

# **Introduction to practicals project**

**Mapping tranquillity and potential  
wind energy**

# Geo 243

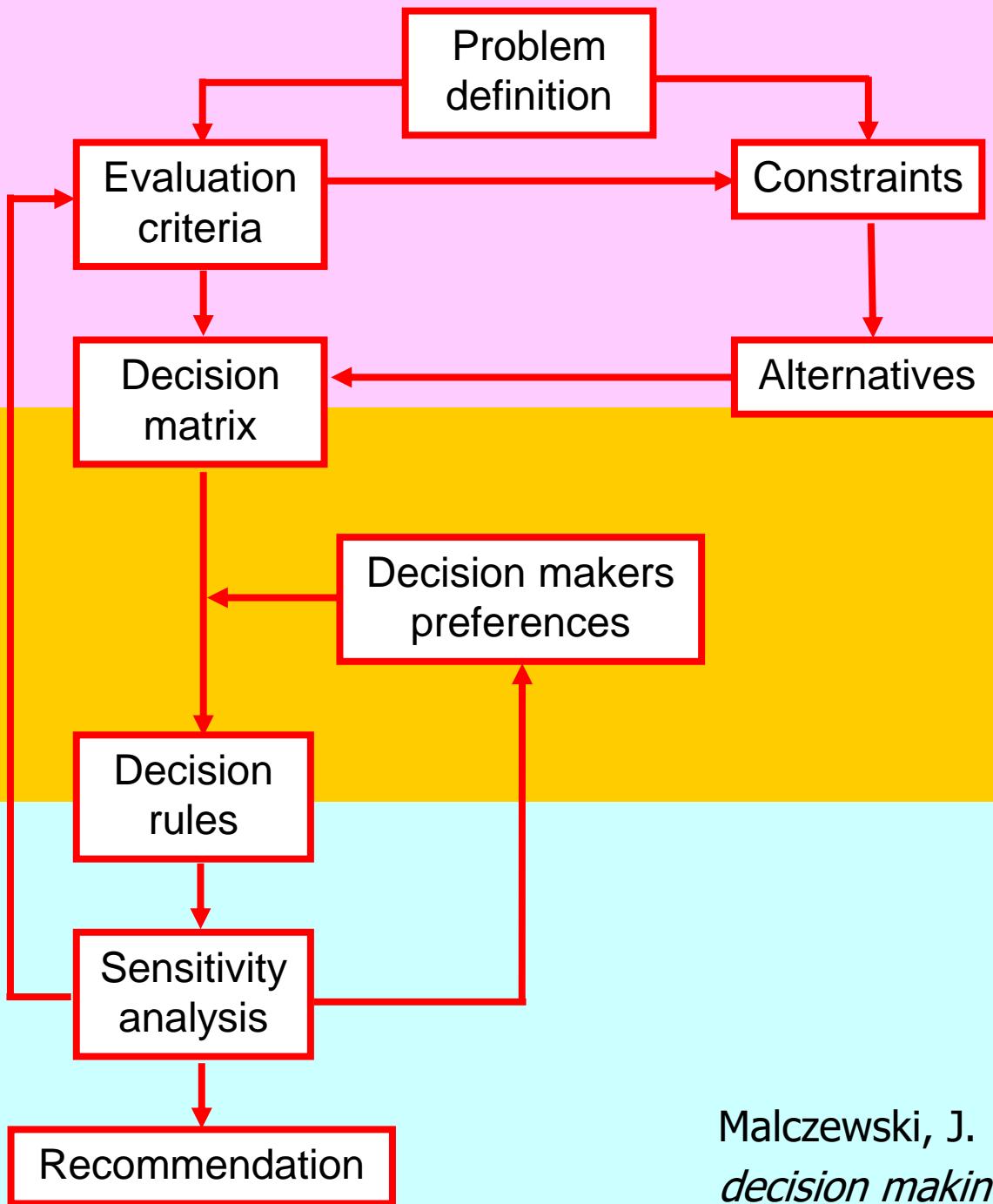
- Last semester you (nearly!) all learned how to use GeoMedia, and carry out simple operations
- In the last exercise you **combined** many of these simple operations to carry out a Multi-Criteria Evaluation (MCE) – where you identified **ideal habitat** for some **animal**
- The methods you used were simple – but the basic ideas were typical of **elements of GIS**

