ratified this protocol at Johannesburg in 2002, at what level were greenhouse gas emissions?

- 6 What are the possible renewable energy resources for Ireland?

- 7 What would be the benefits of a shift to renewable energy resources for the economy and the environment in Ireland?

- 8 What ultimately limits the potential of (i) solar power and (ii) hydro-electric power in Ireland?
(i) -----

(ii) -----

- 9 In 2001 Germany installed 2,500 megawatts of wind energy. How much was installed in Ireland in that year?

- 10 The video mentions two new peat-fired power stations that are being built. What does the narrator suggest will be (i) the economic benefits (ii) the environmental costs of these plants?
(i) -----

(ii) -----



Irish wind power – offshore and onshore

- 1 List some of the benefits of wind power for Ireland's

(i) environment

(ii) economy.

- 2 What are mentioned in the video as good potential sites for wind farms in Ireland?

- 3 What are the advantages of siting wind farms offshore?

- 4 What is an electricity interconnector?

- 5 Why is an electricity interconnector useful with wind power?

- 6 In Denmark, 17% of energy needs are generated by wind power. What is the percentage in Ireland?

- 7 What kind of hidden costs for Ireland are not included in the price of fossil fuels?

- 8 What arguments are made in the video for subsidies for the wind energy industry?

- 9 What is the fastest growing energy business in the world?



Wind energy in Germany

- 1 In the video clip, why are people surprised that Ireland is not using its wind resources?

- 2 Why has Germany been so successful in developing wind energy over the years?

- 3 What percentage of Germany's energy needs are provided by wind power?

- 4 Why did Germany decide to support wind power?

- 5 What have the benefits of wind power been for Germany?

- 6 Why are some German farmers getting involved in wind energy production?

- 7 On the basis of what is discussed in the video, what do you think is needed to develop wind energy in Ireland?



Solar energy in Austria and Ireland

- 1 What is the possible percentage saving in home fuel bills from the use of solar energy?

- 2 What wrongly leads people to believe that the potential for solar energy in Ireland is very small?

- 3 Why has solar energy taken off in Austria, even though it does not have more sunshine than Ireland?

- 4 What benefit do solar collectors offer?

- 5 How do solar tubes work?

- 6 Why are heat pumps considered to be solar powered?

- 7 What are the benefits of solar energy?



The housing boom and energy use in Ireland

- 1 What percentage of energy is consumed by buildings in Ireland?

- 2 Which causes most greenhouse gas emissions: industry, transport or housing?

- 3 The video mentions that Ireland is building 50,000 new houses per year. At this rate, what will the percentage increase in the number of houses be by 2010?

- 4 Why does the presenter believe that the use of fossil fuels to heat homes will not last into the future?

- 5 How can people minimise the effects of rising energy costs?

- 6 List some of the effects of increasing greenhouse gas emissions for the world.

- 7 What energy inefficient features does the presenter pick out in the 1970s house?

- 8 What were the energy efficiency improvements made to the renovated house in Skerries, north County Dublin?

- 9 Why is energy-efficient housing important for sustainable development?



ENERGY USE IN IRELAND AND RENEWABLE ENERGY



GROUP DISCUSSION

After the students have viewed the video clips, begin a discussion under the following title:

- › **The economic benefits of generating energy from burning fossil fuels are outweighed by the costs to the environment**

INDIVIDUAL WORK

Ask the students to list benefits and costs. Then open the general discussion by listing all suggestions on the board.

GROUP DISCUSSION

Begin a discussion under the following title:

- › **What renewable energy sources provide an alternative to fossil fuel use?**

Ask students to suggest renewable energy sources, including sources not mentioned in the video clips, and to create a list of their replies on the board. General discussion should follow on the potential role of each energy source in meeting Ireland's energy needs.

INTERNET SEARCH

Ask students to pick a renewable energy source and search for websites offering information on the usefulness of the source and problems associated with it.

ADVERTISING / PROMOTION CAMPAIGN

Divide the students into groups. Give each group a copy of the students' sheet. After each group makes its presentation, ask the remainder of the students for their reactions to the campaign proposals.

MAP WORK

Using the relevant 1:50,000 OS Discovery Series map, ask the students to consider the choice of locations for a wind farm.

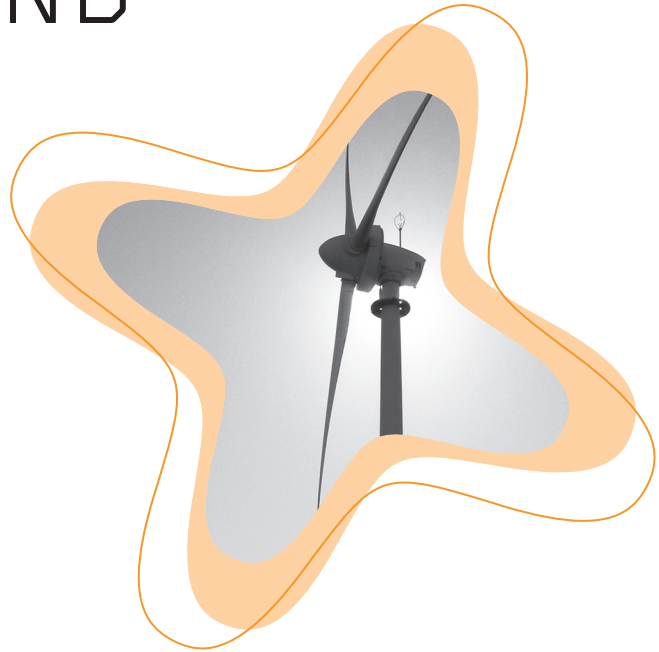
Ask students to:

- 1 select three possible sites for a wind farm using grid references
- 2 justify why each site was chosen
- 3 list reasons why local people might object to the sites chosen.



