

## PROTECTING BIRDS FROM POWER LINES FOCUSING ON COUNTRIES OF DANUBE/CARPATHIAN REGION

Aim of this paper is joining of approach for countries of the Danube/Carpathian region, to define best practices in the elimination of electrocution of birds and their collisions with powerlines and to address methods which appeared to be ineffective. A prepared paper will provide answers on questions raised in individual chapters and from questionnaire prepared by NGO Raptor Protection of Slovakia in frame of the LIFE13 NAT/SK/001272 – LIFE ENERGY project. Subsequently, numerous studies were to leave no doubt as to the alarming scale under certain circumstances of the problem of bird deaths on power lines within Danube/Carpathian region. Main focus of this paper is concentrated on primary countries of interest situated in Danube/Carpathian region of Europe, specifically: Czech Republic, Hungary, Poland, Romania, Slovakia and Ukraine. Other countries of interest include: Austria, Bulgaria, Bosnia and Herzegovina, Croatia, Germany, Montenegro, Serbia, Slovenia.

Electric power is still regarded to be a benefit for humankind, but it is also turning to be a threat for wildlife. Transmission and distribution electricity grids are expanding rapidly worldwide, with significant negative impacts on biodiversity and, in particular, on birds. Collisions and electrocutions are still an important, continuing mortality factor of several species of birds, despite to a number of compensatory measures realised worldwide.

This paper states the current situation and discusses problems related to birds and power lines in participating countries within the Danube/Carpathian region. The recommendations based on the assessment of the current situation are offered in the second part of this paper.



SOURCE: <http://www.interreg-danube.eu/about-dtp/participating-countries>

BIRDS VS. POWER LINES

The risk of power lines for birds is still an underestimated reason of mortality in some countries or areas and the data are either missing or absolutely insufficient. The birds vs. power line issue is dealt within a large number of reports and publications from various European countries. From some countries, only sporadic data were recorded by local experts and wide public. In many countries (such as Germany, Czech Republic, Slovakia, Hungary, Bulgaria) within the Danube/Carpathian region, different methods, efforts and solution for bird safety are under study and under monitoring of efficiency of proper mitigation measures (line marking, insulation of medium voltage poles etc.). But also, in many countries has just got attention recently (Serbia, Romania and Croatia) and the realisation of proper mitigation actions are just developing.

In most Danube/Carpathian countries among most frequently effected species occurred the common buzzard (*Buteo buteo*), as the most often electrocuted raptor species in the region; in some countries also the white stork (*Ciconia ciconia*) – in Czech Republic, Hungary and Poland as well as in Romania. Common kestrel (*Falco tinnunculus*) was often reported from Czech Republic, Hungary and Romania, also common crow (*Corvus corone cornix*) and magpie (*Pica pica*) are being frequently electrocuted. Victims of electrocution include in Romania also some rare raptor species as long-legged buzzard (*Buteo rufinus*).



Electrocuted common buzzard (A), common crows (B), magpie (C), white stork (D)

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### MOST DANGEROUS TYPES OF POWERLINES AND THEIR RISKS OF ELECTROCUTION TO BIRDS

The most dangerous types of pole constructions due to electrocutions are in the Danube/Carpathian countries the following: metal crossarm poles, poles with a different combination of exposed jumper wires locations, mostly when on a top of the console (**Slovakia**); mostly different tension, switch and transformer poles with metal cross arms, metal lattice poles (**Hungary**); relatively truss poles of the distribution lines with a branch, entirely concrete poles with metallic horizontal console and with three or two times three „supporting“ insulators (**Czech Republic**); transformation stations (**Romania**) and 10 kV poles, usually the most dangerous are that with wires at different levels close to each other (**Ukraine**).

### THE LIST OF NON-EFFECTIVE SOLUTIONS TO MITIGATE ELECTROCUTIONS

In **Czech Republic** none of following measures were tested but their use on power lines revealed their inappropriateness as a protective measure. Measure „Racks“ - negatives: short lifetime, damaged racks are more dangerous than missing protection. Measure „Bench“ – negatives: not frequently used, a bench occupies space on a console and birds which - despite of the bench - sit on the console are more threatened than without bench. Because of wrong installation or damage, the plastic belt (used in „Delta Variant console type“) and plastic covers on the insulators top lose their function.

In **Hungary** a number of different experiences have arisen. Regarding to new data, any crossarm cover insulator (green and orange) or plastic phase coverts and various types of plastic insulators which allow birds to perch safely on the console (black ones), or other products installed as retrofitting mitigation on the poles. The plastic products could be attached the wrong way to the crossarms and insulators, ignoring the recommendations and have a short lifetime. After any retrofitting mitigation methods power line companies never pay enough attention to regular maintenance or replacements of missing elements/kits. In **Slovakia** plastic „combs“ in different colors (green, black) as well as other products installed in a wrong way or installed in a way without respect to recommendations turned out to be inefficient. In **Ukraine** some bird-

protecting tools had been developed, they were installed on a few power lines, but results of their functioning have not been received yet. The data for other priority countries (**Romania** and **Poland**) are missing.

