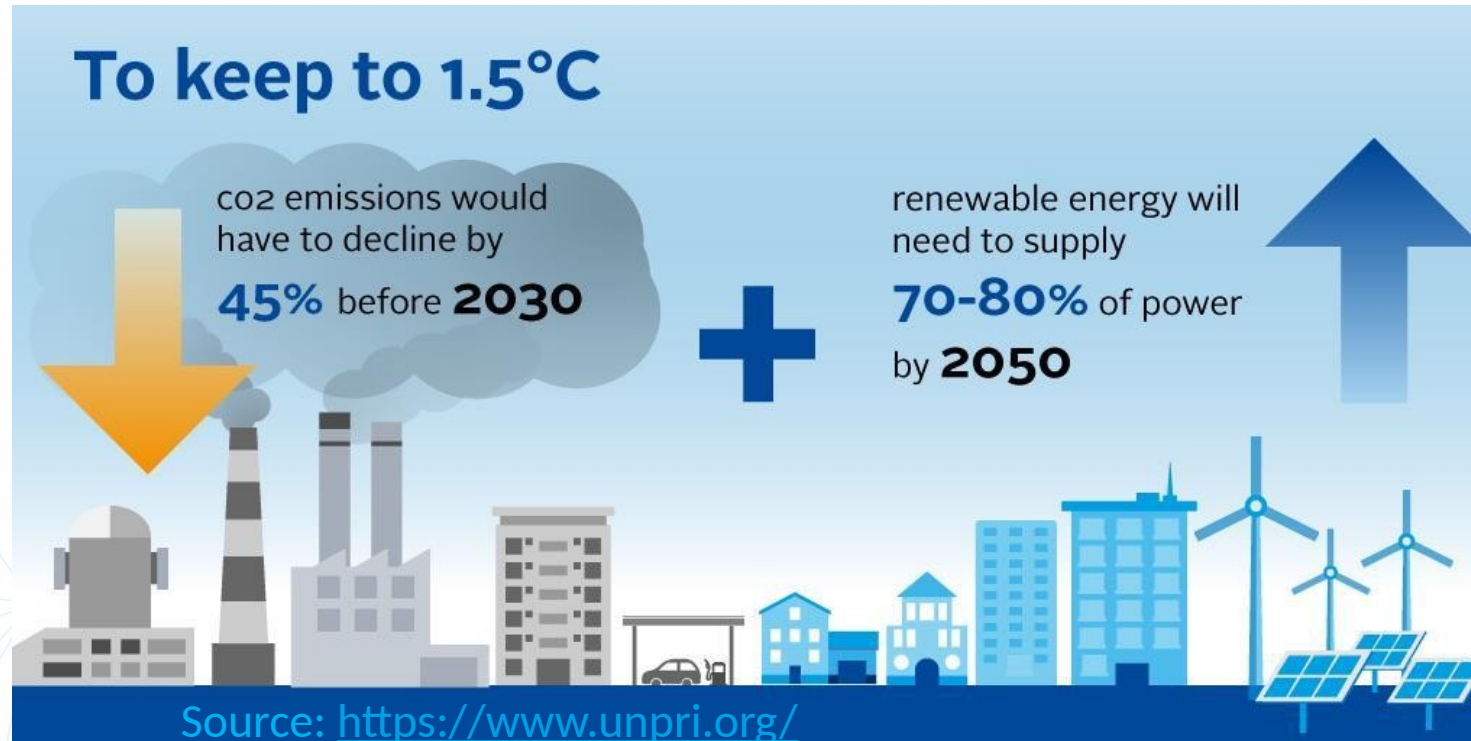




# Wind turbine as GHG reduction tool: health, economic and ecological issues

Isabelle Laplace  
EMWT 2019

# Climate change context



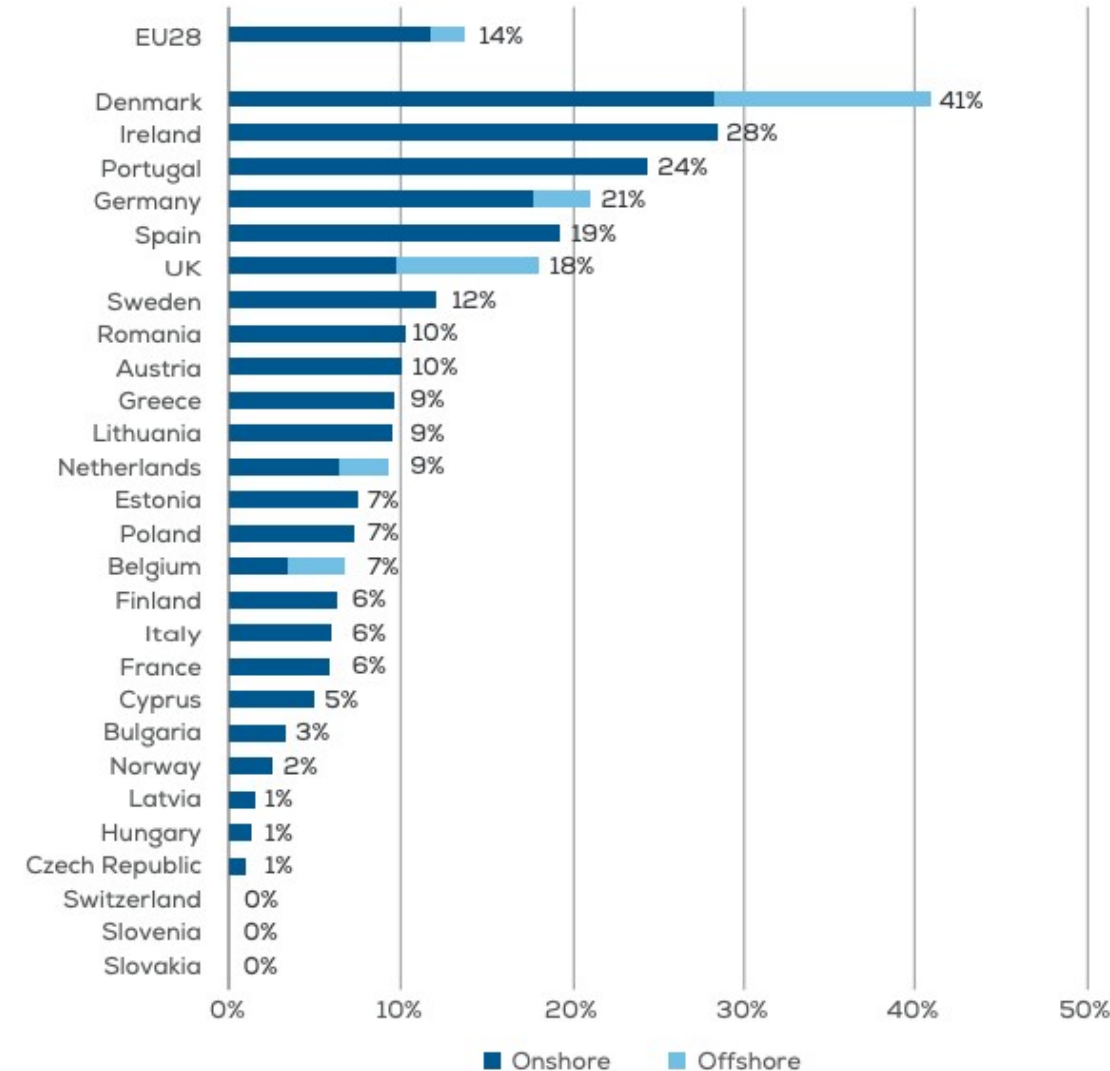
25% of the total anthropogenic greenhouse gas emissions comes from electricity and heat production in 2010



# Wind turbines as part of the solution

- Rapid expansion with an average yearly growth rate of wind energy of 17% between 2011 and 2018
- Wind power accounts for 18.4% of the EU's total energy capacity and 14% of total electricity demand

