ANALYSIS REGARDING THE RISK OF COLLISION OF BIRDS WITH THE WIND TURBINES
WIND FARM CERNAVODA - 2012

1.GENERAL DATA

1.1. Introduction

EDP Renewables has developed in the area of Mircea Voda, Constanta county, a wind farm with a total power of 138 MW, currently operated by S.C. CERNAVODA POWER S.R.L.

The development of the wind farm was done in accordance with the specific legislation in force, in compliance with European and national regulations regarding the development of this kind of projects.

In terms of compliance with the environmental legislation, for building the wind farm, the Environmental Agreement no. 24/29.09.2008 issued by EPA Constanta was obtained, based on the assessment study of the environmental impact, prepared by specialists in the field.

Later, after finishing the construction, regulating the operation conditions for the wind farm was done by issuing the environmental permit no. 578/29.12.2010.

Both the Environmental Agreement and the Environmental Permit required the monitoring of biodiversity in the area of the wind farm, that was performed both during its construction and in the first two years of operation of the wind farm and currently specific monitoring activities are performed in the third year of operation of the wind farm.

S.C. CERNAVODA POWER S.R.L. has achieved this monitoring by means of S.C. Blue Terra Consulting SRL, which prepares regular reports that are submitted to the beneficiary and the environmental authorities according to the regulatory documents mentioned above.

1.2. General data regarding the analyzed objective

The wind farm developed by EDP in the area of the administrative territory of the Mircea Voda village, Constanta county, has a total power of 138 MW and comprises of a total of 46 Vestas V90 turbines with a power of 3 MW each.

Regarding the location of the farm in relation to Natura 2000 sites, the following table indicates the distances to the nearest Natura 2000 sites and their position towards the wind farm.

Table no.1

Natura 2000 Site	Location of the farm in relation to Natura 2000 Site
ROSCI0022 CANARALELE DUNARII	5,7 km East
ROSPA 0039 DUNARE-OSTROAVE	4,8 km East

Regarding the migration routes, as indicated in the impact study, the wind farm is not located on a main migration route, but given the distance of about 5-6 km between the farm and the Danube, it is possible that specimens of birds flying along the Danube River also reach the farm area during their migration.

2. GENERAL DATA REGARDING THE RISK ANALYSIS

2.1. Data and methodologies used for the calculation of the risk analysis

This material represents an analysis of the risk of collision of birds with wind turbines that make up the wind farm in the area of Mircea Voda, Constanta county.

The data used in the analysis are those obtained as a result of monitoring the area for 12 months (over the entire year 2012).

The methodology used is based on the pattern developed by Scottish Natural Heritage (hereinafter referred to as SNH), that takes into account the fact that, in practice, most birds in their flight are able to detect a wind turbine or an entire farm of turbines and to modify their flight so they can avoid such obstacles.

2.2. Description of the calculation method

The method used for the analyzed wind farm, developed by SNH, aims to estimate the number of collisions of birds with the wind turbines over a period of time. In this case, the period taken into account in this analysis is of one year.

The method is mainly based on the following equation:

Number of birds that can collide with the turbines =
number of birds that fly in the action area of the turbine rotor x
the likelihood that the birds that fly in the action area of the rotors be hit by these

Regarding the number of birds that can collide with the wind turbines, there are two approaches:

A. Birds with regular flights in the wind farm area. For the analyzed objective, only species observed in migration in the wind farm area were included in this category. These species are shown in Table. 5 of the Report on the monitoring of biodiversity in the wind farm area, prepared for the entire year of 2012. The above mentioned report also describes the methods of monitoring the avifauna used during monitoring.
B. Birds frequently using the wind farm area. This category only took into account, among the species of birds identified in the wind farm area, those species whose flights are frequent in the action area of the wind turbine rotor.

In each of the two cases the likelihood of collision of birds with the wind turbines was calculated, according to the methodology described by SNH.

The calculation of the collision risk is presented in further detail for each of the two cases mentioned above.

CASE 1: MIGRATING BIRDS

In this case the species listed in Table no. 4 in this material were considered, that represents migrating birds identified in the area of the wind park during the survey activity performed during 2012 and listed in Table 5 of the annual report for the survey of biodiversity.

For the calculation of the collision risk, all species listed in Table no. 3 were considered, though, as the table also emphasizes, not all were observed flying high in the action area of the wind turbine rotor, thus in the area with risk of collision. But taking into account that these species are migratory and have been observed during migration, it has been considered that such specimens can also reach heights that would pose a risk of collision with the turbines.

