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# EXECUTIVE SUMMARY

# 2023





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# What does the Steppe Forward Chair seek?

The Steppe Forward Chair, formed by the Autonomous University of Madrid (UAM) and the Forest Science and Technology Centre of Catalonia (CTFC), with the collaboration and support of TotalEnergies, aims to generate knowledge to reconcile biodiversity conservation with the development of photovoltaic solar plants, promoting research on agro-steppe ecosystems and their interaction with such development. Based on three lines - Research, Transfer, and Outreach - the Chair will enable the writing of scientific publications, the training of a network of researchers, the creation of technical documents available to private and public sectors, the organization of annual outreach events, and the dissemination of knowledge generated in national and international conferences, social media, and other media.





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# What have we achieved?

This executive summary integrates the activity developed by the Steppe Forward Chair during the year 2023.



## RESEARCH LINE

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# RESEARCH 2023





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## RESEARCH LINE



### Habitat use of threatened steppe bird species in the pre-operational stage of future photovoltaic solar plants

The monitoring of the diversity and abundance of steppe birds, as well as the marking of individuals with GPS devices, has continued in two areas of Spain (Abarloar photovoltaic project in Madrid and Guillena photovoltaic project in Seville) where photovoltaic plants are planned to be built. During 2023, a total of **16 individuals from 4 threatened steppe bird species** were marked, providing more data on the movement patterns at both small and large scales of these species during the pre-operational phase of the projects. The monitoring of the diversity and abundance of steppe birds has been conducted following specific standardized methodologies for target species. Additionally, **17 of the individuals tagged with transmitters in 2022** continued to send GPS data throughout 2023. In total, the 48 GPS taggings carried out since 2022 have already generated **over 1.5 million locations**, making it likely one of the largest and most diverse pre-operational bird tagging projects in Spain.

**Table 1.**

The number of tagged individuals by the Chair in 2023 and the total number of individuals tagged since the start of the project (2022-2023)

Study area	Eurasian stone-curlew	Little bustard	Lesser kestrel	Black-bellied sand-grouse	Pin-tailed sand-grouse	Montagu's harrier
MADRID	5	1	0	0	0	0
SEVILLA	0	1	5	0	0	4
TOLEDO	0	0	0	0	0	0
ZARAGOZA	0	0	0	0	0	0
<b>TOTAL (2022-2023)</b>	<b>10</b>	<b>9</b>	<b>15</b>	<b>2</b>	<b>4</b>	<b>8</b>



The Eurasian stone-curlew is a species of crepuscular and nocturnal habits, for which reason the taggings are carried out by specialized technicians and techniques by means of different capture methods and the use of thermographic cameras.



GPS transmitter used in the tagging of Montagu's harriers. The weight of the transmitters depends on the species, it never exceeds 3% of the animal's weight in order to minimize possible negative effects.

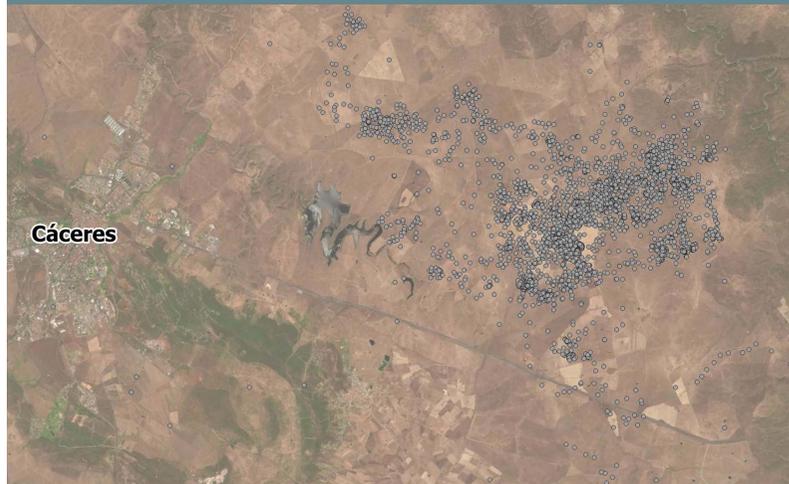


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### MONTAGU'S HARRIER



The Montagu's harriers tagged to date have shown wide dispersal movements within the Iberian Peninsula before migrating to Africa, traveling up to 600 km from the tagging area in Seville and visiting areas in Castile and León, Extremadura, and Portugal. The collected data indicate wintering areas in Mali, Senegal, and southern Mauritania, in West Africa. 3 Montagu's harriers continue to send data in 2024, and the death of 2 individuals has been confirmed with unknown causes.