Percentage of the average annual electricity demand covered by wind<sup>a</sup>





# Wind turbines issues?

## Health impacts



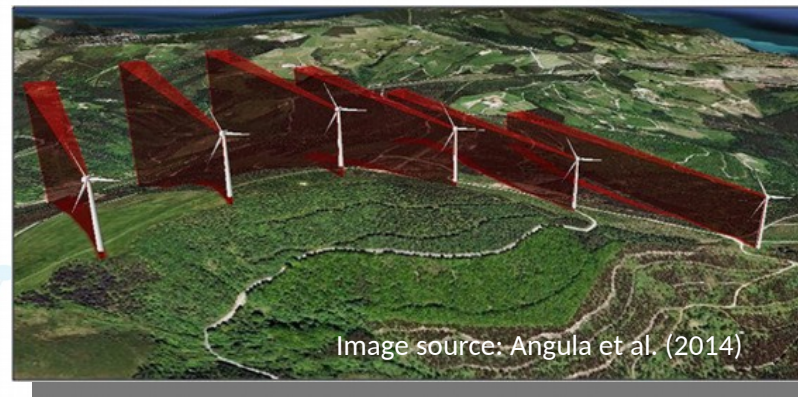
## Biodiversity impacts



## Economic impacts



## Electromagnetic waves impacts



# Wind turbines issues?

## Health impacts



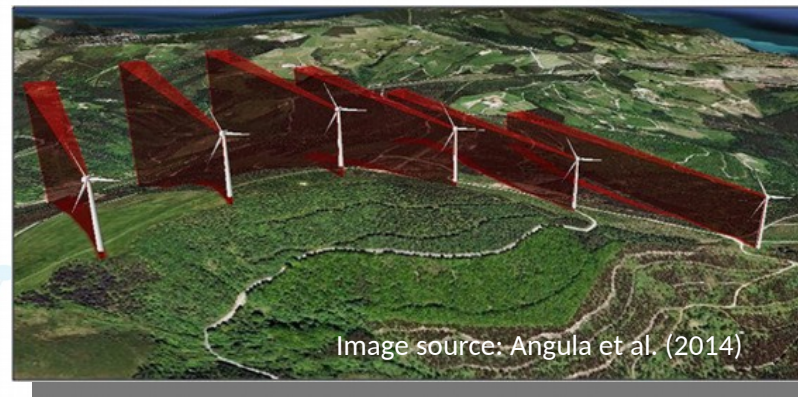
## Biodiversity impacts



## Economic impacts



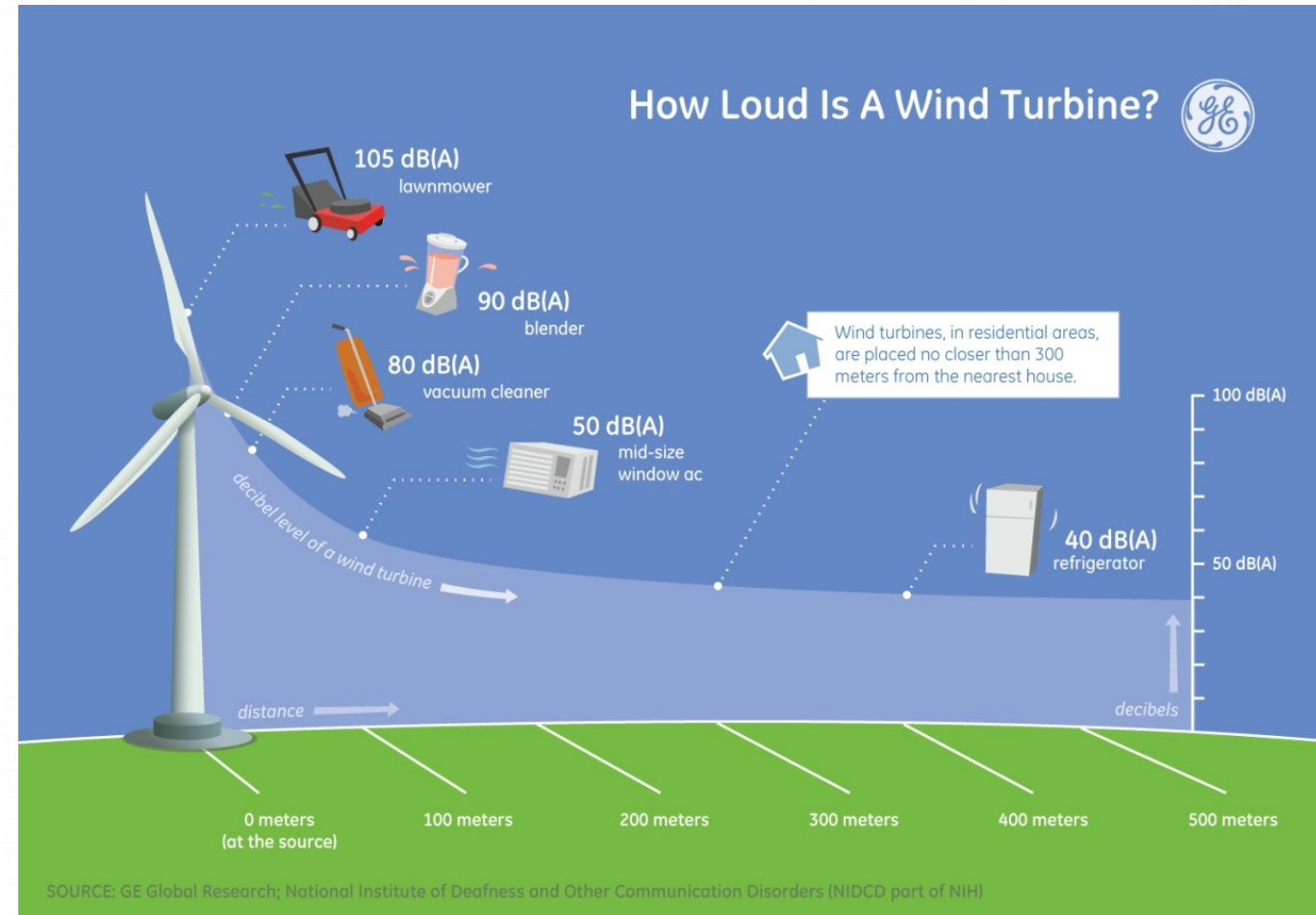
## Electromagnetic waves impacts





# Sound impacts

- Public resistance to wind turbines that are a potential source of stress and fear
- Wind turbines' sound is an important source of stress
- Jalali et al. (2016) report that at a new wind farm in a community is associated to expressed poor sleep quality, daytime sleepiness and rates of insomnia