Regarding the number of birds of each species allowed for in this case, it is estimated as n x 2, where “n” is the number of birds of each species observed during the entire year and 2 represents the number of regular flights of these birds in the wind farm area (spring migration and fall migration).

In order to calculate the risk of collision of birds in this category with the turbines of the wind farm, according to SNH methodology, the following technical data were also used:

Table no. 2

Input data			Output data		
Farm width (largest width of the farm considered perpendicularly to the predominant flight direction)- fig.1	1	10 km	Risk window	W = l x H	1.500.000 mp
Wind turbine height	H	150m	Risk section	A = N x πR^2	292491mp
No. of turbines that make up the farm	N	46		A/W	0.20
Radius of the turbine rotor	R	45m			

The risk window (W) is a "window", actually a vertical section through the farm whose dimensions are defined as follows:

- Length of the risk window is the largest width of the farm, perpendicularly to the predominant flight direction of birds
- Width of the risk window is the height of the highest turbine of the farm. In our case, all turbines have a height of 150 m.

The risk section (A) is the plan area occupied by the action radius of all turbine rotors that make up the wind farm.

Table no. 3: Technical features of the turbines

No. of blades	3
Tower height	105m
Blade length	45m
Maximum blade width	3.5m
Maximum angle of slope of the blade	30^0
Rotor diameter	90m
Rotation period	3.72 sec.
Rotor depth	4.4 m

Table no. 4: birds in migration observed in the wind farm area over the entire year 2011 (taken from the biodiversity monitoring report)

Run. No.	Scientific name	Common name	Observations
1.	*Pelecanus onocrotalus*	Great White Pelican	single specimens or groups of birds flying; flying height 120-150 m/ 400-500 m; flying direction: N, NW-S; S, SW-NE
2.	*Ciconia ciconia*	White stork	single specimens or groups of birds flying; flying height 150-200 m; flying direction: N-S.
3.	*Tadorna ferruginea*	Ruddy Shelduck	single specimens flying; flying height 90-120 m; flying direction: S-E,N
4.	*Circus aeruginosus*	The Western Marsh-harrier	single specimens flying; flying height 50- 70 m; flying direction: W-SE
5.	*Coturnix coturnix*	The Common Quail	single specimens flying flying height 2-3 m; flying direction: S-N-W
6.	*Chlidonias hibridus*	Whiskered Tern	Groups of birds flying flying height 6-8 m; flying direction: S- W, N
7.	*Merops apiaster*	The European Bee-eater	single specimens/ groups of birds/ flying flying height 30-50 m; flying direction: N-SW
8.	*Coracias garrulus*	The European Roller	single specimens flying flying height 25-30 m; flying direction: N, S-E
9.	*Upupa epops*	The Hoopoe	single specimens flying flying height 8-10 m; flying direction: S-N-W
10.	*Calandrella brachydactyla*	Greater Short-toed Lark	single specimens/ groups of birds/ flying flying height 15-25 m; flying direction: NE-S, SW
11.	*Hirundo rustica*	The Barn Swallow	Groups of birds/ single specimens flying flying height 15-40 m; flying direction: S-W,E.
12.	*Riparia riparia*	Sand Martin	Groups of birds/ single specimens flying;

			flying height 15-40 m; flying direction: S-W,E.
13.	*Anthus campestris*	The Tawny Pipit	single specimens; flying height 15-30 m; flying direction: E, S-E,W.
14.	*Motacilla alba*	The White Wagtail	single specimens; flying height 10-20m; flying direction: N, NW-S.
15.	*Motacilla flava feldegg*	Black-headed Wagtail	single specimens flying/ on vegetation; flying height 8-15; flying direction: S-N, W-E
16.	*Lanius minor*	The Lesser Grey Shrike	single specimens flying/ on bushes; flying height 10-15 m; flying direction: S-N, E-SW, N-S.
17.	*Lanius collurio*	The Red-backed Shrike	single specimens flying/ on bushes flying height 6-10m; flying direction: S-W,E.
18.	*Oenanthe oenanthe*	The Northern Wheatear or Wheatear	single specimens flying/ on the ground; flying height 6-8 m; flying direction: S-E, N-W, N-S.
19.	*Sylvia communis*	The Whitethroat	single specimens flying/ on bushes flying height 6-10 m; flying direction: S-W, E.
20.	*Saxicola rubetra*	The Whinchat	single specimens flying; flying height 4-6 m; flying direction: N-SE, S.
21.	*Luscinia megarhynchos*	The Nightingale	single specimens flying; flying height 3-5 m; flying direction: S-W, E.
22.	*Emberiza citrinella*	The Yellowhammer	single specimens/ groups of birds flying; flying height 8-10 m; flying direction: W-NE, E.
23.	*Emberiza hortulana*	The Ortolan Bunting	single specimens flying; flying height 10-20 m; flying direction: S-E, N.
24.	*Fringilla coelebs*	The Chaffinch	Groups of birds flying; flying height 8-10 m; flying direction: N-S.