One of the dispersal areas used by two of the marked Montagu's harriers was Llanos de Cáceres, a high ecological value agro-steppic area, visited in June.



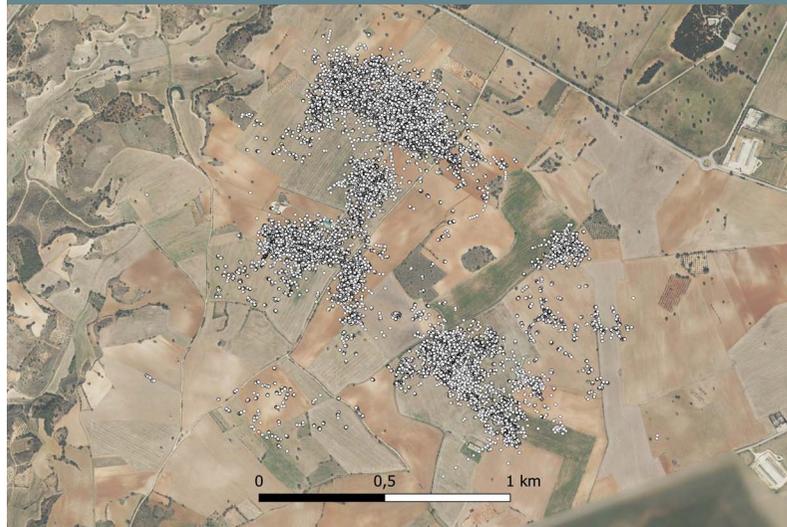


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### LITTLE BUSTARD



The information provided by the tagging of little bustards in 2022 and 2023 has shown dispersal movements of more than 200 km from the breeding areas, visiting areas such as Zamora, Soria, or Évora (Portugal). In the breeding areas, little bustards have shown a very small ranging area of less than 10 km<sup>2</sup> during the spring. This behavior is typical for this species with a dispersed lek mating strategy, where males remain in one or several adjoining plots while performing their mating ritual. 5 little bustards continue to send data in 2024, and the death of 2 individuals has been confirmed likely preyed by a raptor.

Little bustards generally exhibit a very reduced home range during breeding season.



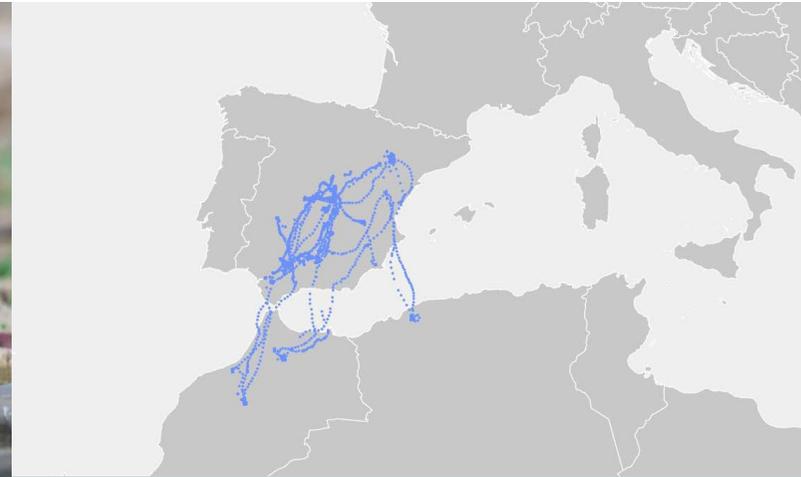


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### EURASIAN STONE-CURLEW



Of the 10 Eurasian stone-curlews tagged since 2022, 3 have wintered on the coasts of Morocco and Algeria, and 7 in southern Spain. Data collected by GPS shows that at least 4 of the 5 tagged in 2022 have returned to the same breeding areas in 2023 for breeding. Regarding their foraging areas, these have been proven to be very limited during the breeding season, with some months having areas of less than 3 km<sup>2</sup>. In 2023, one of the marked stone-curlews showed signs of possible successful breeding within a photovoltaic plant in Toledo.

Landscape structures and field margins may influence the behavior of species, like in the case of this Eurasian stone-curlew individual.