# Visual impacts

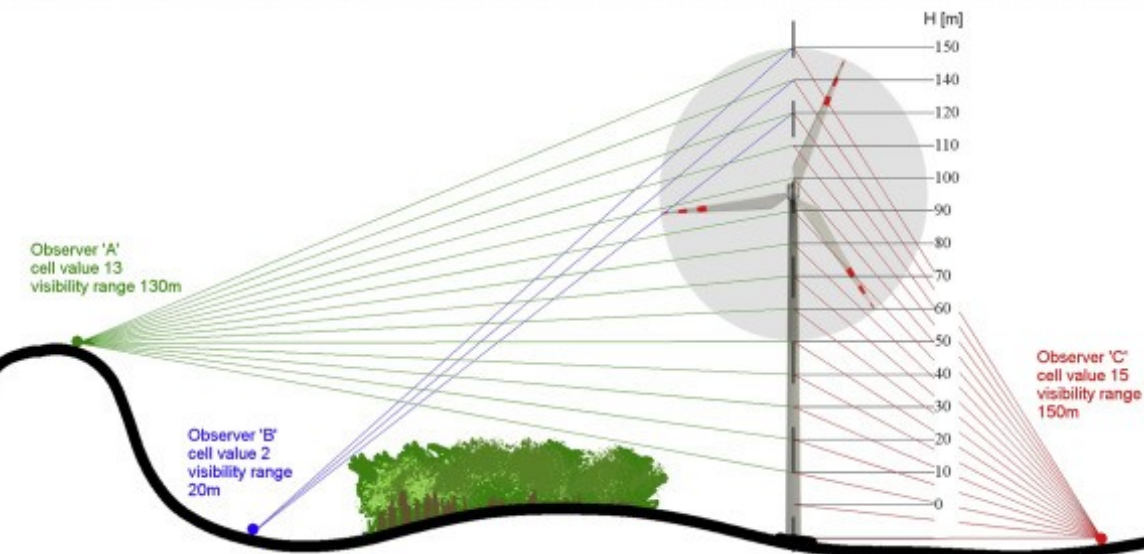


Image source: Wróżyński et al. (2016)

- The aesthetic integration of wind turbines farms into the landscapes is an important issue (Wróżyński et al. (2016))
- Jalali et al. (2016) show a lower level of sleep quality for people worried about the visual impact of wind turbines and its potential consequences on the economic value of their residential property



# Wind turbines issues?

## Health impacts



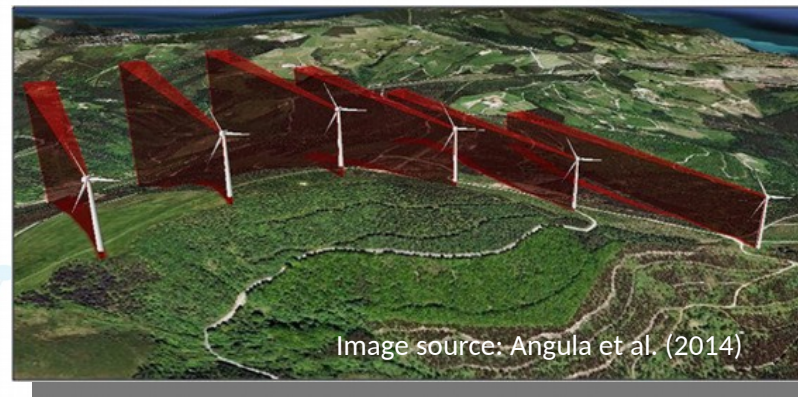
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## Economic impacts