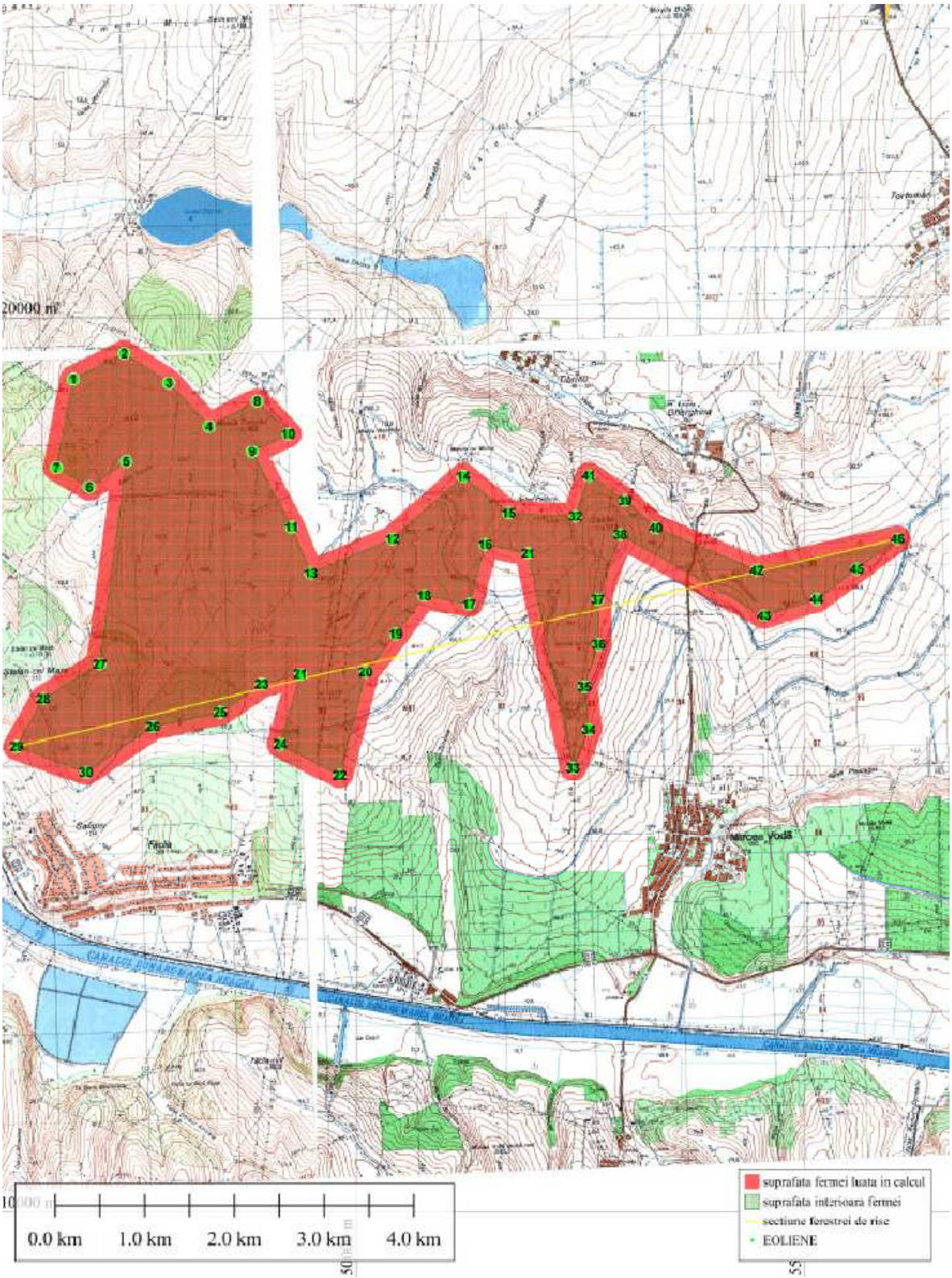

Figure no. 1: technical data on the wind farm (width, risk section, risk window)

The following table presents the results on the risk of collision with the farm turbines of birds in migration observed in the wind farm area.

