

# Integrating wind energy in the environment

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## 1. Global environmental benefits

- Wind energy as a clean energy source

## 2. Local environmental impacts

- Are site-specific, vary among the different species and should be put in context
- Can be avoided/minimised: the role of environmental assessments, mitigation and compensation measures

## 3. Conclusions and recommendations

- Achieving the 20% RES target while respecting biodiversity

# 1. Global environmental benefits

## Wind energy as a clean energy source

- avoiding 108 Mt of CO<sub>2</sub> - equivalent to 24% of the EU's GHG reduction target of 20%
- avoiding emissions of toxic pollutants (mercury)
- avoiding emissions of conventional air pollutants (smog-forming NO<sub>2</sub> and acid-rain forming SO<sub>2</sub>)
- without serious water withdrawal and pollution (e.g. nuclear and thermal powers plants)
- without the adverse impacts of mountain-top mining and strip mining of coal
- avoiding the external costs of fossil-fuel based electricity generation (environmental/human health costs)

	2007	2020 (medium scenario)
Romania	-	€1.155 billion
EU-27	€10.2 billion	€32.9 billion

- Reduces the threat posed by CLIMATE CHANGE - the single largest threat to biodiversity

## 2. Local environmental impacts

### 2.1 - Potential negative environmental impacts

- Birds
  - Potential risks: collision, habitat disturbance, interference with birds' movements
  - Dependent on the site/season/species
    - landscape topography
    - direction and strength of local winds
    - types of resident and migratory birds
    - type of bird activity (nocturnal migrations/movements from and to feeding areas)
    - wind farm layout and turbine design characteristics
  - Must be placed in context
    - mortality rate of 0.1 per turbine per year (Navarra)
    - wind is responsible for 0.003% of bird mortalities caused by human (and feline) activities

Causes	Annual Mortality Estimate
Buildings/windows	550 Million
High tension lines	130 Million
Cats	100 Million
Vehicles	80 Million
Pesticides	67 Million
Communication Towers	4.5 Million
Wind turbines	28.5 thousand
Airplanes	25 thousand

Source: Erikson et al. 2005

## 2. Local environmental impacts

### 2.1 - Potential negative environmental impacts

- Bats
  - studies show that potential impacts are even more site-specific
    - summer roosts, swarming sites and over-wintering sites
  - majority of fatalities occur during the migration period rather than on nightly foraging trips
  - as they are associated with known migratory routes they can be avoided
- Visual impacts
  - subjective aspect, dependent on the individual perception of beauty
  - it decreases with the distance
  - experience has shown that opposition is mainly encountered during the planning phase; after commissioning the acceptability is strong
  - wind farms should be sited with consideration of the specific landscape

## 2. Local environmental impacts

### 2.1 - Potential negative environmental impacts

- Noise
  - Mechanical noise from gearboxes and generators → mitigated through good insulation materials (insignificant)
  - Aerodynamic noise from blades → mitigated through modern wind turbine designing. Depends on various factors:
    - layout of the wind farm
    - topography/shape of the land
    - speed and direction of the wind
    - background noise
  - Must be placed in context

Source/Activity	Noise level (DB)
Rural night-time background	20-40
Quiet bedroom	35
<b>Wind farm at 350m</b>	<b>35-45</b>
Busy road at 5km	35-45
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City traffic	90
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Source: CIEMAT

## 2. Local environmental impacts



### 2.2 – Assessing and mitigating potential impacts

- Environmental Assessments
  - EU law require developers of wind power projects to examine all significant potential environmental impacts
  - The objective is to avoid/minimise potential negative effects from the beginning of the project rather than trying to counteract them later
    - *Strategic Environmental Assessment* (Directive 2001/42/EC): procedure used to evaluate the adverse impacts of any plans and programmes (national, regional and local governments)
    - *Environment Impact Assessment* (Directive 85/337/EEC): procedure which ensures that environmental consequences of specific projects are identified and assessed before authorisation is given
      - <http://ec.europa.eu/environment/eia/eia-support.htm>
    - *Impact Assessments for Natura 2000 sites* (Special Areas of Conservation (SAC) designated by MS under the Habitats Directive + Special Protection Areas (SPAs) designated under the Birds Directive): Article 6 of the Habitats Directive
      - [http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision\\_of\\_art6\\_en.pdf](http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf)
      - [http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura\\_2000\\_assess\\_en.pdf](http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf)

## 2. Local environmental impacts

### 2.2 – Assessing and mitigating potential impacts

- Mitigation measures (good practices)
  - Careful and proper siting of wind farms (e.g. avoiding bird migration routes)
  - An environmental monitoring programme before, during and after construction will provide the needed information to evaluate the potential impacts
  - Adequate design of wind farms
    - siting turbines close together
    - grouping turbines to avoid an alignment perpendicular to main flight paths
    - provide corridors between clusters of wind turbines
  
    - design of the wind farm according to the peculiarities of the site
    - locate the wind farm at least a certain distance from dwellings
    - low number of large turbines is preferable to many smaller wind turbines
  - Adequate design of turbines and associated structures
    - towers and nacelles should be designed to avoid providing resting places for birds and bats
    - underground transmission cables installation
    - increase the visibility of rotor blades
  
    - similar size and type of turbines
    - selection of neutral colour and anti-reflective paint for towers and blades
    - blades rotating in the same direction



## 2. Local environmental impacts



### 2.2 – Assessing and mitigating potential impacts

- Compensation measures
  - Objective:
    - offsetting any potential loss or damage to habitats
    - should offer a comparable habitat in the vicinity of the development
  - E.g.: habitat restoration or enhancement of the sites; development of species managements plans to increase the species populations
    - conversion of specific areas to new breeding sites (Cortijo Linera wind farm, Spain)
    - programme of planting trees, hedges and pockets of crops to improve conditions for farmland birds (Black Law wind farm, Scotland)

## 2. Local environmental impacts



### 2.3 – Environmental Positive Impacts

- Wind energy also offers an opportunity to practice ecological restoration
  - Changes in land management next to wind farms may benefit the creation of new vegetation and animal habitats
  - Wind farms may act as refuge if no hunting is allowed within the wind farm area (new bird species appearing in the area)
  - Restoration of blanket bogs, peat and wetlands – both between and around the turbines

# 3. Conclusions and Recommendations



- Any impacts of wind energy **should not be viewed in isolation**. They should be judged against the far more serious environmental impacts of producing electricity from other energy sources
- In favour of a **balanced approach** seeking to harmonise the goals of CC and protecting biodiversity
- **Specific recommendations:**
  - continued cooperation with national and local environment and nature protection organisations (since a very early project preparation phase)
  - careful and transparent planning - the use of strategic planning tools (such as spatial planning)
  - continued research into environmental impacts – to better understand the real extent of possible habitat and wildlife impacts (Environmental Impact Information Tool)
  - continued research to improve technology development - to produce energy more efficiently whilst reducing negative impacts on the surrounding environment
  - development of guidelines - the development of targeted and focused environmental assessment guidelines for wind farms



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**THANK YOU VERY MUCH  
FOR YOUR ATTENTION**

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