## Electromagnetic waves impacts

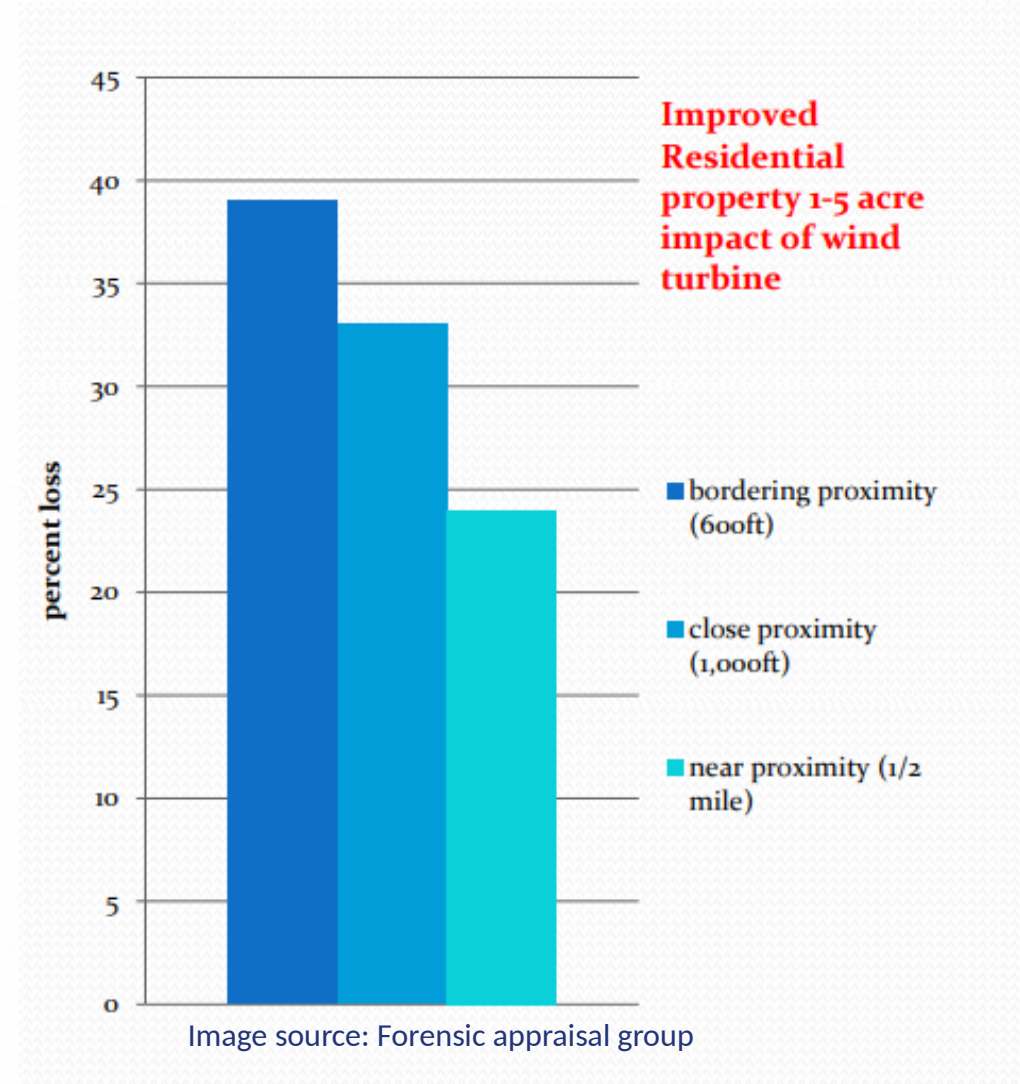






# Impacts on residential property value

- According to the experts from the US Forensic appraisal group :
  - Sales within the wind turbine area sold for less than comparative sales outside of the turbine area.
  - The impact of the wind turbines on vacant residential land is in the range of -19% to -40%.





# Impacts on tourism demand

- By considering German municipalities where wind turbines were installed between 2008 and 2012, Broekel and Alfken (2015) show:
  - A decrease in tourism demand in these municipalities
  - An increase in tourism demand in nearby municipalities where no wind turbines were installed
- Kipperberg et al. (2019) also document significant negative externalities of wind turbines expansion on local recreation in Norway's fringe of urban centers.