# Using GIS for making decisions

- **GIS** can form *part* of spatial decision making
- **Typical** real-world approaches involve modelling some **attributes** which **vary over space**, and integrating **multiple attributes** to **identify optimum sites**
- This information is then presented to **decision makers**
- **Who are Swiss decision makers?**

# Spatial Decision Support Systems(SDSS)

- People make decisions (either rationally or irrationally!)
- **SDSS** can be thought of as the **tools** or **process** that decision makers can use to **help them** in making decisions through:
  - **visualising** the problem
  - **defining relationships** between factors
  - **predicting outcomes** through modelling
  - **evaluating** how sensitive decisions are to changes in individual factors (and also to uncertainty)
  - visualising **spatial relationships** between potential sites
- The following diagram visualises a framework for SDSS



**Intelligence phase**  
GIS

**Design phase**  
MCE

**Choice phase**  
MCE/GIS

Malczewski, J. 1999. *GIS and Multicriteria decision making*. Wiley, London.

# What does it all mean!!

- SDSS aims to **support**, not replace, decision makers!
- The diagram show the steps in the process of SDSS and divides them up into three phases:
  - The **intelligence phase** – here **raw data** are collected, processed and visualised. The decision maker can utilise exploratory spatial analysis techniques to clearly identify the problem
  - The **design phase** – here a set of possible alternatives are identified through use of a range of techniques
  - The **choice phase** – finally we evaluate the alternatives – perhaps one is chosen, or a range are delivered to decision makers

# Important aside

- In real applications of SDSS, much of the effort is invested in **data acquisition, preparation and integration**
- Typically, we have to model particular attributes, often using **complex models**
- **Presenting results** to decision makers is also an important, and challenging part of the process
- SDSS is **much more** than simple MCE
- We'll discuss this more later in the course

# Two possible project themes

- Tranquillity
- Wind power

The screenshot shows a web browser window with the URL [www.geo.uzh.ch/microsite/geo372/documents.html](http://www.geo.uzh.ch/microsite/geo372/documents.html). The page content is as follows:

- Home**
- Übungen**
- Unterlagen**
- (Meta)Daten**
- Tipps**
- Links**

**Unterlagen**

Hier können Sie wichtige übungs- bzw. veranstaltungsbezogene Unterlagen als PDF herunterladen.

**Rahmenbedingungen**

**Bewertungskriterien für das Modul GEO372**

**Ausschreibung Projekt Tranquilität**

**Ausschreibung Projekt Windenergie**

**Programm der Vorlesung** ([Download als PDF](#))

**Policy notice**

Vorlesungsunterlagen werden am Tag der Vorlesung gestellt. Die Unterlagen werden in der Vorlesung ausgedruckt abgegeben.

# Mapping tranquillity

- What is **tranquillity** – Gelassenheit; Rühe??

“Tranquillity is primarily a **natural resource**. It reflects the degree to which human beings **experience** the **environment unhindered** by **disruptive noise, movement and artificial lighting** and **structures**. In a densely populated, heavily built-up country like England it is **scarce** and its **distribution is uneven**.”

# Background and aims

- The Campaign to Protect Rural England carried out a real study to quantify tranquillity over all of England
- The aims were to “develop ways of **identifying, measuring and mapping tranquillity** so that it can be **integrated fully into public policy decisions**”
- This is important because, in general, it is hard to include “**feelings**” in planning decisions...

