

LIFE12 BIO/GR/000554

Demonstration of good practices to minimize impacts of wind farms on biodiversity in Greece

## Windfarms & Wildlife

### Layman's Report



WindFarms  
& Wildlife





LIFE12 BIO/GR/000554

Text: M. Tzali, J. Fric / NCC, E.Tzen / CRES

Contact: Kyriakos Rossis  
Centre for Renewable Energy Sources & Saving, CRES  
19<sup>th</sup> klm. Marathonos Ave. Pikermi 19009, Hellas  
Telephone: +30 210 660 3300, 210 660 3364  
e-mail: [kros@cres.gr](mailto:kros@cres.gr)

Text photos: CRES, NCC archive, L. Sidiropoulos, N. Veljkovic, R.A.I. Machin,  
tassos (depositphotos.com)  
Cover photos: imagebrokermicrostock , TTStudio T. Sereda (depositphotos.com)  
Illustration: V. Chatzirvassanis

© CRES, 2018

Title:	<b>Demonstration of good practices to minimize impacts of wind farms on biodiversity in Greece</b>
Short name	<b>LIFE Windfarms &amp; Wildlife</b>
Code:	<b>LIFE12 BIO/GR/000554</b>
Duration:	<b>01/10/2013-31/12/2018</b>
Coordinating beneficiary:	<b>Centre for Renewable Energy Sources &amp; Saving, (CRES)</b>
Beneficiary:	<b>Nature Conservation Consultants Ltd. (NCC)</b>
Location of activities:	<b>CRES Demonstration Wind farm - Park of Energy Awareness (PENA), Private wind farms</b>
Funding:	<b>European Commission Program LIFE+, Green Fund</b>
Total Budget:	<b>894.784 €</b>
EU Funding:	<b>430.642 €</b>
Programme site:	<b><a href="http://www.windfarms-wildlife.gr">www.windfarms-wildlife.gr</a></b>



## THE OBJECTIVE

2

The overall objective of the LIFE12 BIO/GR/ 000554 project is to improve the compatibility of wind farms development with the EU's biodiversity conservation objectives in Greece.

Considering that proper siting is a prerequisite for the design of a wind farm, the program focused on the monitoring of the flying fauna (birds and bats), which can contribute to the proper siting of a wind farm in the design phase, as well as to mitigate the potential collision and barotrauma risk to flying fauna by wind farms at their operation phase.

Taking into account that available modern technologies for monitoring of flying fauna and for mitigation of potential collision risk with wind turbines are an important tool, the primary objective of the project was their demonstrative implementation under the special conditions prevailing in Greece, their evaluation and dissemination of the results to stakeholders in order promote their use in wind farms at national level.



The dissemination of the results was based mainly on

- the development of guidelines that will enable stakeholders in Greece to optimize design, to implement and evaluate methods for the reduction of the potential impacts of wind energy projects on biodiversity,
- the implementation of informative and training meetings.



## THE CHALLENGE

3

The shift towards renewable energy sources (RES) in order to tackle climate change comprises a European and national objective. In 2018, the European Commission presented a strategic long-term vision of electricity production with zero CO<sub>2</sub> emission by 2050.

Greece has set high targets for increasing the share of RES in the energy mix and saving energy. The energy strategy of Greece towards 2030 focuses on the development of RES, the penetration of natural gas as a transition fuel and the electrification of energy infrastructure. Then, after 2030 and by 2050, the national strategy sets even higher RES targets to cover almost all demand and focuses on developing interconnections, smart grids and energy storage.

Large share of RES is expected to be covered by wind energy. The expected rapid increase of wind energy production creates challenges for its potential impact on nature and wildlife, which cannot be ignored due to the predicted scale of growth.

Simultaneously, the conservation of biodiversity is also a European and national objective, and more specifically, the halt of biodiversity loss and ensuring of its conservation in favorable status. The vision of the European Union for 2050 is that the biodiversity and the ecosystem services it provides are protected, valued and appropriately restored for their intrinsic value and essential contribution to human wellbeing and economic prosperity.