# Wind turbines issues?

## Health impacts



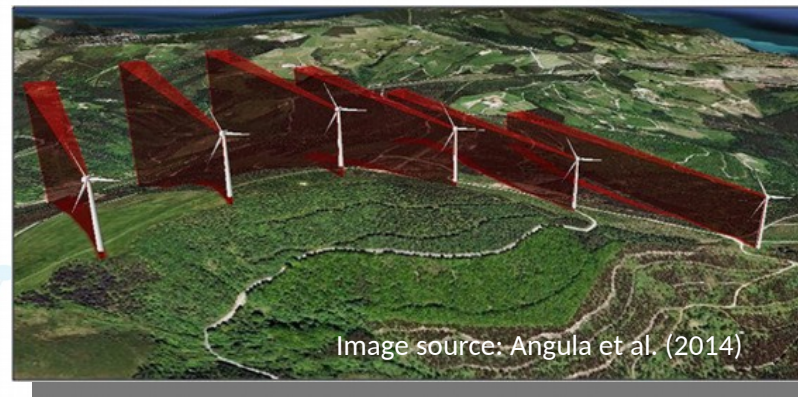
## Biodiversity impacts



## Economic impacts



## Electromagnetic waves impacts



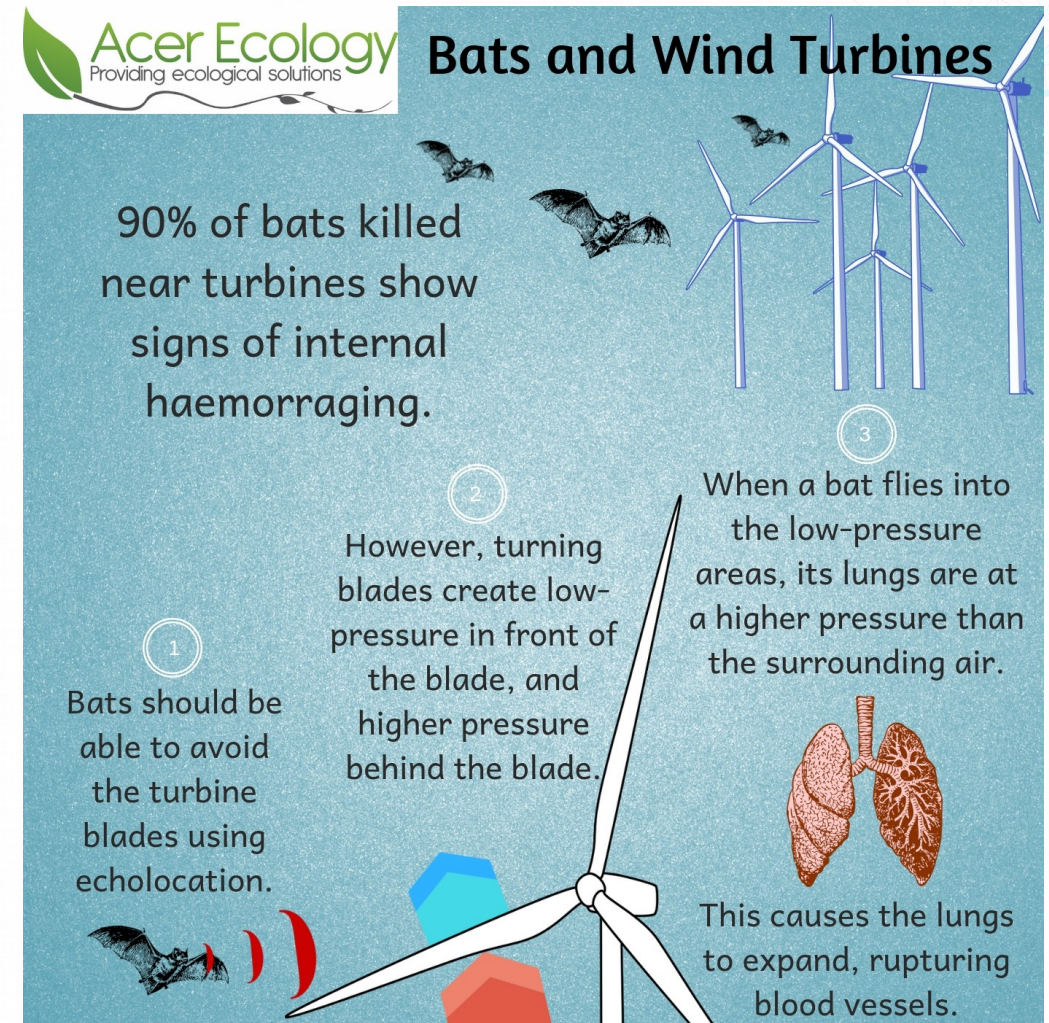


# Bats and birds death



Miao et al. (2019):

- U.S. onshore wind turbines cause disappearance of about 151,630 breeding birds between 2008 and 2014
- No significant negative impact for turbines 1,600 m away from bird observation sites.



80,000 bats would be killed each year by Britain wind turbines (The telegraph)



