Demonstration of good practices to minimize the impact of wind farms on biodiversity

Επίδειξη καλών πρακτικών με στόχο τον περιορισμό των επιπτώσεων των Αιολικών Πάρκων στη βιοποικιλότητα

LIFE12 BIO/GR/000554 - Demonstration of good practices for the mitigation of wind farm impacts on wildlife in Greece

Kyriakos Rossis & Eftihia Tzen, CRES, Tasos Dimalexis, NCC

www.windfarms-wildlife.gr

Project objectives

The overall project objectives are:

To demonstrate state of the art methods and approaches that will improve the compatibility of wind farm development with the EU biodiversity conservation targets

To develop prescriptions and guidelines that will enable Greek state authorities and wind farm developers to effectively plan, implement and regularly evaluate the performance of the mitigation technologies for the benefit of affected biodiversity.

Project Information

Main Project location: CRES Demonstration Wind Farm-PENA, Keratea, Attica

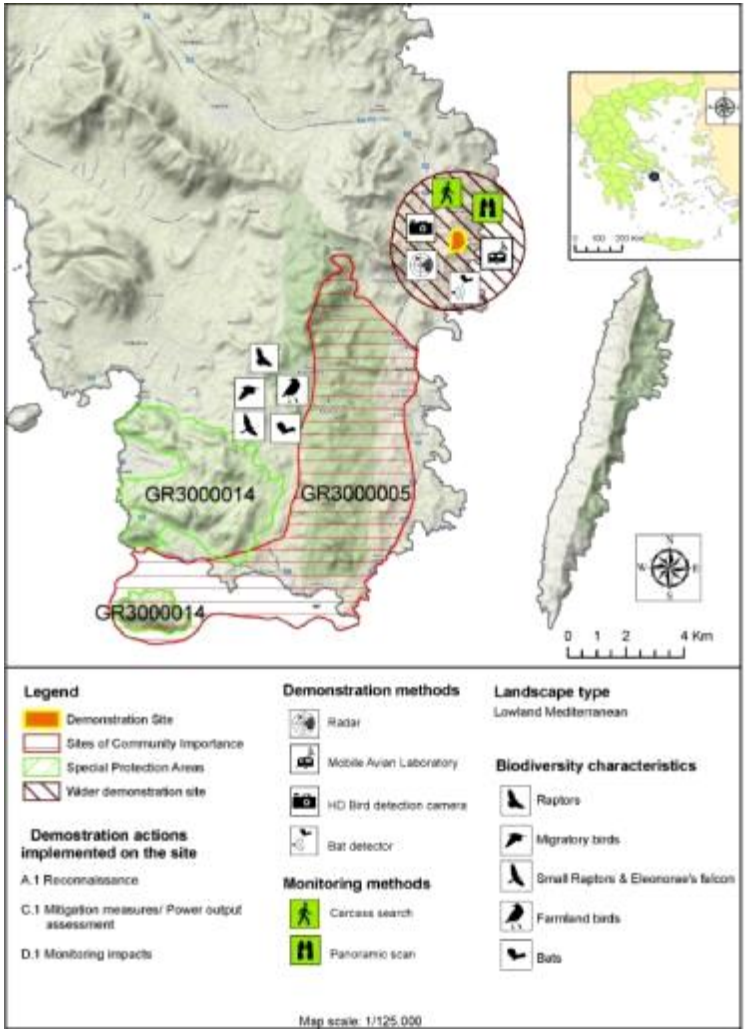
Duration: 01.10.2013 – 30.09.2018

Coordinating Beneficiary:

Center for Renewable Energy Sources & Saving (CRES)

Associated Beneficiary:

Nature Conservation Consultants Ltd, (NCC)



Project Actions

In order to achieve the general and specific project objectives a series of 15 actions, have been foreseen:

Preparatory actions (Actions A),

Concrete conservation actions (Actions C),

Public awareness and dissemination actions (Actions E),

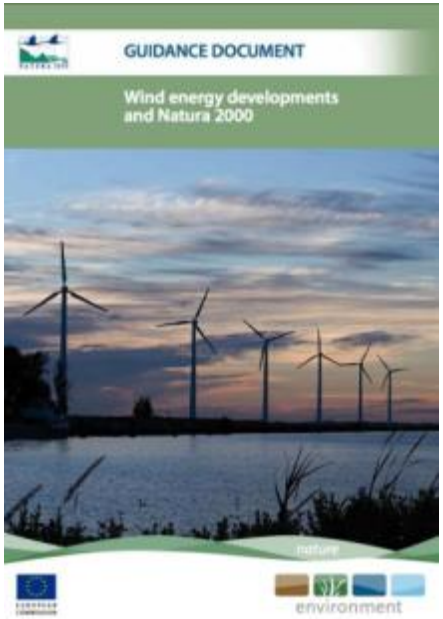
Monitoring actions (Actions D)

Actions referring to the overall project management and operation (Actions F).