ENERGY USE IN IRELAND AND RENEWABLE ENERGY

—
group work



TASK

Design an advertising / promotion campaign for a renewable energy source.

Among the barriers to the development of renewable energy mentioned in the video are the need for more government support, inadequate knowledge among the general public and lack of confidence among investors. Your group has been asked to counter these problems by a promotion / advertising campaign to raise awareness about one form of renewable energy.

- > The campaign will use all media outlets: TV, radio, newspapers, magazines and billboards.
- > A campaign poster and slogan are required.
- > Your target audience is citizens / voters of all ages who can influence the Government and business interests who may invest in the energy resource.
- > The purpose of the campaign is to increase people's understanding of the importance and potential of the particular form of energy.

DEVELOPING THE CAMPAIGN

Your task will be to decide on:

- > your aims for this campaign
- > the kind of information you would like to give the public
- > how much information the public needs to have
- > the style and format of your campaign
- > how long the presentation will last
- > how your group will tackle the different tasks.

Present your campaign plans to the rest of the class.



ENERGY USE AND AWARENESS IN THE LOCAL COMMUNITY

geographical investigation



SYLLABUS REFERENCE

Structure and organisation of the investigation, Core Unit 3, Leaving Certificate Geography Syllabus, pp 17–18.

SURVEY TITLE

The opinions and energy-related behaviour of people in the local community

The surveying process follows these steps:

- > identifying key aims
- > preparation
- > considering methods of gathering information
- > collecting data
- > preparing a report
- > reaching conclusions and making evaluations.

STEP 1

Identify key aims

Discuss the following list of aims with students.

Aims:

- 1 To investigate current energy use in households in our community.
- 2 To evaluate the awareness of the consequences of current patterns of energy use and consumption.
- 3 To assess the awareness of renewable energy alternatives to present energy sources.

STEP 2

Preparation

Ask students to:

- 1 view the video clips on energy in Ireland
- 2 use the findings of the Internet search and the group work activity on renewable energy (previous activity).



STEP 3

Considering methods of gathering information

Discuss with students the concepts of a survey of a sample group and a full survey. A sample survey of households in the community is proposed in this case.

Formulating questions

Ask students to study the information on types of survey questions given in the students' information sheet.

- › Ask each student to write down ten questions to be included in the survey. Students are asked to concentrate mainly on 'closed questions' (see the students' information sheet), but to include one or more 'open questions'. List all suggested questions on the board, and choose approximately ten questions, with reference to the aims of the investigation. The majority of questions should be 'closed'.
- › Consider taking some questions from the Department of Environment's 2003 National Survey, in order to allow comparison.
- › Practice the survey by getting the class to complete it themselves, and make changes as necessary.
- › Include a section in which the respondent's age group and gender can be noted.

STEP 4

Collecting data

- › Where students carry out / administer a survey in their own community, anonymity is compromised, and this might affect answers given. The class must reach an agreement on confidentiality and giving and maintaining assurances to people surveyed with regard to their identity and their responses to the survey.
- › Agree on an introduction that will be used with all people surveyed.
- › Discuss the need for random samples.
- › Each student should carry out ten surveys of households in their own area. Surveys may best be done in pairs and personal security should be a priority. Students who live near each other should check that they will not duplicate surveys.



STEP 5

Preparing a report

In order to record results, ask students to:

- (i) construct a coding frame (a list of question numbers and possible answers), for example:

- Q1 possible answers:
yes | no | don't know | no response
- Q2 possible answers:
agree | disagree | neither agree nor disagree | no response

- (ii) divide completed surveys among class groups and record results on tally sheets, for example:

| Question | Response | | | |
|---------------------|----------|----------|----------------------------|-------------|
| Q1 | Yes | No | Don't know | No response |
| Number of Responses | | | | |
| Q2 | Agree | Disagree | Neither agree nor disagree | No response |
| Number of Responses | | | | |

- (iv) present quantified results as percentages
- (v) illustrate the results with histograms, pie charts, etc.
- (vi) use information and communication technology to present the results
- (vii) compare results where possible with results of national survey on the environment 2000 or 2003 from the Department of the Environment, Heritage and Local Government.

STEP 6

Reaching conclusions and making evaluations

Students should:

- > initiate a group discussion on the results
- > analyse the results in relation to the aims of the investigation, noting comparisons with national attitudes and opinions
- > draw conclusions based on the evidence produced by the investigation
- > examine how worthwhile the investigation has been and how it could be improved.





ENERGY USE AND AWARENESS IN THE LOCAL COMMUNITY

background information

TYPES OF SURVEY QUESTIONS

Closed questions

Comprehensive categories are given and answer is circled/ticked. Answers are easy to quantify.

Semi-closed questions

Alternatives are provided, and respondents can offer new variables.

Open questions

Lines or spaces are provided for answers to be written. Answers are difficult to quantify.

Ranking/scaling questions

Responses can be provided either numerically (usually 1–5) or descriptively ('excellent' through to 'poor').

Attitudinal/opinion measures

Scale of opinion may range from 'strongly agree' to 'strongly disagree'.

Filter questions

May determine that a subset of subsequent questions is irrelevant.