# Wind turbines issues?

## Health impacts



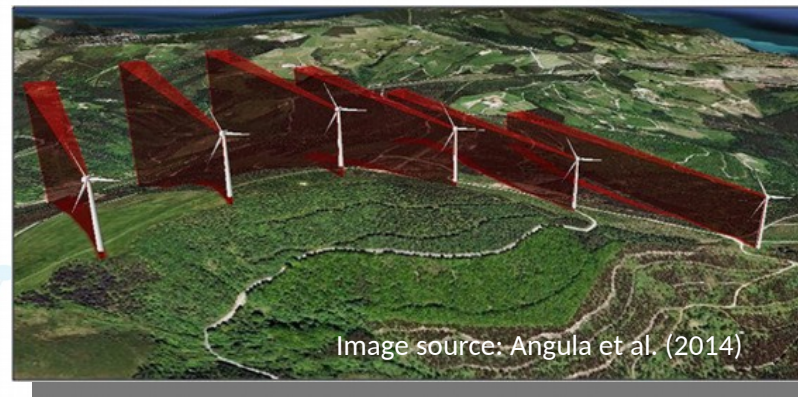
## Biodiversity impacts



## Economic impacts



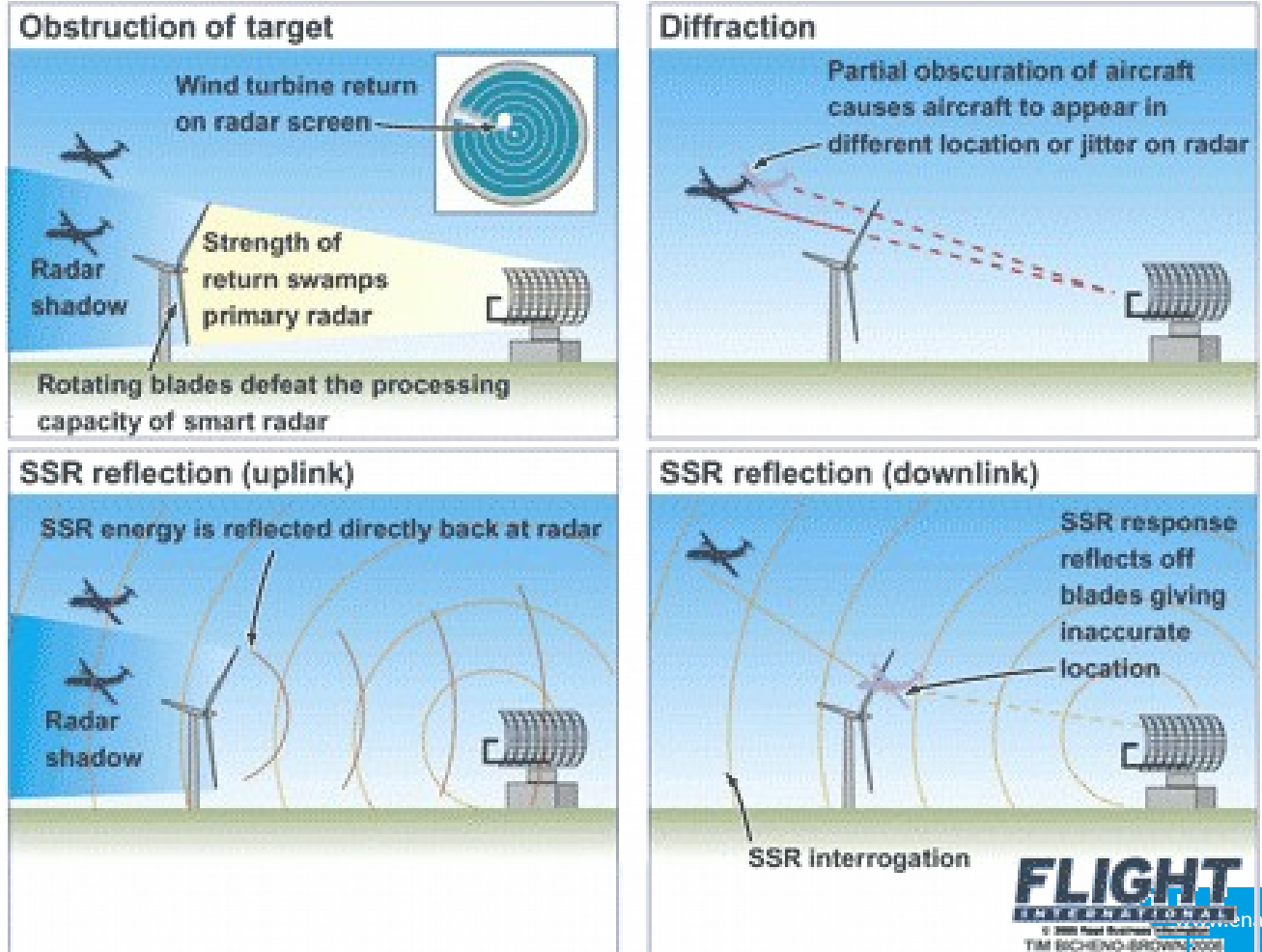
## Electromagnetic waves impacts



# Electromagnetic interferences

- Wind turbines generate their own electromagnetic radiation and can distort radio and television stations as well as radars.