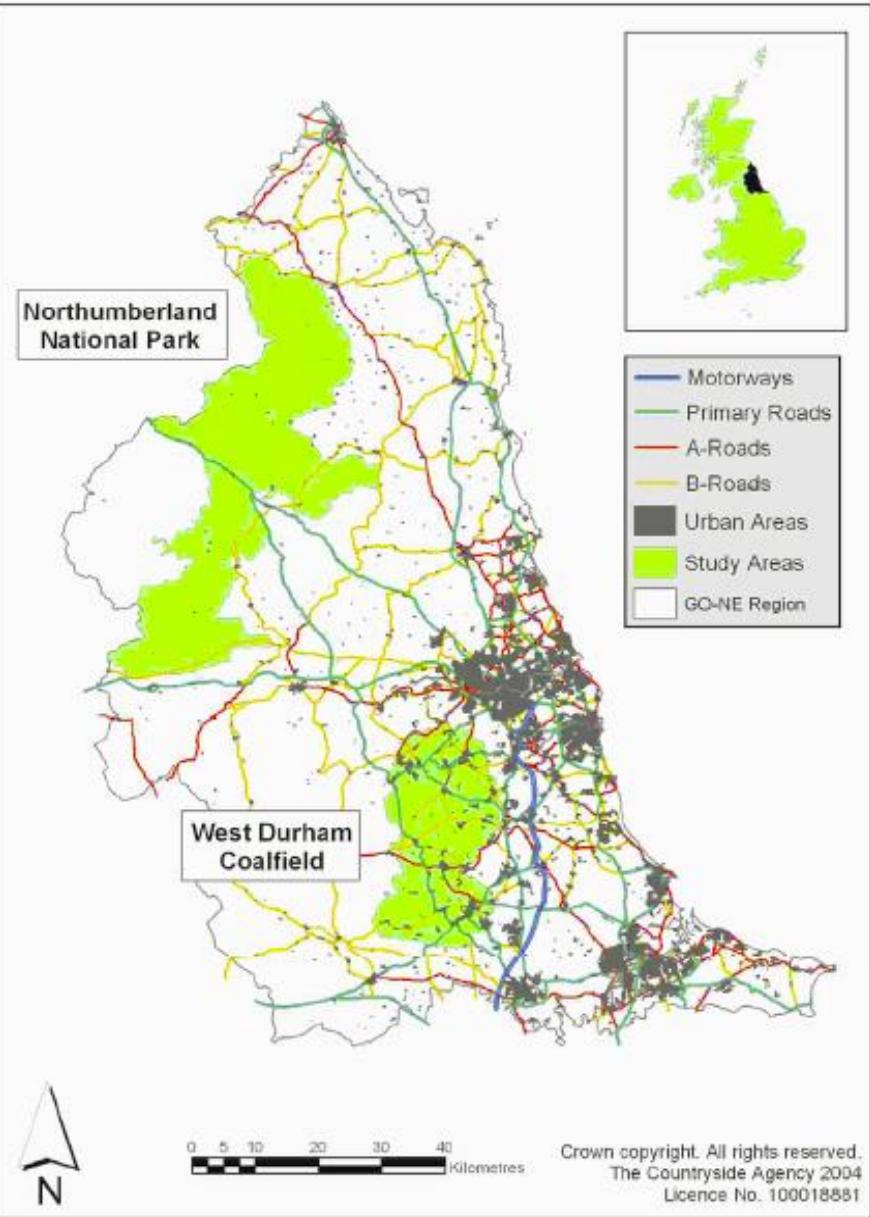
# Basic methodology

- Initial pilot studies for small areas in the North of England
- Two key steps:
  - Survey to ascertain what tranquillity **means** to people and **factors** that added or diminished it...
  - Using **basic Multi-Criteria Evaluation (MCE) techniques** (as in Geo243) **weighted factors** and produced a “**tranquillity map**”

# Finding out what tranquillity is

- Carried out through **participative research** (interviews, questionnaires, group work) to study 4 key questions
  - What is tranquillity?
  - What adds to it?
  - What is not tranquillity?
  - What lessens it?
- Look at thresholds for intrusion on tranquillity (**audible** and **visual**) – when do things **significantly disturb** us?