Table no. 5

Bird species	Number of birds	Number of birds through the risk window	Length of bird cm	Wingspan cm	Way of Flying: Hovering (0) / Flapping (1)	Flying Speed m/s	Collision Likelihood* %	No. of birds with risk of collision without any avoidance Activities	Avoidance rate**	Real risk no. of birds/ year
1	2	3	4	5	6	7	8	9	10	11
	n	nxA/W	L	A				Col. 3 x 8		(1-col.10)xcol.9
Ciconia-ciconia	190	38	110 cm	200cm	1	12	14.50%	5.51	95%	0.28
Pelecanus-onoctotalus	362	72.4	160	300	1	12	20.40%	14.7696	95%	0.74
Tadorna-feruginea	2	0.4	60	100	1	12	11.80%	0.0472	95%	0.0024
Merops-apiaster	44	8.8	28	40cm	1	17	9%	0.792	98%	0.016
Coracias-garrulus	12	2.4	30	57	1	12	9.10%	0.2184	98%	0.0044
Upupa-epops	22	4.4	28	46	1	12	9.00%	0.396	98%	0.0079
Lanius-collurio	26	5.2	18	26	1	9	10.70%	0.5564	98%	0.012
Lanius-minor	24	4.8	20	27cm	1	9	10.90%	0.5232	98%	0.0105
Anthus-campestris	24	4.8	16	27cm	1	9	10.50%	0.504	98%	0.0101
Motacilla-alba	186	37.2	18	28cm	1	9	10.70%	3.9804	98%	0.08
Sylvia-communis	20	4	14	25cm	1	9	10.40%	0.416	98%	0.0083

Coturnix-coturnix	22	4.4	18	27cm	1	9	10.70%	0.4708	95%	0.0235
Fringilla-coellebs	860	172	15	28cm	1	17	6.20%	10.664	98%	0.2133
Hirundo-rustica	182	36.4	19	33cm	1	17	6.40%	2.3296	98%	0.0466
Circus-aeruginosus	6	1.2	55	140	0	12	12.50%	0.15	95%	0.0075
Chlidonias-hybridus	66	13.2	25	38	1	12	8.80%	1.1616	98%	0.0232
Calandrella-brachydactyla	58	11.6	15	25	1	17	6.40%	0.7424	98%	0.0148
Riparia-riparia	52	10.4	13	24	1	17	6.30%	0.6552	98%	0.0131
Motacilla-flava feldegg	4	0.8	15	25	1	12	8.00%	0.064	98%	0.0013
Oenanthe-oenanthe	13	2.6	14	25	1	12	7.00%	0.182	98%	0.0036
Saxicola-rubetra	12	2.4	13	25	1	12	7.80%	0.1872	98%	0.0037
Emberiza-melanocephala	20	4	16	27	1	12	8.00%	0.32	98%	0.0064
Emberiza-hortulana	10	2	16	27	1	12	8.00%	0.16	98%	0.0032

* calculated according to the SNH methodology

** according to the specialized literature

CASE 2: BIRDS FREQUENTLY USING THE WIND FARM AREA

In the wind farm area, as a result of the avifauna monitoring for one year, a total of 56 species of birds were highlighted, which were presented in Table no. 3 of the monitoring report and in Table no. 7 of this material. But among these species only some have been taken into account when calculating the risk of collision, given that many of the species observed fly at heights much lower than the height of the action area of the turbine rotor, where the risk of collision of birds with wind turbines is particularly present.

Thus, the species that were included in the calculation in this case are shown in Table no. 8.

When making the calculations, technical characteristics of the turbines, listed in Table no. 3, and the data in the following table were taken into account.