### THE LIST OF EFFECTIVE SOLUTIONS TO MITIGATE ELECTROCUTIONS

The most effective measure in **Czech Republic** is „Pařát console type“ with a perch or „Delta Variant console type“ with a perch. The shape of console discourages birds from sitting down and at the same time, perch offers place to sit. That is why there is a bird motivation to use a perch on these consoles. The monitoring of this solution at four selected powerlines in different parts of the Czech Republic has shown, that perches were frequently used by common buzzard with a high protective value and results indicate, that positive effect will be also for other raptors typically using poles as perches: black kite, red kite, rough-legged buzzard, etc.).

In **Hungary** the most effective solution appears to be a complete change of the pylon head construction for the new, bird friendly scaled type with well geometry. Switch poles could be changed to closed types filled with gas. To branch poles could be attached a new perching frame generating a safe sitting and landing surface for birds.

From **Poland** are missing data on most effective protective measures, as there is no general evaluation. Removal of dangerous parts of installation can usually help in most cases, but regularly gathered data are missing.

In **Romania** underwater cables and cable insulations have been recommended as effective solutions.

In **Slovakia** the most effective solution appears to be a complete change of the construction for the new type – so called “Antibird”. Then also phase covers and various types of plastic insulators which allow birds to perch safely on the console or do not allow the birds to perch on the construction at all. Antibird is effective thanks to the shape of the console (45° angle of the arms). In the years 2006 - 2007 three new

elements were tested that proved to be the most appropriate types, they are still used today and are called "Tooth" - insulators, which allows the birds to securely engage the bracket column. New type of insulation with telescopic parts was developed for 22 kV power lines, to eliminate the distance between the products and support insulators.

In **Ukraine** no testing has been done yet, even if some measures already have been developed.

### MOST DANGEROUS TYPES OF POWERLINES AND THEIR RISKS OF COLLISION TO BIRDS

Collisions of birds are relevant to the main cause – the flying individual is unable to register such an obstacle ahead. Problems of collisions into power lines can be generally based on factors of origin divided into four categories, including biological, topographical, meteorological and technical perspective.

In **Hungary** deaths from collisions had been located sporadically. First extensive survey and results were found out in the frame of the LIFE project titled „Conservation of *Otis tarda* in Hungary” between 2004-2008 mainly in Kiskunság National Park Directorate. The results proved the need of using bird diverters in bustard habitats on the wires increasing visibility and focusing on building underground cable system instead of existing power lines.

In **Romania** collisions started to be regularly monitored since 1996.

In **Slovakia** deaths from collisions had been located sporadically, but first more extensive results were found out in the year 2010 in SPA Ondavská rovina. The results proved the need of a systematic approach, therefore we have been regularly monitoring collisions since 2014. A project LIFE Energy has started, its duration is planned for 5 years period (2014-2019). Project is focused on collisions of birds with 22 kV and 110 kV power lines. First there is a need to identify most dangerous types of powerlines for collisions (e. g. in Slovakia 22 kV and 110 kV powerlines) as well as to identify most dangerous sites with high collision rate. In Slovakia in frame of project LIFE13 NAT/SK/001272 a complex methodology for monitoring of these powerlines has been

identified during period May 2016 – May 2019 and results will be evaluated at the end of the process. The data from other priority countries (**Poland, Czech Republic and Ukraine**) are missing.

In most Danube/Carpathian countries among most frequently effected species occurred:

- **Czech Republic:** *Cygnus olor* – *Anas platyrhynchos*, *Turdus merula*, *Columba sp.* Source: results of the project „Monitoring of the avian mortality due to transmission line electrocution and collision“ (one-time monitoring was carried out in 2015-2016, 1/10 of the total length of high voltage lines was monitored).
- **Hungary:** *Grus grus*, *Otis tarda*, *Ardea cinerea*. The results from a surveys carried out by MME and National Park Directorates („KFO“ = Monitoring of Medium voltage power lines), long term knowledge from the field, reported deaths from collisions.
- **Poland:** no sufficient data.
- **Romania:** *Cygnus olor*, *Anser albifrons*, *Ciconia ciconia*. Data from personal observation.
- **Slovakia:** *Cygnus olor*, *Anas platyrhynchos*, *Egretta alba*, *Ardea cinerea*. Data from a survey carried out within the LIFE Energy project, long term knowledge from the field, reported deaths from collisions.
- **Ukraine:** *Gull sp.*, *Corvidae sp.*, *Melanocorypha calandra*, *Larus cachinnans*, *Philomachus pugnax*, *Corvus monedula*, *Oxyura leucocephala*, *Otis tarda*. Data based on personal observations.