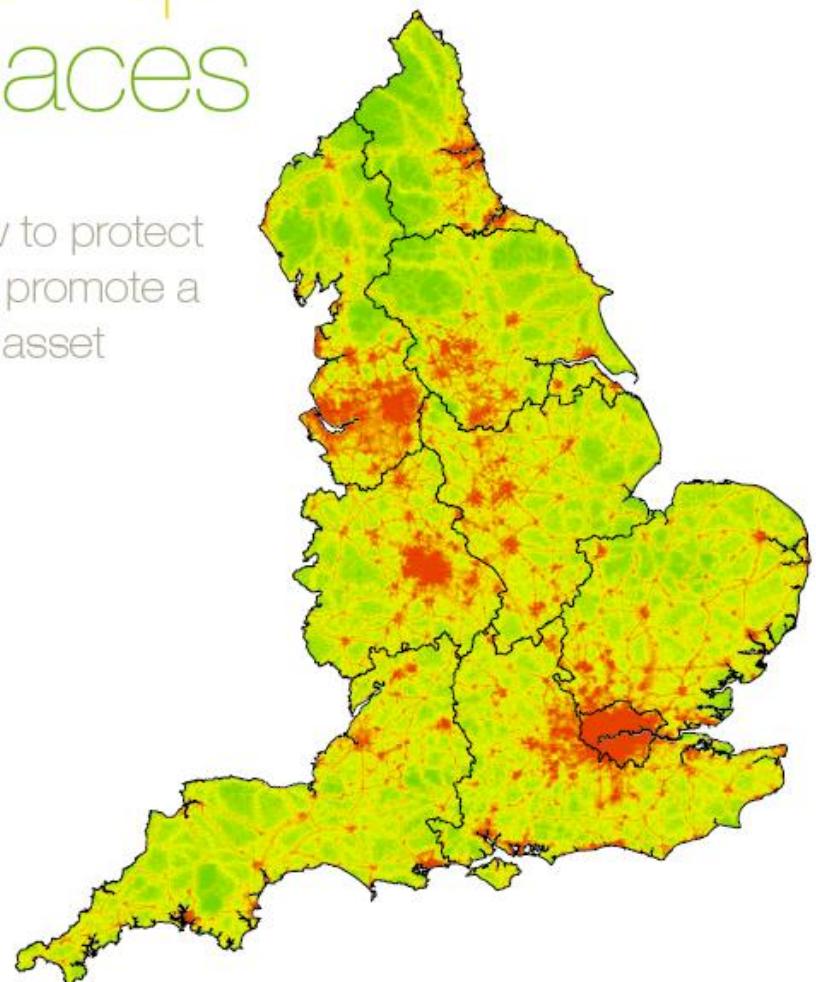
# Study area(s)



Pilot study (compared two areas)

tranquil  
places

How to protect  
and promote a  
vital asset



Main study for all of **England** at 500m  
resolution

# Results of tranquillity survey

## **What tranquillity is – the top 8 survey responses**

1. Seeing a natural landscape
2. Hearing birdsong
3. Hearing peace and quiet
4. Seeing natural looking woodland
5. Seeing the stars at night
6. Seeing streams
7. Seeing the sea
8. Hearing natural sounds

## **What tranquillity is not – the top 8 survey responses**

1. Hearing constant noise from cars, lorries and/or motorbikes
2. Seeing lots of people
3. Seeing urban development
4. Seeing overhead light pollution
5. Hearing lots of people
6. Seeing low flying aircraft
7. Hearing low flying aircraft
8. Seeing power lines

These criteria must be **operationalised**

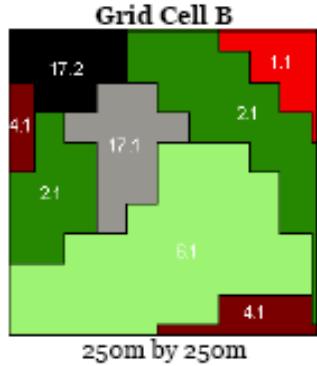
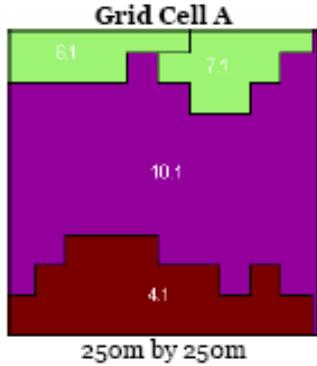
# Example - Perceived naturalness

Subclass	Name	Score
1.1	Broad-leaved woodland	6
10.1	Dwarf shrub heath – dense	6
10.2	Dwarf shrub heath – open	6
11.1	Fen, marsh and swamp	6
12.1	Bog	6
13.1	Standing water / canals	6
5.2	Setaside	5
6.1	Neutral Grass	5
7.1	Calcareous	5
8.1	Acid Grass	5
9.1	Bracken	5
16.1	Inland Rock	5
5.1	Improved Grassland	4
2.1	Coniferous woodland	3
4.1	Arable – cereals	3
4.2	Arable – horticultural	3
4.3	Non – rotational horticulture	3
17.1	Built up areas, suburban / rural developed	2
17.2	Built up areas, urban residential / commercial urban industrial	1