## EFFECTS OF WIND TURBINES ON RADAR SURVEILLANCE





# Wind turbines issues?

## Health impacts



## Biodiversity impacts

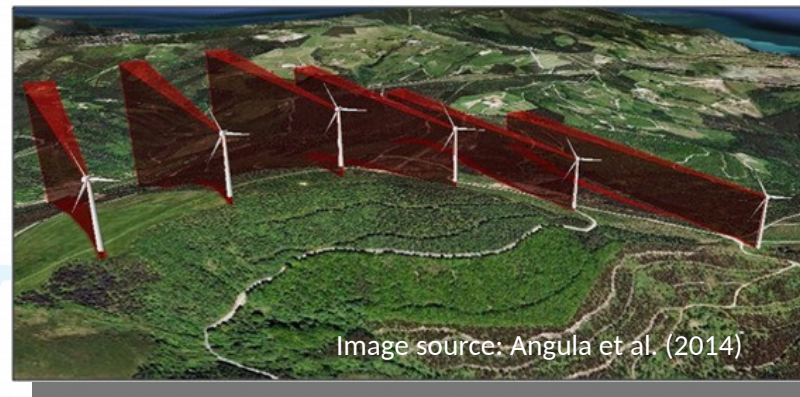


## Economic impacts



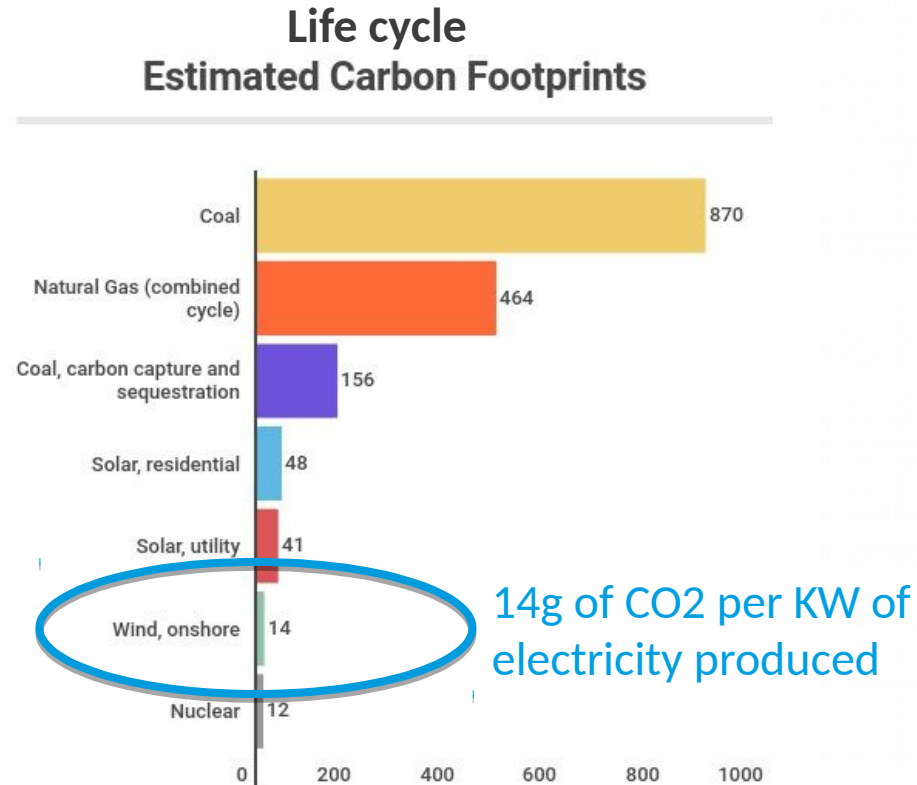
Researches are progressing a lot on all these issues

