

Busse P. 2013. *Methodological procedure for pre-investment wind farm ornithological monitoring based on collision risk estimation*. Ring 35: 3-30.

Even though the proportion of wind farm victims compared to general bird species mortality is relatively low, there is necessity to limit direct and indirect losses to the bird populations caused by this kind of human activity. Estimation of threats to the birds resulting from building of wind farms is a very difficult task and it must take into account several constrains. The basic task is to build farms in localities that are the safest to birds. This can be achieved by pre-investment monitoring and direct observations at the spot and then evaluation of potential threats and risks. Field methods typical for the studies on bird populations are usually applied in such monitoring. The procedure described below includes four steps: screening (starts the process and sets preliminary constrains of the location), monitoring (standardised data are collected at the location), estimations of potential collision risk and evaluation of the location. The key parameters determining collision risk of bird species are: (1) the number of individuals utilising the monitored area in different seasons, (2) air space utilization (height and directions of flights), as well as (3) characteristics of the species behaviour. The starting data set contains: species name, number of individuals, height of flight (three layers – below, in, above the rotor), and distance from the observer. The final estimation of the collision index (the most probable number of collisions per turbine a year) is based on (1) estimation of the total number of individuals that use the defined area during a year and (2) estimation of probability that the individual will collide. In the latter (i.e. 2) the most important is that birds can actively avoid passing through the rotor swept (active avoidance rate) and that even birds, which crossed the rotor swept area not necessarily will be killed. Calculations are performed for each species separately and then are summarised to get the farm index as well as season indices. Some values of indices for raptors studied at 76 localities in Poland are given in the table. The final evaluation of the site is made as shown in a parametric analysis table, discussion of cumulative and barrier effects and the discussion of species specific risk to species of high conservation concern.

Key words: wind farm, pre-investment monitoring, birds, collision estimation, methods, cumulative risk, barrier effect, raptor collision indices