How is the link between pre and post construction studies?

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Introduction and aim

The use of wind as energy resource is increasing around the world, leading the renewable energy revolution. However wind farms have adverse effects on birds, being mortality through collision with turbine blades, one of the most important from a conservation point of view. Mortality rates vary greatly between different studies, but may have a higher impact on raptor populations. Therefore, the prevention of bird collisions before wind farm construction is a critical issue for some species.

Environmental Impact Assessment (EIA), required by environmental authorities prior to wind farm construction, includes a baseline field survey to determine the bird populations that use the wind development area annually. Based on the frequency of flying birds in a particular area, EIAs determine the differential risks for birds and whether the wind farms were should be approved or not.

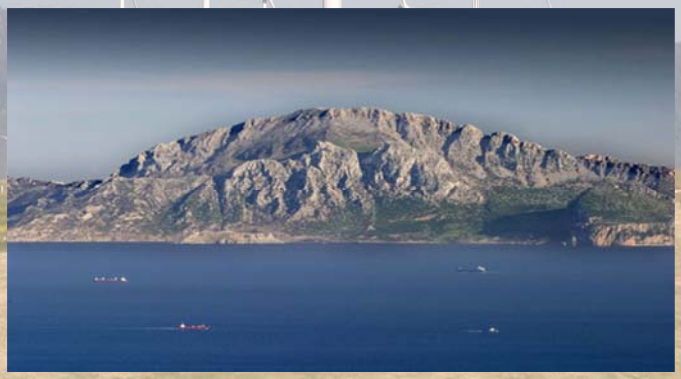
In order to assess to what extent EIAs are efficient tools in identifying bird mortality risks, we compared results from EIAs with actual mortality data in the same wind farms to determine if both were related.

Methodology

We studied 53 potential areas (20 finally approved and 33 rejected) all located in Tarifa, southern Spain. The Strait of Gibraltar is one of the most important migration routes for birds. This area is the third region in number of breeding griffon vulture (*Gyps fulvus*) pairs in Spain.

EIAs recorded the number of birds using these areas from fixed observation points by binoculars. Observations were distributed over the study area, year and day-light hours. When any bird or group of birds were detected, data such as species, number of birds, flight altitude were recorded. Additionally we also used the number of birds per hour and the total birds at rotor height. Here we concentrate in griffon vultures because this specie is the most frequently killed in this area.

In the approved wind farms actual mortality have to be recorded the from their starting. Every wind farms was monitored from dawn to dusk, with a total of 13 trained observers, coordinated and interconnected for surveying the total area. Search for dead birds was made on a daily basis at every turbine. When a carcass was found, data such as species, age, sex, distance to the closet turbine, kind of injuries and estimated time of death were recorded.



Results

The 53 potential wind farms were classified into three levels of mortality danger (according to number of birds per hour and the total birds at rotor height). The 20 authorised wind farms showed significantly lower values for these variables than did the unauthorised ones.

A total of 138 griffon vultures colliding with turbines (0.405 dead vulture/turbine/year) and there were significant differences in mortality among the 20 wind farms (ANOVA $F = 8.276$, $df = 19, 232$, $p < 0.001$).

A marginal relationship was found between vultures per hour and mortality of vultures (Spearman correlation; $r_s = 0.443$, $n = 20$, $p = 0.0503$) but not between vultures at risk and mortality (Spearman correlation; $r_s = 0.304$, $n = 20$, $p = 0.191$).

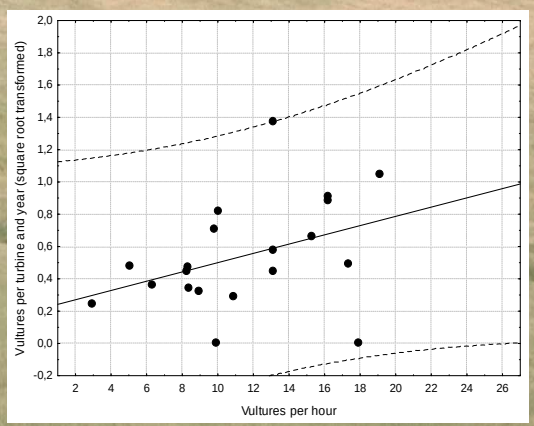
A marginal although non-significant regression between vultures per hour and mortality of vultures per turbine and year was found, with vultures per hour explaining 14% of the variance ($r = 0.379$, $n = 20$, $p = 0.099$).

Discussion

All of these high mortality wind farms have been approved after risk assessment studies conducted prior to their construction, according to the law.

These results show that only a weak marginal relationship between predicted risk (from EIAs) and actual mortality of griffon vultures were found. Wind farm areas showed significant differences among them in the frequency of flying birds observed during risk studies and later they also showed significant differences in mortality rates when operating. However no relation between both groups of variables was detected.

The correlation between predicted mortality and actual mortality must be improved in future risk assessment studies by i) prior data collecting taking into account the actual distribution of wind directions during a year. This variable is of main importance in soaring species because it affects bird behaviour and use of space; ii) prior data collecting based on transect counts or supported by radar; and finally iii) prior data collecting should be done focused not only at a particular wind farm area but at the finer level of the individual proposed turbines.



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