Increasing perceived naturalness

Perceived naturalness based  
on survey results for  
different landcovers

# Implementing...



Grid cell A

Subclass	LCM Subclasses	Score	Area m <sup>2</sup>	Percentage Area	Relative Naturalness
4.1	Arable Cereals	3	14278.91	22.85	68.55
6.1	Rough Grass / Grass	5	4911.78	7.86	39.3
7.1	Calcareous grass	5	5481.29	8.77	43.85
10.1	Dwarf shrub heath	6	37827.96	60.52	363.12
		Total =	514.82		

Grid cell B

Subclass	LCM Subclasses	Score	Area m <sup>2</sup>	Percentage Area	Relative Naturalness
4.1	Arable Cereals	3	2869.58	4.59	13.77
6.1	Rough Grass / Grass	5	23833.54	38.13	190.67
2.1	Coniferous woodland	3	6546.89	10.48	31.43
4.1	Arable Cereals	3	1546.89	2.48	7.43
17.1	Built up areas, suburban/rural developed	2	6875.04	11	22.00
17.2	Built up areas, suburban/rural developed	1	5296.09	8.47	8.47
2.1	Coniferous woodland	3	11954.68	19.13	57.38
1.1	Broad-leaved woodland	6	3577.29	5.72	34.34
		Total =	365.49		

- Cell ends up with a naturalness **score**
- Which is more natural – Irchelpark or Uetliberg?
- Mean value for a 3x3 window is used to take account of this...

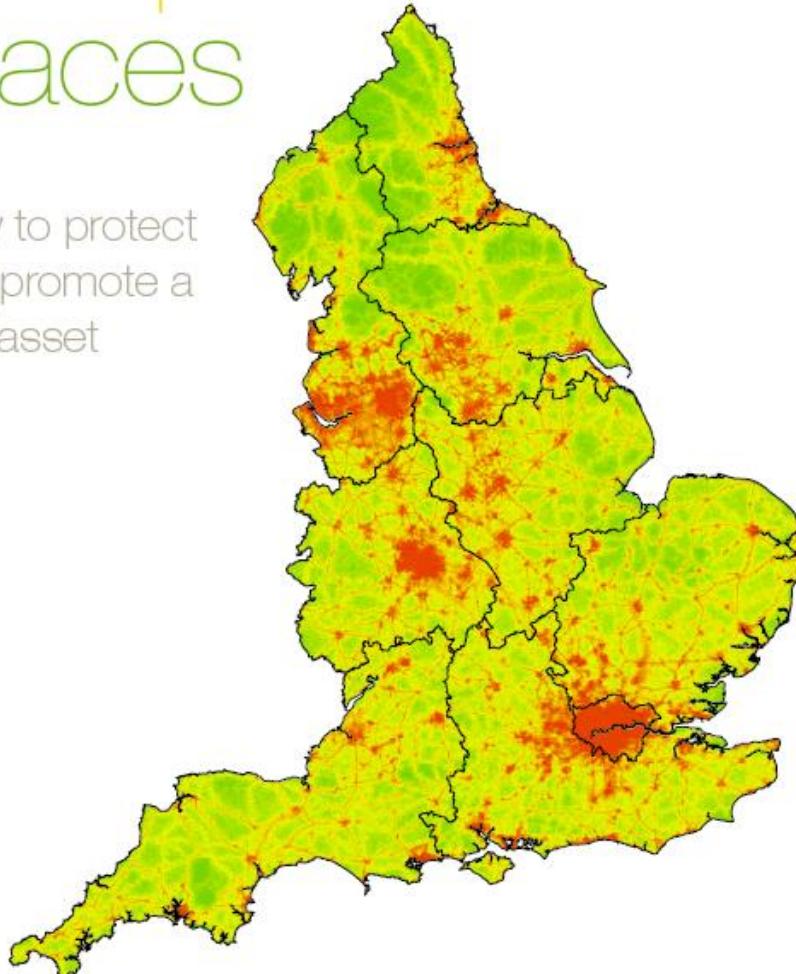
# Openness

- Openness was considered to be associated with tranquillity
- One measure of openness is how much we can see from a point
- This was calculated with DEMs through calculating for **every cell** how many cells were visible...
- We will return to the idea of **visibility** in the lecture on **viewsheds...**

# Results

tranquil  
places

How to protect  
and promote a  
vital asset



- Look at the map on the left
- Which factors do you think are the most important?
- Do you think all factors are independent of each other?