The most frequently effected bird species by collisions in Slovakia: mute swan (A), common pheasant (B), mallard (C), common blackbird (D) © Raptor Protection of Slovakia

In **Czech Republic** the phenomenon of collisions has not been credibly studied and evaluated. It seems that the position of particular component is more important than its technical parameters. The results of the project „Monitoring of the avian mortality due to transmission line electrocution and collision“ revealed that mortality due to collisions is an area factor, that is often overlooked (f.e. for „small passerines“). It is necessary to emphasize that the above mentioned project was focused on high voltage lines. Extra-high voltage lines – from the view of collisions - have not been systematically studied. None of the protective measures were tested. Only sections of a few power lines are refitted with protective measures. Their efficiency was not studied.

The most dangerous types of power lines do not correlate with constructions of the lattice tower types in **Hungary** (high voltage power lines) or pole types on medium voltage system. More important is the location of the power line sections, whether they crosses important bird habitats/breeding areas or main migration routes. Even a single barbed wire fence could cause a mortality in an unfavorable location. For 120 kV, 220 kV, 400 kV power lines the most risk is associated with optical cables, and ground/earth wires (the highest ones), which are also the thinnest ones. Any systematical testing has not been realised, however static spiral bird diverters used by MAVIR seemed to be too rigid / brittle and UV-sensitive and thus we documented a lot of missing diverters after some years. A vibrating FireFly diverter had also a period with high rate of amortization, but newest type seems to be sufficient, and could be fitted to the wires by drones, thus reducing the trailing damage and collateral costs.

In **Romania** the most dangerous types of powerlines turned out to be the medium voltage lines in Danube Delta Biosphere Reserve, because there are very short segments of high voltage lines only. Wire fences and mirror windows turned out also seriously dangerous.

In **Slovakia** more important than the voltage is location of the construction regarding to habitats inhabited by birds or to main migration routes. For constructions of 110 kV, 220 kV, 400 kV, the most risk is associated with optical ground/earth wires, especially

the highest one, which is the thinnest. So far, testing have not been performed systematically. Results from the long term monitoring are not available yet. Bird diverters have been installed on multiple power line sections only recently, under the LIFE Energy project.

On the basis of experience gained in **Ukraine** pylons with wires on different levels, as well as a lot of wires on small space, high concentration of wires and location of the construction regarding to habitats inhabited by birds or to main migration routes turned out to be the most dangerous. some bird-protecting tools, they were installed on a few power lines, but results of their functioning have not been received yet. For **Poland** are no sufficient data available.

### CONCLUSIONS AND FINAL RECOMMENDATIONS

Overhead power lines are an important factor significantly influencing the life of birds. The attitude between birds and networks of overhead electrical power lines has two levels. The first is electrocution in abutment birds on the console of power pylons, and other is collisions with the overhead electrical power lines. The most dangerous types of constructions due to electrocutions are in the Danube/Carpathian countries are metal cross arms poles, poles with a different combination of exposed jumper wires locations, switch and transformer poles with metal cross arms, metal lattice poles. There are many types of effective solutions of insulations of poles of medium-voltage power lines such as: plastic hood, silicon tubes, long rod insulators, plastic insulators covering the metal console etc. The best solutions are those, which allow the birds to securely perch on poles.

For collisions, the most dangerous types of power lines do not correlate with constructions of the lattice tower type or pole types on medium voltage system. More important is the location of the power line sections, whether they cross important bird habitats/breeding areas or main migration routes. Line marking is one of the best solution, how to make the cables more visible to birds in flight.

Recommended properties of marking devices are: motion of the device or its parts, reflectivity, contrasting colors, and enhances the visibility of the line and glowing for up



to 6 hours after sunset. Buried power lines may be a solution to bird collisions in some instances, but can cost about 10 times more than the line marking. Even if collisions and electrocution could not be eliminated, still they can be reduced by proper measures.

**Risk reduction option** include (APLIC, 2012; Haas et al., 2005):

- Line placement that takes migratory patterns and high bird-use areas into account.
- Line orientation that considers biological and environmental factors such as bird flight paths, prevailing winds, and topographical features.
- Line configuration that reduces vertical spread of lines, clusters multiple lines in the same right-of-way (ROW), increases the visibility of lines, and/or decreases the span length if such options are feasible.
- Line marking to increase the visibility of the line.
- Burying lines if feasible and warranted.

**The risk of power lines for birds is still an underestimated reason of mortality in some countries or areas and the data are either missing or absolutely insufficient and only sporadic data are still available from local experts and wide public.**

**In general a systematic approach and standardized monitoring on transnational level will enable to invest into the real effective measures and focus on areas with the highest priority. When only the most risky lines are treated and most effective solutions are applied more birds will be prevented from collisions and electrocution. Sharing of expert knowledge will ensure the better cooperation in bird vs. power line issue within the responsible authorities and stakeholders.**

AVIAN POWER LINE INTERACTION COMMITTEE (APLIC) 2012: Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

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