Table no. 6

Input data			Output data		
Surface of the wind farm (farm area)- see fig.1	A	19977796 mp	Volume of the farm	$V_w = A \times H$	2996669400 mp
Wind turbine height	H	150m	Volume scanned by the turbine rotor	$V_r = N \times \pi R^2 \times (d+l)$	See table no. 8
No. of turbines that make up the farm	N	46			
Radius of the turbine rotor	R	45m			
Length of the turbine rotor	d	4.4 m			
Length of the bird	1	See table no. 7			

The wind farm area (A) was thus considered: area strictly delimited by the wind turbines (cross-hatched area in Fig. 1), plus surface in the close vicinity with a width of 50m, considering that it also enters the range of action of the rotor (area in red, not cross-hatched on the sketch in Fig. 1)

The volume of the farm (V_w), where there is some risk that birds collide with turbines, is the area bounded as described above - A, multiplied by the height of wind turbines -H.

Table no. 7: Data on the monitoring of the avifauna in the Cernavoda wind farm area over the year 2012 (taken from the biodiversity monitoring report)

Run. No.	Scientific name	Common name	Number of specimens												Phenology	Ecology
			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.		
1.	*Ciconia ciconia*	White stork				93					2				Summer Guest (SG)	terrestrial
2.	*Pelecanus onocrotalus*	Great White Pelican				180					1				Summer Guest (SG)	aquatic
3.	*Hieraatus pennatus*	Booted Eagle									1				Summer Guest (SG)	terrestrial
4.	*Tadorna ferruginea*	Ruddy Shelduck				1									Summer Guest (SG)	terrestrial
5.	*Circus cyaneus*	The Hen Harrier		1											Winter Guest (WG)	terrestrial
6.	*Circus aeruginosus*	The Western Marsh-harrier					1			2					Summer Guest (SG)	aquatic
7.	*Buteo buteo*	The Common Buzzard	2	1	2	3	1		1	1	1	1	1		Partially migrating (PM)	terrestrial
8.	*Falco tinnunculus*	The Common Kestrel	2	1		6	2	2	2	1	1		3	1	Partially migrating (PM)	terrestrial
9.	*Perdix perdix*	The Grey Partridge	23	15		3	2				10				S	terrestrial
10.	*Phasianus colchicus*	The Common Pheasant	1			1	2	2		2	1	2	1		S	terrestrial
11.	*Coturnix coturnixâ*	The Common Quail				2	2	2	5						Summer Guest (SG)	terrestrial

12.	*Larus ridibundus*	The Black-headed Gull	23	15	45	15					4		5	3	Partially migrating (PM)	terrestrial
13.	*Larus cachinnans*	The Caspian Gull	12	27	31	8	5		12		7		5	3	S	aquatic
14.	*Chlidonias hybridus*	Whiskered Tern					33								Summer Guest (SG)	aquatic
15.	*Athene noctua*	The Little Owl					1								S	terrestrial
16.	*Columba livia domestica*	The Domestic Pigeon	21	16	27	35				4	3	5	3		S	terrestrial
17.	*Streptopelia turtur*	The European Turtle Dove									2				Summer Guest (SG)	terrestrial
18.	*Streptopelia decaocto*	The Eurasian Collared Dove	9	7		4	6	10	2		5	7	3	4	Summer Guest (SG)	terrestrial
19.	*Merops apiaster*	The European Bee-eater					2	3	6	6	5				Summer Guest (SG), P	terrestrial
20.	*Coracias garrulus*	The European Roller					1	1	2	2					Summer Guest (SG)	terrestrial
21.	*Upupa epops*	The Hoopoe				1	1	2	2	3	2				Summer Guest (SG)	terrestrial
22.	*Calandrella brachydactyla*	Greater Short-toed Lark					7	5		4	3	5			Summer Guest (SG)	terrestrial
23.	*Melanocorypha calandra*	The Calandra Lark				23	19	22			4	4			Partially migrating (PM)	terrestrial
24.	*Galerida cristata*	The Crested Lark	4	7	6	5					1	1	1		S	terrestrial
25.	*Alauda arvensis*	The Skylark			17	21	26	33		7	12	21			Partially migrating (PM)	terrestrial
26.	*Hirundo rustica*	The Barn Swallow					19	23	23	14	12				Summer Guest (SG)	terrestrial