# Source for the above examples

You can find a short and detailed technical report (where all the images came from) on this work at:

[http://www.northumbria.ac.uk/static/5007/lifepdfs/appdf/Tranq Main Technical Rep.pdf](http://www.northumbria.ac.uk/static/5007/lifepdfs/appdf/Tranq%20Main%20Technical%20Rep.pdf) (Detailed technical report on pilot study)

<http://www.cpre.org.uk/resources/countryside/tranquill-places/item/1855->

(Shorter report on main study)

**Could we apply this model directly in Switzerland?**

# Wind energy

- Most European countries have commitments to increase use of renewable energy
- One potential source is wind energy
- The siting of wind farms is controversial
- The question – **where can we put wind farms?**
- Who might care about this question?



News report

Image from: <http://www.bwea.org/ukwed/print-map-operational.html>



Address http://news.bbc.co.uk/1/hi/wales/4674207.stm

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## Windfarm map unveiled for Wales

Seven areas across Wales have been chosen by the Welsh Assembly Government for the development of wind farms.

The aim is to increase the amount of energy from renewable sources by 10% over the next five years.

There are around 400 turbines in Wales, and the strategy confirms areas across mid and south Wales for further development, first set out a year ago.

The boundaries were outlined during the consultation process, but are slightly smaller.

Environment Minister Carwyn Jones said he was confident that the planning framework was "appropriate for Wales and will enable us to meet our commitment to deliver four terawatt hours of electricity generated from renewable sources by 2010".

Economic Development Minister Andrew Davies said they would continue to work with local planners, the industry and other key groups "to ensure progress on implementation of our policy and to enable effective planning for renewable energy in all its forms".

The strategy outlines development in the following areas:

- Clocaenog Forest,



Wind power is just one renewable energy source



<http://wales.gov.uk/topics/planning/planningresearch/publishedresearch/meetingtarget/?lang=en>



Where I Live  
Take a look at the latest from mid Wales



BBC ACTION NETWORK  
Wind farms  
The key issues - and how to influence what happens

### SEE ALSO:

- In Pictures: Cefn Croes wind farm 16 Jun 05 | In Pictures
- 'Quick fix' row at £50m wind farm 16 Jun 05 | Mid Wales
- Support for more wind farms 13 Jul 04 | North East Wales
- Q&A: Wind and wave power 12 Nov 01 | UK
- Windfarms needed to meet targets 21 Jan 03 | Wales
- Wind farm spin-off for villagers 02 Apr 04 | Scotland
- Giant windfarm plan unveiled 18 Dec 03 | Wales

### RELATED INTERNET LINKS:

- Friends of the Earth Cymru
- Wind farm planning maps
- Welsh assembly

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### TOP WALES STORIES NOW

- Demo to support ferries' workers



Welsh Assembly Government

## Facilitating Planning For Renewable Energy in Wales: Meeting the Target

Review of Final Report - Research Contracts 105/2002 and 269/2003



**b** **Lo** **N** **No** **S**

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**Wind farm 'maps'**

The RSPB series of maps show the huge wind for the Hebrides.

The charity, the plans of Scottish map the scale of

The charity turbine development have an un

But the development limited the

If it was built north from of the Firth

In the west Falkirk and

Ann McCallum's charity, to illustrate to how this development essentially

"By selecting under EU climate legislation to ..."