Based on EU Guidance Document and current literature the project demonstrates the use of modern technologies in wind farm cases in Greece:

- Radar surveys
- Video surveillance
- Acoustic monitoring – bat detectors
- Thermal cameras

And promotes combinations of conventional methods e.g. visual bird counts with modern technologies to mitigate impacts.



http://ec.europa.eu/environment/nature/natura2000/management/docs/Wind_farms.pdfT
The purpose of the document is to provide guidance on how best to ensure that wind energy developments are compatible with the provisions of the Habitats and Birds Directives.
Is focused mostly on the procedures to follow under Article 6 of the Habitats Directive when dealing with wind farm related plans and projects which could affect a Natura 2000 site and provides clarifications on certain key aspects of this approval process.
The Habitats Directive does not, a priori, exclude wind farm developments in or adjacent to Natura 2000 sites.
These need to be judged on a case by case basis.

Demonstration of good practices for the mitigation of wind farm impacts on wildlife

In collaboration with interested wind farm developers, several good practices have been demonstrated n commercial wind farms. These are:

1. Conventional visual surveys
2. Use of marine surveillance radar
3. Video surveillance automated systems
4. Bat detectors + thermal cameras

Within the project, in CRES Demonstration Wind farm PENA have been installed and operated for demonstration purposes:

- a Video surveillance automated system (DT Bird),
- Four (4) types of bat detectors
- a marine surveillance radar

[a second video surveillance system is scheduled to be installed before the end of 2017 at a commercial wind farm in northeastern Greece.]

The project is preparing :

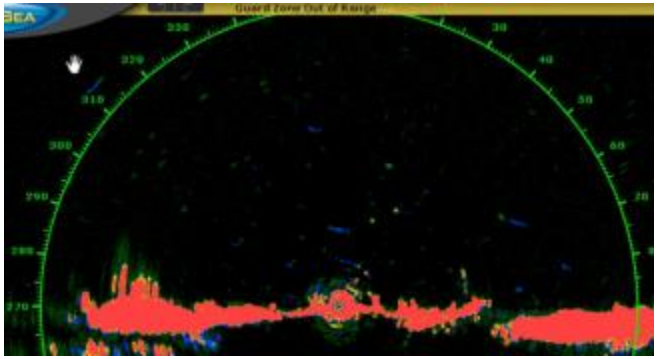
- A **Good Practice Guide** on mitigation practices
- A GIS **Decision Support Tool** for public administration and stakeholders, to screen potential site sensitivity and appropriate mitigation measures/practices

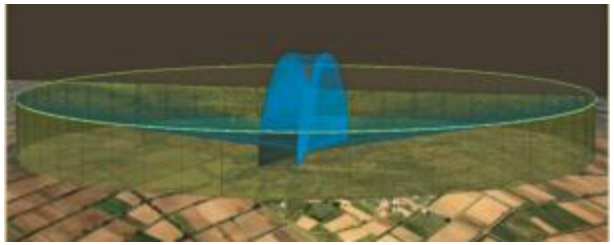
A number of open meetings, presentation and seminars have been organized at CRES wind farm-PENA , National Parks and Regional Administrations. More seminars will be organized within 2018.