27.	*Riparia riparia*	The Sand Martin								11	15				Summer Guest (SG)	terrestrial
28.	*Anthus campestris*	The Tawny Pipit				2	2	2	3	3					Summer Guest (SG)	terrestrial
29.	*Motacilla alba*	The White Wagtail				7					34	52			Summer Guest (SG)	terrestrial
30.	*Motacilla flava feldegg*	Black-headed Wagtail				1	1								Summer Guest (SG)	terrestrial
31.	*Lanius collurio*	The Red-backed Shrike					1	2	5	3	2				Summer Guest (SG)	terrestrial
32.	*Lanius minor*	The Lesser Grey Shrike					2		2	2					Summer Guest (SG)	terrestrial
33.	*Pica pica*	The European Magpie	7	14	6	9	13	11	5	3	5		3	3	S	terrestrial
34.	*Corvus monedula*	The Jackdaw	18	26	25	16	10	6	7	5	6	4	3	2	S	terrestrial
35.	*Corvus frugilegus*	The Rook	190	150	235	47	20		14	32	45	52	43	23	S	terrestrial
36.	*Corvus corone cornix*	The Hooded Crow	24	18	24	10	5		4	5	9	8	6	10	S	terrestrial
37.	*Sylvia communis*	The Whitethroat				2	2	2	1	2	1				Summer Guest (SG)	terrestrial
38.	*Phylloscopus collybita*	The Common Chiffchaff									3	2			Summer Guest (SG)	terrestrial
39.	*Phylloscopus trochillus*	The Willow Warbler									2	1			Summer Guest (SG)	terrestrial
40.	*Ficedula parva*	The Red-breasted Flycatche									4	2			Summer Guest (SG)	terrestrial
41.	*Oenanthe oenanthe*	The Northern Wheatear				3	2	1	2	3	2				Summer Guest (SG)	terrestrial

42.	*Saxicola rubetra*	The Whinchat					2	1		1	2				Summer Guest (SG)	terrestrial
43.	*Luscinia megarhynchos*	The Common Nightingale				2									Summer Guest (SG)	terrestrial
44.	*Sturnus vulgaris*	The Common Starling	65	25		86	69	52	14	32	20				Partially migrating (PM)	terrestrial
45.	*Turdus pilaris*	The Song Thrush										2			Summer Guest (SG)	terrestrial
46.	*Turdus pilaris*	The Fieldfare				1							9	6	Partially migrating (PM)/ Winter guest	terrestrial
47.	*Passer domesticus*	The House Sparrow	45	36		18	20	16	15	11	8	14			S	terrestrial
48.	*Passer montanus*	The Eurasian Tree Sparrow	26	17		10			8	4	7	3			S	terrestrial
49.	*Fringilla coelebs*	The Chaffinch									260	170			Partially migrating (PM)	terrestrial
50.	*Carduelis spinus*	The Eurasian Siskin	5	4								5	7	8	Partially migrating (PM), Winter Guest (WG)	terrestrial
51.	*Carduelis carduelis*	The European Goldfinch	7	6		8					5	3			S	terrestrial
52.	*Carduelis cannabina*	The Linnet	10	8		3			5		4	3			Partially migrating (PM)	terrestrial
53.	*Emberiza citrinella*	The Yellowhammer	12	15		5	8	5	6			5	7	6	S	terrestrial
54.	*Miliaria*	The Corn Bunting				12	10	16	4	2	4	3			Partially	terrestrial

	calandra														migrating (PM)	
55.	*Emberiza-melanocephala*	The Black-headed Bunting					10								Summer	terrestrial
56.	*Emberiza-hortulana*	The Ortolan Bunting					3	2							Summer	terrestrial

Abbreviations: SG – Summer guest; PM – partially migrating; S - sedentary; WG – winter guest; P – passing by

Table no. 8 summarizes the results regarding the risk of collision with the farm turbines of birds that frequently use the air space of the wind farm over the year.

Table no. 8

Bird species	Length of the bird (cm)	Wingspan (cm)	d+l (m)	Vr	No. of birds observed in the farm area	No. of days/year	no. of birds in Vw –N (occupation degree)	Vr/Vw	NxVr/Vw	v (flying speed - m/s	t=(d+l)/v	no. Birds between the rotors	Collision likelihood	no. of birds with risk of collision without any avoidance activities	Avoidance rate	Real risk no. of birds/year
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Streptopelia decaocto	32	44	4.72	1381257.759	57	50	11400	0.000461	5.25	12.00	0.39	13.36	9.40%	1.26	95.00%	0.06
Buteo buteo	46	112	4.86	1422227.269	14	35	1960	0.000475	0.93	17.00	0.29	3.25	8.20%	0.27	98.00%	0.01
Columba livia	33	46	4.73	1384184.152	114	40	18240	0.000462	8.43	17.00	0.28	30.28	9.00%	2.73	98.00%	0.055