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**Wind farm 'maps'**

Plans to extend most powerful have been a Scottish Executive

Fifty-two turbines on the £90m project near Dunbar creating up to

The development turbines by to 100,000 homes

But claims by the forefront by a research

The site will Renewables and Power Consu

The work is due to years to come new jobs coming the construction

Deputy Enter Allan Wilson extension on the Hills site the Tuesday.

http://news.bbc.co.uk/1/hi/scotland/4484236.stm

A screenshot of Microsoft Internet Explorer version 6.0. The title bar reads "BBC NEWS | Scotland | Ramblers attack pylon expansion - Microsoft Internet Explorer". The menu bar includes File, Edit, View, Favorites, Tools, and Help. The toolbar contains icons for Back, Forward, Stop, Home, Search, Favorites, and Print. The address bar shows the URL "http://news.bbc.co.uk/1/hi/scotland/4300242.stm". Below the address bar is a navigation bar with links for BBC.co.uk, Home, TV, Radio, Talk, Where I Live, A-Z Index, and a search field with a "Search" button. At the bottom, there are links for "Low Graphics version | Change edition" and "Contact us | Help".

Last Updated: Saturday, 1 October 2005

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## Ramblers attack pylons

Plans to erect huge power pylons across Scotland have been attacked by the Ramblers Association in Scotland, who claimed they would be "disastrous".

Scottish and Southern Energy plans to upgrade electricity pylons from Beaulieu near Inverness to Denny close to Falkirk with 600 pylons, some

SSE spokesman Alan Young essential.

But Cameron McNeish, RAS remote and environmentally

Part of the proposed line runs Park.

The firm plans 200 fewer pylons than present, but they would be larger.

SSE said the pylon line would ship power produced by new wind farms and hydro schemes in the Highlands and islands customers further south.

Mr McNeish said it was conceivable "energy highway" in a remote

the Lammermuir Scottish Wind Assessment Project (Swap) green light on

is good news for our renewables sector and will increase the current generating capacity to

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## BBC NEWS UK EDITION

Last Updated: Thursday, 30 June, 2005, 13:47 GMT 14:47 UK

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## Council backs huge wind farm plan

Plans to build the largest onshore wind farm in Europe have been approved by Comhairle nan Eilean Siar (Western Isles Council).

An application by Lewis Wind Power for a 209 turbine wind farm in North Lewis, costing £400m, was passed by 19 votes to eight on Wednesday evening.

It was approved despite more than 4,000 objections.

However, the Scottish Executive must grant planning permission and it could decide to hold a public inquiry.

In addition, the Royal Society for the Protection of Birds (RSPB) has stated that it is willing to take the matter to Europe if necessary.

The council also approved by 22 votes to 7 an application by Beinn Mhor Power for 130 turbines on the Eishken Estate.

Some councillors accused the authority of ignoring public opinion, but those in favour argued that the social and economic benefits far outweighed the disadvantages.

Local councillor Anne Macdonald said: "The government has given our area a title of outstanding beauty. It is beautiful,

SEE ALSO:

- Green light for Lewis wind farm 28 Jun 05 | Scotland
- Wind farm 'catastrophic' for isle 18 May 05 | Scotland
- Greenpeace opposes wind farm plan 06 Apr 05 | Scotland
- Plans lodged for major wind farm 01 Nov 04 | Scotland

RELATED BBC LINKS:

- Scottish Politics

RELATED INTERNET LINKS:

- Comhairle nan Eilean Siar (Western Isles Council)
- Amec
- RSPB Scotland
- Scottish Executive
- British Energy
- Moorland Without Turbines
- Views of Scotland
- Lewis Wind Farm

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- Edinburgh joins climate protest
- Stuck passengers offered refunds
- Dolly expert leads stem research

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**TOP UK STORIES NOW**

- Thousands attending Best funeral
- Hostage envoy arrives in Baghdad
- MPs urged to set pensions example

Internet

# Using the literature

- It is important that you use **literature** to justify **choices** and **choose a focus**
- Think broadly – for example **tranquillity** can be linked to **ecosystem services**
- You'll find a recently published **special issue** on renewable energy here:  
[http://www.mdpi.com/journal/ijgi/special issues  
/renewable-energy-ijgi#published](http://www.mdpi.com/journal/ijgi/special_issues/renewable-energy-ijgi#published)
- Both of these **questions** are also **highly political** – big changes in UK policy with respect to onshore wind power

# Summary

- Your aim is to model either tranquillity or potential for wind energy for Kanton Bern
- You **don't need to decide** which right away
- In the practicals, we will **introduce useful techniques** before you **work independently** on a solution
- You have **lots of freedom** in developing a solutions – to get a good mark you should **use it!**
- **Ask us if anything is unclear...**