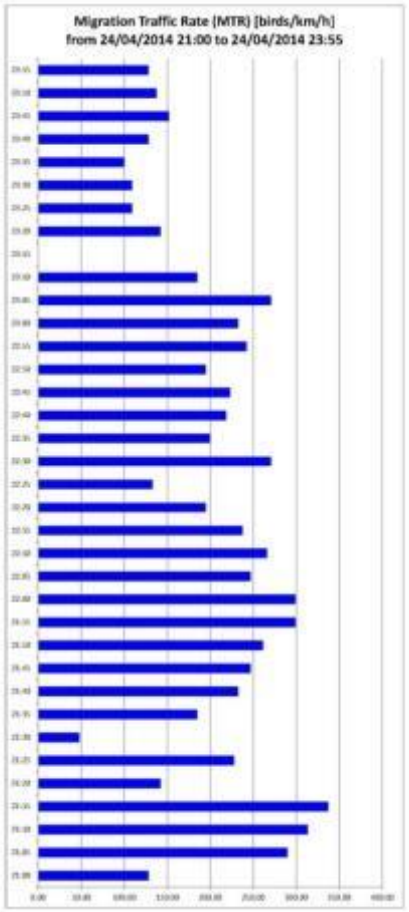




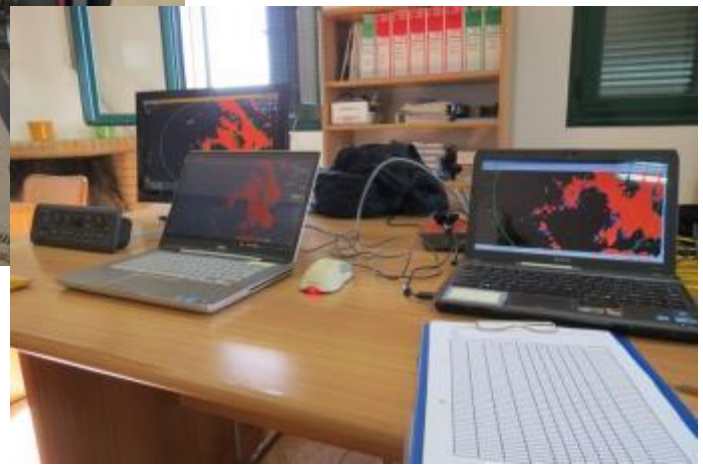

Demonstration of technologies: Marine surveillance radars







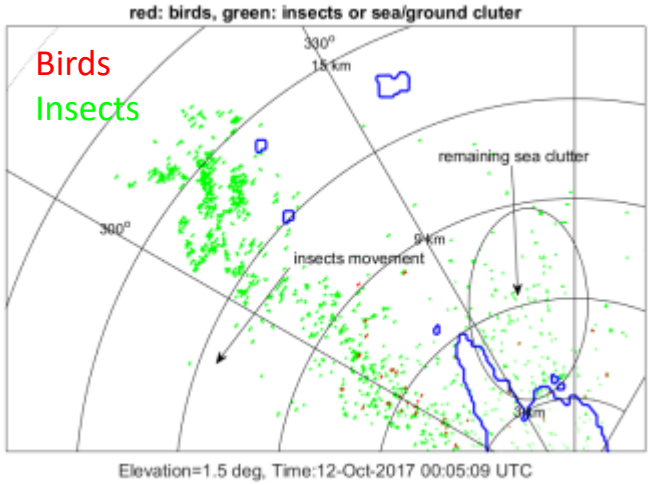
The marine surveillance radar system at CRES Demonstration Wind Farm



The marine surveillance radar system at the National Parks of Evros Delta and Dadia

Demonstration of technologies:

Parallel operation of a marine and a dual Doppler radar,
for bird migration assessment at Antikythira island ,Oct 2017

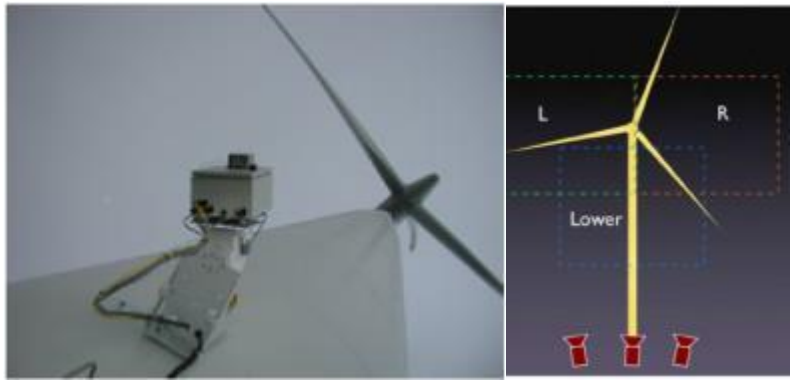


In collaboration with the National Observatory of Athens

Demonstration of technologies, Installation on wind turbines

Acoustic surveillance (bat detectors)

Thermal camera systems



Transect surveys for bats

Observations from vantage points

Demonstration of technologies:
The video surveillance system (DT Bird)

How it works

It is an automated video surveillance system, using artificial intelligence to track and locate flying birds, assess their flight trajectory and in cases of collision risk perform collision avoidance routines by:

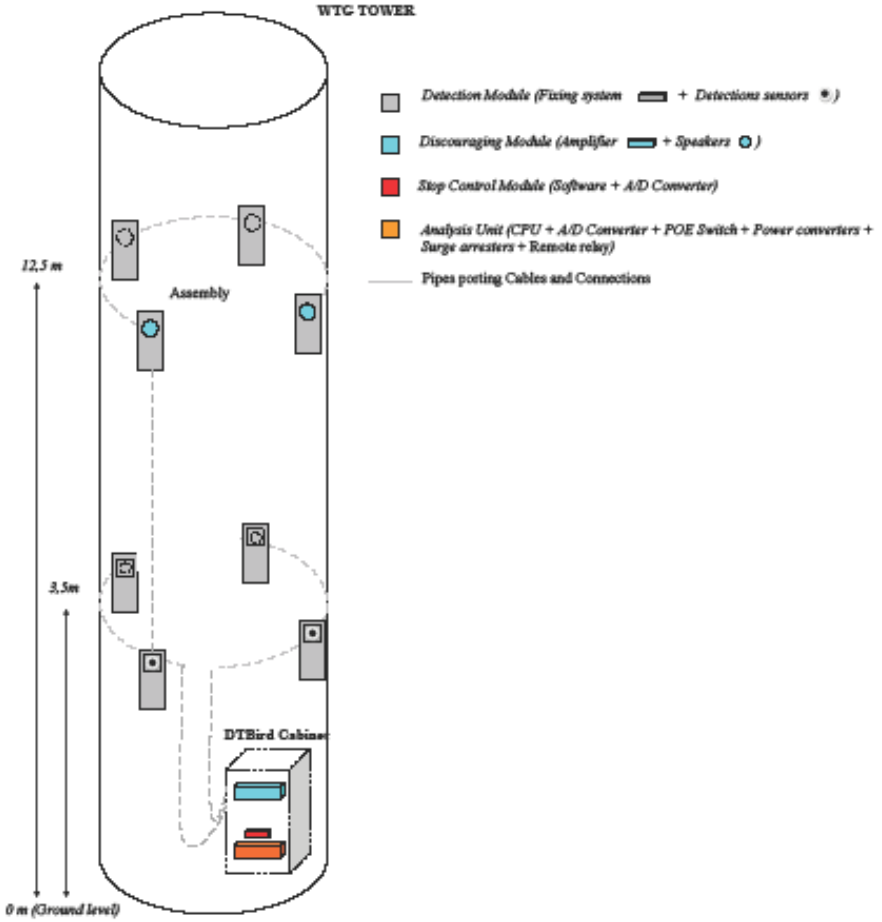
(a) Transmitting warning or scaring sounds to force birds to change their flight trajectory, in order to avoid the turbine, or/and

(b) Collaborate with the SCADA system to stop the turbine or significantly decelerate the rotation speed, in order to minimize collision risk.

DTBird installation at NEG MICON 48/750kW at CRES demonstration Wind Farm

Equipment installation with magnets

DTBird installation at NEG MICON 48/750kW at CRES demonstration Wind Farm

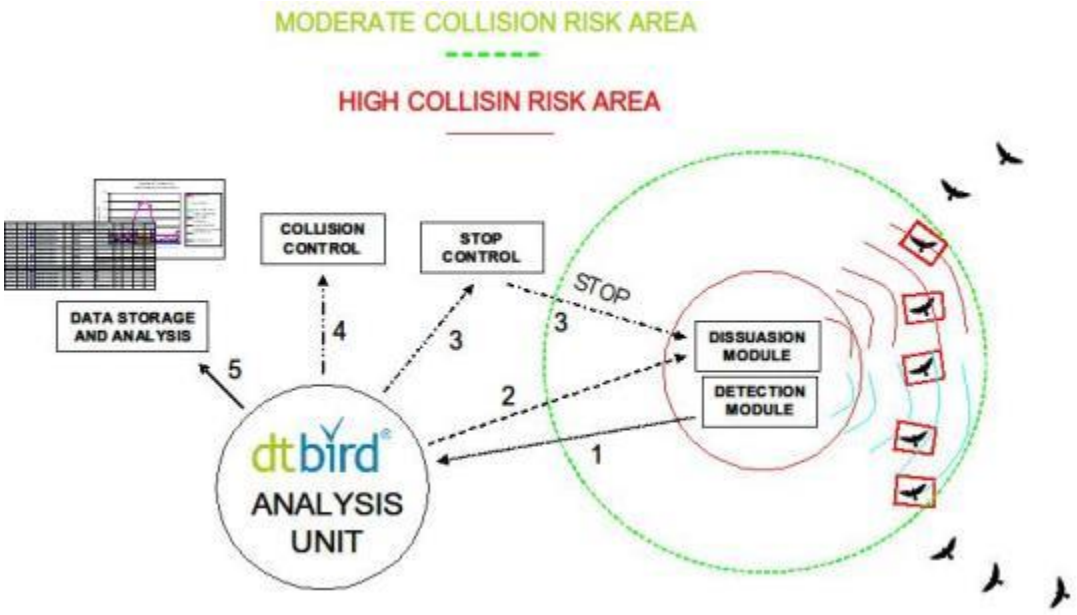


Demonstration of good practices for the mitigation of wind farm impacts on wildlife

dtbird®

4 or 8 HD cameras covering 360 ^{0}

Tracking birds in 2 perimeters and performing real time collision minimization measures



Observations:

Currently, automatic WTGs stop duration of all DTBird® Systems operating worldwide vary from 2 to 20.5 hours/WTG/Year, with an average below 8 hours/WTG/Year (including the time needed for the reactivation of the WTG).