domestica																
Passer domesticus	14	22	4.54	1328582.675	16	15	960	0.000443	0.43	12.00	0.38	1.12	9.00%	0.10	95.00%	0.01
Falco tinnunculus	30	68	4.7	1375404.972	21	45	3780	0.0005	1.73	17.00	0.28	6.28	7.00%	0.44	98.00%	0.01
Pica pica	45	55	4.85	1419300.875	56	56	12544	0.000474	5.94	9.00	0.54	11.02	10.00%	1.10	95.00%	0.06
Corvus Monedula	33	68	4.73	1384184.152	128	60	30720	0.00	14.19	9.00	0.53	27.00	10.00%	2.70	95.00%	0.13
Corvus frugilegus	46	85	4.86	1422227.269	851	56	190624	0.000475	90.47	12.00	0.41	223.38	10.00%	22.34	98.00%	0.45
Corvus corone cornix	46	90	4.86	1422227.269	123	56	27552	0.000475	13.08	12.00	0.41	32.29	10.00%	3.23	98.00%	0.06
Larus ridibundus	38	91	4.78	1398816.12	110	35	15400	0.00	7.19	12.00	0.40	18.05	9.70%	1.75	98.00%	0.04
Larus argentatus	57	135	4.97	1454417.598	110	45	19800	0.00049	9.61	12.00	0.41	23.20	11.00%	2.55	98.00%	0.05
Alauda arvensis	18	33	4.58	1340288.249	137	35	19180	0.00045	8.58	17.00	0.27	31.84	10.70%	3.41	98.00%	0.07
Passer montanus	14	27	4.59	1343214.643	75	30	9000	0.00045	4.03	17.00	0.27	14.94	6.40%	0.96	98.00%	0.02
Sturnus vulgaris	21	36	4.61	1349067.43	363	40	58080	0.00045	26.15	17.00	0.27	96.42	6.50%	6.27	98.00%	0.13
Emberiza citrinella	16	32	4.56	1334435.462	69	41	11316	0.00045	5.04	17.00	0.27	18.79	7.00%	1.32	98.00%	0.03
Miliaria calandra	18	34	4.58	1340288.249	51	35	7140	0.00045	3.19	17.00	0.27	11.85	7.00%	0.83	98.00%	0.02

Observations:

- Column 4: d- represents the depth of the turbine rotor, 4.4m (it is highlighted in table no. 2). Column 4 represents the sum between this depth of the turbine rotor and the length of the birds (see column 2);

- Column 6: represents the number of birds of each species observed in the wind farm area, as a result of the monitoring.

- Column 7: represents an estimation of the number of days within a year when the bird species identified after the survey are considered to fly in the farm area. The number of days is estimated according to the number of months when the species was identified in the farm area, according to the data indicated in table no. 6, considering that birds spent on average 4 hours/day in the wind farm area.

- Column 8= col.6 x col.7

- Column 12: represents the time necessary for a bird to fly over the entire distance representing the depth of the rotor

- Column 14: the likelihood was calculated according to the SNH methodology

3. RESULT INTERPRETATION AND CONCLUSIONS

Obviously a risk of birds collision with the wind turbines exists only when a bird is flying within the rotor sweep area or when it can be affected by the turbulences caused by the rotors.

The behavior during the flight, including the height at which birds fly, varies considerably between species. Many birds sometimes barely reach the action area of the rotor, while others perform routine flights in these areas and others fly at heights much higher than this area.

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There are also various types of flights such as hovering, flying in circles in the air, flying horizontally and vertically, which is characteristic for certain species of birds or certain activities, that may pose different risks of collision. The variation of the visibility conditions during the day or night, or due to weather conditions, is also likely to influence the risk of bird collision with the turbines.

For example, although few data are available, it seems that most collisions that occur are the result of the fact that birds do not notice wind turbines due to poor visibility conditions, rather than of the fact that they cannot avoid a turbine visible.

As far as the analyzed farm is concerned, as shown in tables no. 5 and no. 8, one can notice that all values that emphasize the real risk of collision of birds with the wind turbines (column 11 of Table no. 5 and column 17 of Table no. 8) are subunits, which leads to the conclusion that in the second year of operation of the wind farm it is very unlikely that mortality occurs in the populations of birds that cross the wind farm area due to collision with the wind turbines.