Consequently, although significant development of RES infrastructure is required, in order to achieve the European and national goals, it is of crucial importance to ensure that this will be done in a way that will not compromise biodiversity conservation.



## DEMONSTRATIVE APPLICATION OF MODERN TECHNOLOGIES 4

The project team was equipped with modern technology systems and carried out their demonstrative application at CRES Demonstration Wind farm - Park of Energy Awareness (PENA) at Keratea Attikis, as well as at private wind farms.

The systems that were demonstrated and evaluated included ornithological radar, video surveillance system, thermal camera and bat detectors.

In total the examined systems were:

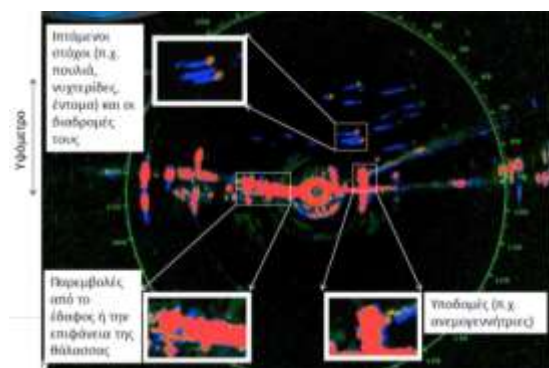
- Seven (7) different flying fauna monitoring systems.
- Three (3) different early warning and collision prevention techniques.





# ORNITHOLOGICAL RADAR

The ornithological radars have the ability to scan the three dimensional airspace around its location and record: (a) birds crossing the area, (b) the height at which they fly and (c) the routes they follow.



A marine surveillance radar was primarily used in the framework of the LIFE project, however also a meteorological radar was tested for monitoring of flying fauna. The marine surveillance radar was used at PENA and in private wind farms, in Evros river wetland, in mountainous, lowland and insular areas.

*Flying fauna monitoring:* The marine surveillance radar has the ability to detect birds in radius from 1-1,5 km up to 6 km, depending on the size of the birds.

*Impact mitigation:* The radar can operate in combination with a network of observers for the timely detection of birds and shutting-down of selected wind turbines. Automated radar systems are also available, which combined with a decision making system can trigger either emission of dissuasive sounds for the avoidance of collision, or shut-down of one or more wind turbines.

Advantages	Constraints
<ul style="list-style-type: none"> <li>Allows simultaneous recording of numerous bird movements at large distance and altitude ranges.</li> <li>Allows monitoring under conditions of low or no visibility.</li> <li>It is an ideal <b>complementary</b> tool to conventional visual recordings for limited time periods, such as migration.</li> <li>It is ideal for monitoring of nocturnal bird migration.</li> </ul>	<ul style="list-style-type: none"> <li>It is not suitable for areas with highly uneven terrain relief and high vegetation.</li> <li>Alternatively, in cases of uneven terrain relief or in large wind farms, the installation of multiple systems is required for sufficient coverage.</li> <li>Species identification requires visual observations.</li> <li>Prolonged use leads to high operational cost.</li> <li>The automated systems have a high equipment cost.</li> </ul>



## VIDEO SURVEILLANCE SYSTEM

6

Optical surveillance systems are based on the recording and analysis of high resolution images recorded by high definition cameras.

Two such systems were used in the framework of the LIFE project, which were installed on two wind turbines at CRES wind farm and at a private wind farm at the area of Evros.

*Flying fauna monitoring.* The system allows monitoring of the flying fauna movements in close vicinity to the wind turbine on which it is installed, as well as species identification by recorded data analysis.

*Impact mitigation.* The systems combined with a decision making system can trigger either emission dissuasive sounds for the avoidance of collision, or shut-down one or more wind turbines.

The recorded virtual shut-down of the wind turbine at PENA was estimated to be equivalent to annual energy production loss of 0,12 - 0,24%.



### Advantages

- Allows continuous bird recording during day in its monitoring zone.
- It has the ability of focused monitoring in areas of confirmed bird activity.
- It has relatively low installation and operation cost.