Rotor Stop init time: 2 – 10 s after DTBird® stop trigger, depending on WTG manufacturer.

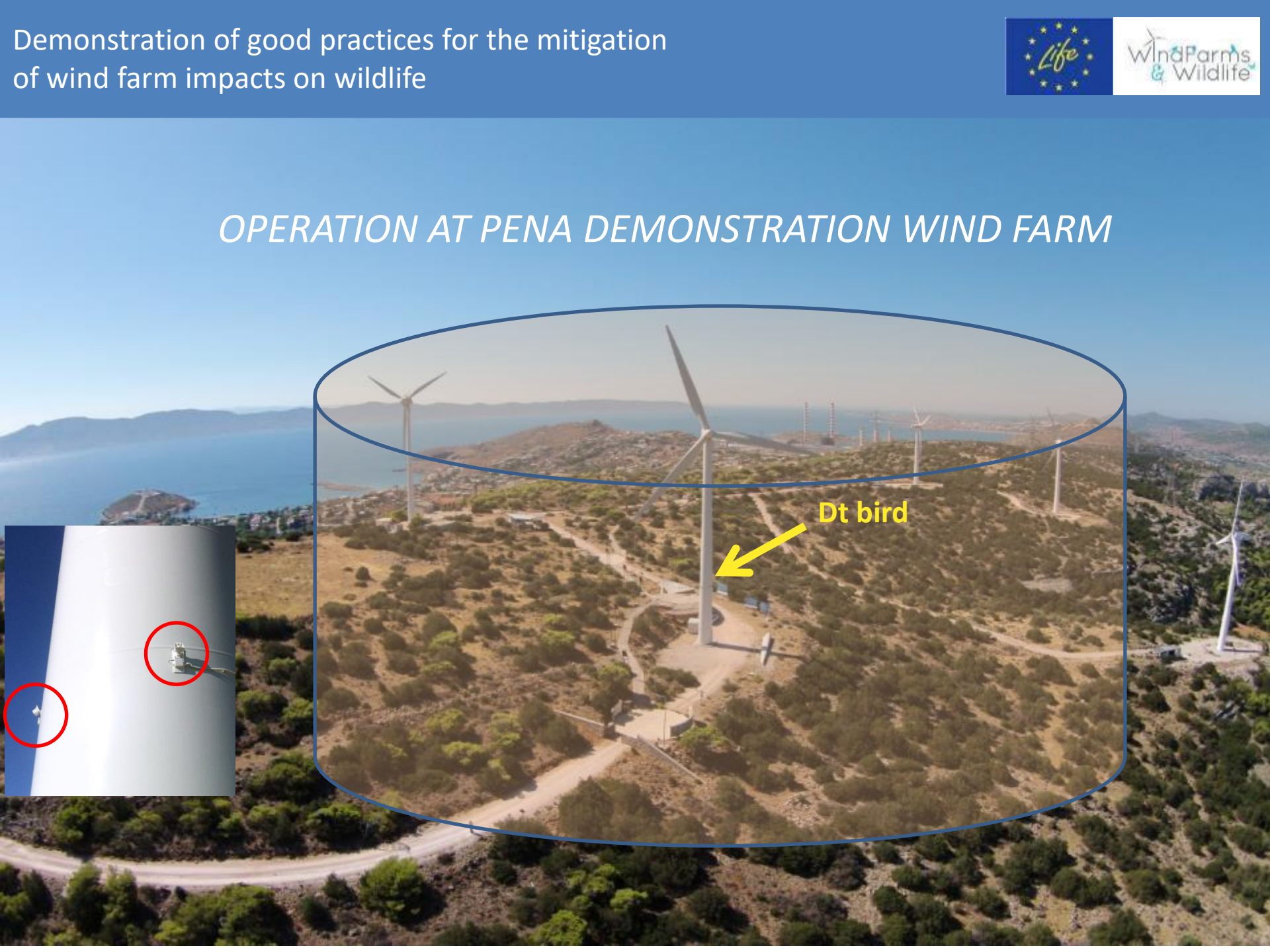
Complete rotor Stop: 10 - 25 s after WTG stop init, depending on WTG manufacturer.