## Electromagnetic waves impacts





# Wind turbines: solutions for climate change issues?



grams of CO2 per kilowatt of electricity produced

Source: Joshua D. Rhodes, University of Texas at Austin, Energy Institute, 2017



- No direct CO<sub>2</sub> emissions
- But greenhouse gas emissions are produced when wind turbines are manufactured, built maintained and decommissioned.
- But these emissions are lower than for other electricity sources





# The EU believes in wind turbines assets

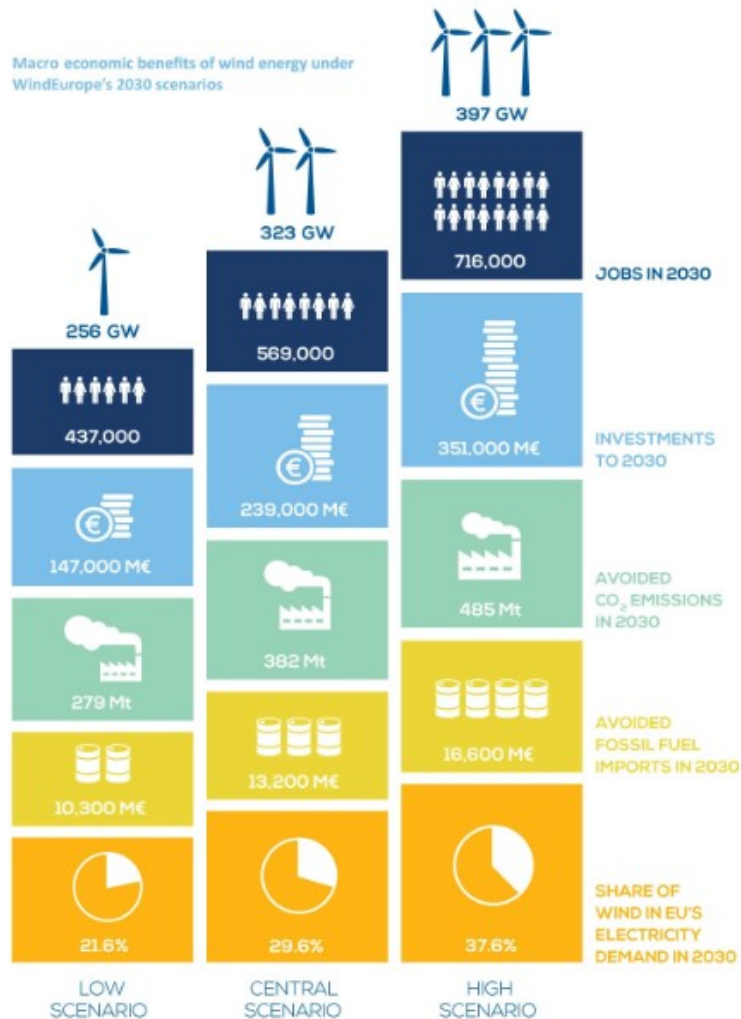


Image source : <https://windeurope.org/>

The European Commission forecasts that energy from wind turbines will represent 26% of the total EU electricity generation in 2050

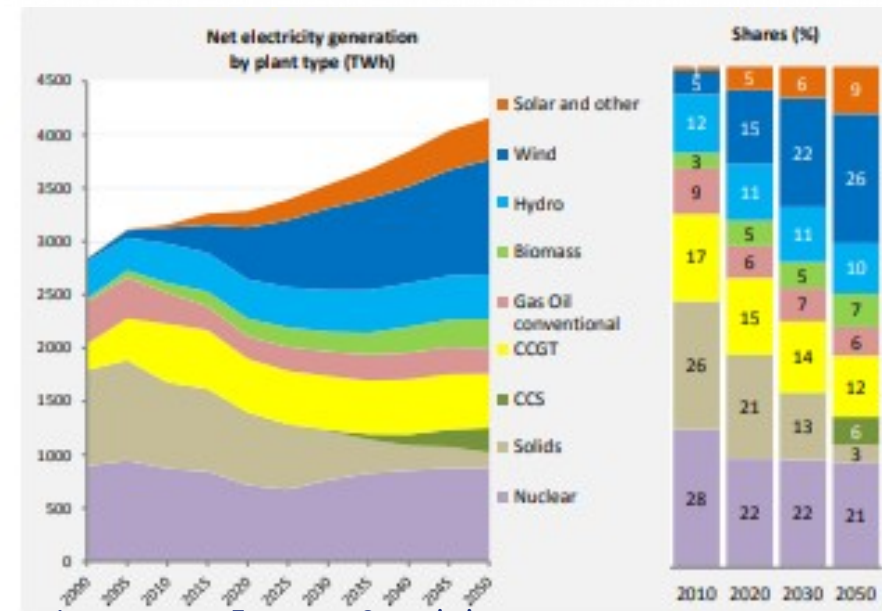


Image source: European Commission

Thank you very much for your attention.

Any question?