### Constraints

- In cases of a large wind farm the installation of multiple systems is required to ensure sufficient coverage.
- It is unable to locate targets under low visibility conditions and during night.
- It has limited bird detection range. It is suitable for large and medium sized birds.





# BAT DETECTORS

7

Bat detectors are based on recording of the ultrasounds emitted by bats during their flights.

Three such systems were used for demonstration in the framework of the LIFE project. They were installed at wind turbines at CRES demonstration wind farm - PENA, while hand-held devices were also used in other wind farms.

*Flying fauna monitoring:* The systems allow continuous monitoring of bat presence in close proximity to their installation point (e.g. rotor area) and species identification based on data analysis.

*Impact mitigation:* Based on the results of the systems' recordings adjustments may be applied in the wind turbine operation, either for shutting-down for specific time period, or for adjustments at its cut-in speed, where this is permissible and feasible

The main bat activity at CRES wind farm - PENA was observed at temperatures over 15°C and low wind speed.

## Advantages

## Constraints

- It is the **optimal choice** for the estimation of bat presence and potential impact of a project on them.
  - It can be applied in all types of environment.
  - It allows the monitoring of bat presence at rotor height.
  - It allows continuous data recording.
- It requires time consuming data processing by an expert.
  - It is not possible to mitigate impact in real time, due to low detection range.



## MAIN ACHIEVEMENTS OF THE PROGRAMME 8

In the framework of the project two key decision support tools have been developed within the project.

The **Good Practice Guide**, among others presents good practices for the mitigation of wind farm impact on flying fauna, which are based on modern technologies that have been successfully applied in other countries and which were demonstratively applied and evaluated within the project under specific conditions prevailing in Greece and in the Eastern Mediterranean.

The **Decision Support Tool** was developed in GIS environment and aims to assist in the initial screening of wind energy development sites by providing information on flying fauna, protected areas and species, sensitive species, as well as in the proposal of optional mitigation measures, that could potentially be used to mitigate bird and bat collision risk.

The tools developed, as well as, the project's results in general can be utilized by:

- Competent authorities and, more specific, services involved in wind farm project licensing, as well as environmental terms application monitoring,

- Investors, project managers and other professionals involved in the design, implementation or approval of wind farm plans or projects
- Environmental organizations,
- Consultants, involved in project design, licensing and monitoring of a wind farm project.





## STAKEHOLDERS TRAINING

9

Theoretical and technical seminars addressing stakeholders were implemented to demonstrate the available new technologies that were used in the framework of the project at CRES demonstration wind farm - PENA at Keratea Attikis, as well as at private wind farms, and wetland and mountainous areas.

farms on biodiversity and by the ability to attend seminars and information events.



PENA site has been and will continue to be a benchmark for informing and raising awareness of the public and stakeholders, by the provision of printed material and information on RES and their implementation, demonstration of modern technologies for the mitigation of impacts of wind



## PUBLIC AWARENESS

10

The project was presented in a series of conferences and exhibitions in the fields of the renewable energy sources and the environment, and its results were disseminated to interested parties in Greece and abroad.

It is estimated that the main wind farm investment and construction companies, consultants and environmental organizations, as well as competent authorities in Greece have been informed.

The project team participated in the organization of the technical seminar entitled «Good Practices for reconciling wind energy development and biodiversity conservation», that was implemented in 2017 by the Greek Ministry of Environment and Energy (YPEN).

A workshop was held in Athens in December 2018 for the presentation of the results of the program, with a large participation of public sector bodies, wind energy investors, environmental stakeholders, consulting companies and others.





## AFTER LIFE

11

As CRES is the National Agency for RES it is a reference point for investors and interested parties concerning the information on topics related to wind energy development in Greece. Consequently, through its operation it will continue to disseminate the project's results and experience gained.

The project partners will continue to provide technical information concerning the technologies applied in the framework of the project.

The operation of the radar, video surveillance, ultrasound recording and thermal imaging will continue in order to monitor, assess and mitigate the collision risk for the flying fauna at CRES demonstration wind farm-Park of Energy Awareness and other selected wind farms, and to demonstrate them to interested parties.