Data are recorded on a **web platform** which enables statistical analysis and reporting.
To enhance **transparency & accountability**, the platform may be **directly accessible by competent authorities**

Detection distance:

BIRD WINGSPAN	SET UP RANGE
> 150 cm	200 - 600 m
75 - 150 cm	100 - 350 m
< 75 cm	25 - 175 m

OPERATION AT PENA DEMONSTRATION WIND FARM

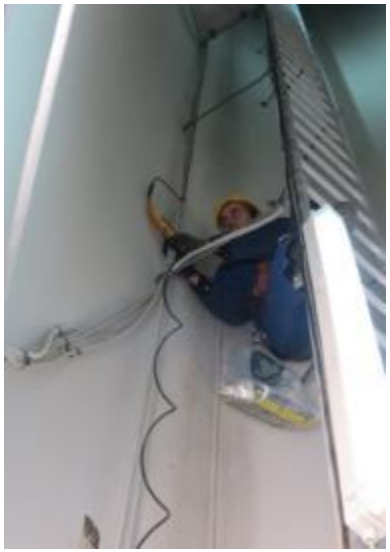


Can such a system stand alone?

- There is not any automated system intelligent enough to work without human intervention and adjustment to the specific needs of each particular site and set of sensitive species.
- A systematic ornithological monitoring project, including a carcass search component, should always run in parallel to any automated mitigation avoidance system, to evaluate its effectiveness and provide the means for adaptive mitigation of the collision risk.
- Proper collision risk assessment is required for each wind turbine, including sensitive species, for the appropriate adjustments to be made.
- A continuous effort is needed on a 24/7 basis, to assess the outcomes of the video surveillance, evaluate the events that mobilized the system mitigation routines, identify from the video clips the species that triggered the routines, and carry out field verifications for collision victims in case of suspected collision events.

Demonstration of technologies:

Installation of bat detectors at NEG MICON 48/750 kW, CRES Wind Farm-PENA



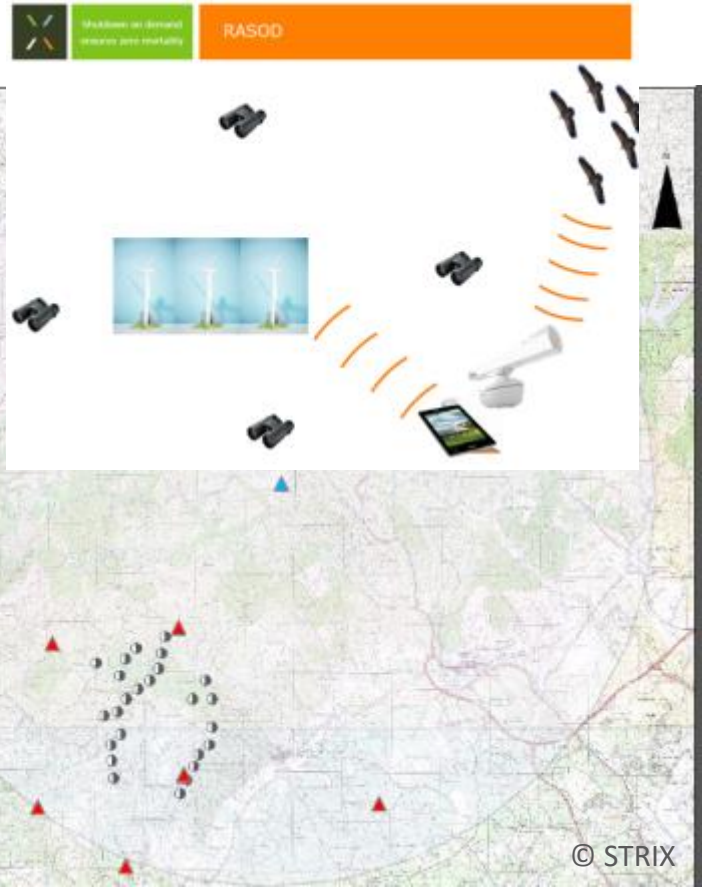
Demonstration of technologies:

Installation of bat detectors at V47/660 kW, CRES Wind Farm-PENA

… and a successful practice elsewhere:

Visual surveys and shut down on demand (for migratory species)

- Conditioned licensing
- Long-term monitoring
- Radar and visual surveillance
- Turbine temporary shutdown on demand (RASOD)



Capacity building I: Good Practice Guide, GPG

Aims to provide in a simple and comprehensive manner an **overview of the available good practices** for the **mitigation of impacts of wind energy** development on **biodiversity, in protected areas**

The GPG is based on **the EU Guidance Document** and state of the art methods and technologies, successfully applied elsewhere

It provides detailed information on the issues addressed, complementary to the available guidelines and good practice guides available at European level

The guide is addressed to:

- **Competent authorities**, facilitating monitoring and evaluation of wind energy production projects.
- **Consultancies**, providing state of the art developments which can be utilized in elaboration of **Appropriate Assessments**.
- **Energy companies**, providing information on the efficiency of methods and their impact on energy production.

Demonstration of good practices for the mitigation of wind farm impacts on wildlife

Capacity building II: Decision Support Tool, DST

Objectives

- **Enable easy initial screening** of 10x10km squares for the presence of sensitive species
- **Suggest potential mitigation practices & measures**, in case significant impacts are anticipated for sensitive species

Main Sources of DST information

- Existing Natura 2000 &biodiversity data bases
- EU Guidance Document on wind energy development and nature legislation

Landscape type: Terrastrial/Marine

Natura 2000 sites: SPA: GR4220026 **SCI:** GR4220014
Nationally designated areas: Wildlife Refugee
Important Bird Areas: GR154

Bird data coverage: SPA, SPA, IBA, IBA
Note: Publically available data incomplete on national level. Data available for Natura 2000 and IBA sites only.
Bat data coverage: NO DATA
Note: Publically available data incomplete on national level.

Sensitivity of the area to wind farm development:
The data provided below aims to provide information on the sensitivity of bird and bats in the area to potential wind farm development. The tables below indicate the presence of sensitive bird and bat species groups in the area as well as evidenced or potential risks to each species group. Species groups are separated into groups containing site's SPA or IBA trig species (indicating important populations in the area) and those without trigger species. For each group the total number of trigger and non-trigger species is presented, along with the number of species belonging to Bird Directive Annex I, number of migratory species and number of other species, which can be used for e.g. Environmental Impact Assessment or planning of mitigation measures, if required.

Important Migratory Site: Yes

Sensitive bird species groups present
Wind farm impact on sensitive species groups, number of species per group and status category (in descending order of impact):

Sensitive bird species groups with significant populations (i.e. with SPA, IBA trigger species):

	Impacts					Trigger sp.				Non-Trigger sp.				Available coll. mitigation measures				
Species group	Dist.	Col.	Bar.	Hab.	Pos.	Tri.	An.I	Mig.	Oth.	NTr.	An.I	Mig.	Oth.	Ass. gen.	Ass. sign.	Mit. cont.	Mit. seas.	Mc
Raptors	X	X	X	X		2	2	1	0	11	9	9	0	A1.1	A1.1+ A1.2	M1.1+M3.1	M1.1+M3.1,M1.1+M2.1, ((M2.2))	C
Owls		X				1	0	0	1	1	0	1	0	A1.1+ A1.2	A1.1(+ A1.3 + A1.4)	M1.1	M1.1(+M4.1)	C
Granivorous farmland birds	!					1	1	1	0	1	0	1	0					
Buntings					!	1	1	1	0	1	0	1	0					

Other, non-trigger sensitive bird species groups(i.e. without SPA, IBA trigger species):

	Impacts					Non-Trigger sp.				Available coll. mitigation measures				
Species group	Dist.	Col.	Bar.	Hab.	Pos.	NTr	An.I	Mig.	Oth.	Ass. gen.	Ass. sign.	Mit. cont.	Mit. seas.	Mon.
Larks	X	X	X	X		1	1	0	0	A1.1	A1.1	M1.1	M1.1	C1
Falcons	X	X	X	X		5	4	4	0	A1.1	A1.1(+ A1.2)	M1.1	M1.1(+M2.1)	C1
Shearwaters	X	X		X		2	2	1	0	A1.1	A1.1+ A1.2 + A1.3 (+ A1.4)	M1.1	M1.1+M2.1(+M4.1) ((M2.2))	C1

Note: Impact categories: Dist. = Disturbance, Col. = Collision, Bar. = Barrier effect, Hab. = Direct habitat loss or damage, Pos. = Potential positive effect
Impact significance: X = Evidence of or potential risk or impact, ! = small or non-significant risk or impacts, but still needs to be considered in the wind farm environmental assessment
Species status: Tri. = Number of trigger species per group, NTr. = Number of non-trigger species per group, An.I = Number of trigger species of Birds Directive Annex I per group, An = Number of trigger species of Habitats Directive Annex II per group, Mig. = Number of migratory species per group, Oth. = Number of other (non-Annex I, resident) species per grou
Available collision mitigation measures: Ass. gen. = General initial assessment, Ass. sign. = Initial assessment in case of significant expected impacts, Mit. cont. = Continuous collision mitigation measures, Mit. seas. = Seasonal collision mitigation measures, Mon. = Monitoring of impacts and the efficiency of mitigation measures
Measures:
A1.1 = Conventional bird visual and acoustic surveys: Assessment of expected impacts of the wind farm on birds based on conventional visual and acoustic bird observations
A1.2 = Radar surveys: Assessment of bird abundance and flight routes by marine surveillance radar in association with visual observations for species identification
A1.3 = Thermal imagery/night vision: Assessment of nocturnal bird activities with thermal imagery or night vision
A1.4 = Acoustic surveys: Automated recording of nocturnal bird vocal activities for the estimation of abundance and species composition
A2.1 = Conventional bat acoustic surveys: Assessment of expected impacts of the wind farm on bats based on ground-level conventional bat surveys
A2.2 = Automated ultrasonic detectors: Assessment of intensity and temporal variation of bat activities at rotor height
A2.3 = Thermal imagery/night vision: Assessment of bat activities with thermal imagery or night vision
C1 = Carcass searches: Regular assessment of aerial fauna fatalities or injuries at wind farm to assess the impacts, to adjust wind turbine operation if necessary and to assess the efficiency of collision mitigation measures if applied.
M1.1 = Conventional bird visual observations: Adjustment of wind farm operation based on conventional visual bird observations
M1.2 = Conventional bat acoustic observations: Adjustment of wind farm operation based on ground-level conventional bat surveys
M2.1 = Radar: Real-time assessment of aerial fauna presence and flight routes by simultaneous marine surveillance radar and visual monitoring in association with manual SCADA.
M2.2 = Radar: Real-time automated assessment of aerial fauna presence and flight routes with automated ornithological radar in association with automated SCADA.
M3.1 = Video surveillance system: Real-time automated assessment of bird presence and flight routes in the vicinity of wind turbine in association with dissuasion of birds and automate SCADA.
M4.1 = Thermal imagery: Assessment of intensity and temporal variation aerial fauna activities at rotor height in association with temporal wind turbine curtailment.
M5.1 = Automated ultrasonic detectors: Assessment of intensity and temporal variation of bat activities at rotor height in association with temporal wind turbine curtailment.

Evidenced sensitive species presence:
In addition to the sensitive species groups, particular species which have been identified on national or international to be at risk of wind farm impacts are provided below.
Note: XXX = Evidence on substantial risk of impact, XX = Evidence or indications of risk or impact, X = Potential risk or impact, ! = small or non-significant risk or impact, but still to considered in assessments.

Sensitive bird species with significant populations (i.e. SPA, IBA trigger species):

		Impacts					Status	
Species	Groups	Dist.	Col.	Bar.	Hab.	Pos.	An.I	Mig
Aquila fasciata	Raptors	XX	XX	X	XX			X

Conclusions from the so far project implementation (I)

- The **proper sitting of a wind farm** is the safest option to minimize the risks for the protected species in protected areas. Evidence to date indicates that appropriately sited and well designed wind energy developments are generally not a threat to biodiversity (EU Guidance document).
- **Sensitivity mapping** is an essential tool, that helps environmental permitting authorities to make informed decisions throughout each project permitting process. Important nationwide knowledge gaps, need to be covered, to enable informed decisions on land use planning on behalf of permitting authorities.
- There is an urgent **need for capacity building** in central and regional competent authorities on wind farm and wildlife interactions and effective mitigation measures, to support the environmental permitting process and the assessment of environmental compliance of each project, during its operation phase. The project GPG, DST and the planning seminars are expected to help on this issue.
- Full scale mitigation is met with the **continuous involvement of experts and field ecologists** during the project planning, sitting, assessment, and monitoring of the project performance stages. The need for integration of modern technologies with well planned field assessment programmes should be clearly identified.
- Possible cumulative effects of wind energy installations on the avian populations of large home ranges over greater geographical areas should be evaluated and incorporated on the long term national and intra-national planning for Nature Conservation/biodiversity protection.

Conclusions from so far project implementation (II)

- In cases of operating wind farms **within bird migration "bottleneck sites "** (where the sensitive period lasts for 2-3 months), the safest mitigation practice is the **shut down on demand,** through networks of trained observers coordinated by surveillance radar systems that minimize or even eliminate collision risk. Not applicable to sites with resident sensitive species due to the enormous human effort required.
- The use of marine surveillance radar systems, faces significant limitations due to the landscape features and relief of most Greek wind farm sites. But is can be a promising option when combined with other technologies and practices.
- The **automated video surveillance** system in combination with on site ornithological monitoring projects (when needed involving also telemetry) is considered to be the most effective mitigation technology, for cases like **Thrace, NE Greece, hosting large bodied resident raptors**. Such solutions should be encouraged in cases of operating wind farms **within or in the vicinity of SPAs in that region**.
- It is important for permitting authorities, wind farm develops and consultants to take into consideration the **sensitivity and ecological requirements of the protected species**, when planning new wind farm projects. The use of modern technologies and practices of proven effectiveness to mitigate impacts should be considered when is required.
- It is important that the public authorities, conservation community and wind farm developers **work together for harmonizing approaches** towards biodiversity compatible wind farm development within and in the vicinity of the Natura 2000 sites network.

Thank you for your attention
Ευχαριστούμε για την προσοχή σας