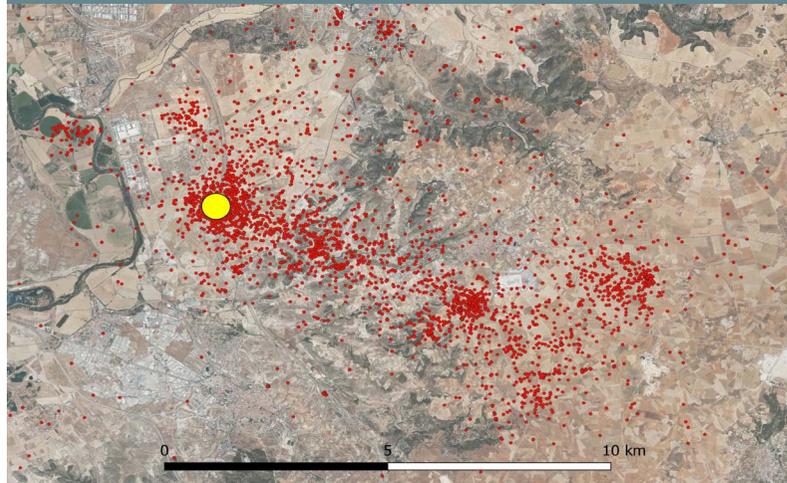


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### LESSER KESTREL



The limitations of the GPS model used for tagging Lesser kestrels due to its weight, require the individual to fly near the data reception antenna to download the collected GPS data. This reduces the information obtained for this species. However, two individuals marked in 2022 in Seville have data downloaded from 2023, showing their wintering areas located in Senegal and Mali, in West Africa. During the breeding season individuals have shown ranging areas of less than 500 km<sup>2</sup>.

The daily movements of Lesser kestrels vary depending on where food is available. In this case, the movements of the individuals marked in a breeding colony in Madrid (yellow point) reach the agro-steppic area of Campo Real, located 7 km east of the colony.



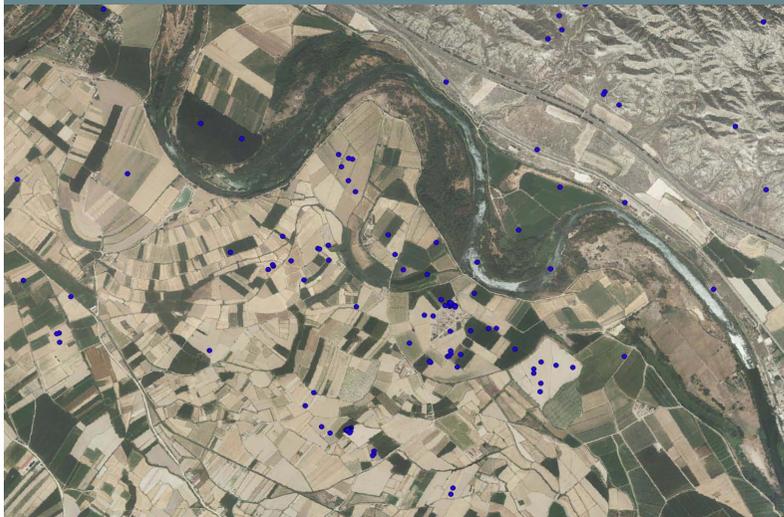


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### PIN-TAILED SANDGROUSE BLACK-BELLIED SANDGROUSE



Since the inception of the Chair, tagged Pin-tailed sandgrouse and Black-bellied sandgrouse have shown relatively short dispersal movements compared to other species with a maximum of 80 km. Regarding breeding, one Black-bellied sandgrouse and one Pin-tailed sandgrouse, both marked in Zaragoza, showed signs of possible egg hatching in 2022, but none in 2023. These two individuals are the only ones still providing data in 2024, while the death of 1 Pin-tailed sandgrouse individual has been confirmed, with unknown causes.

Some tagged Pin-tailed sandgrouse individuals have shown movements of several kilometers from the breeding area to access water, like in this case; to agricultural fields near the river.



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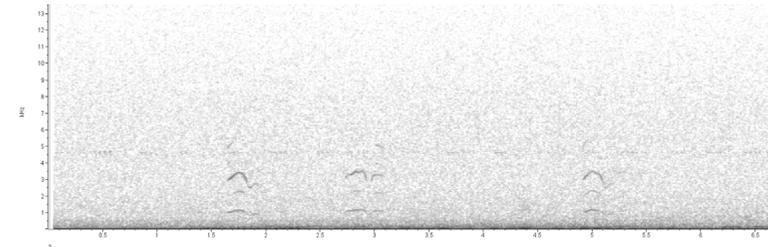


### Assessment of the “lake effect” of photovoltaic solar plants on migratory birds

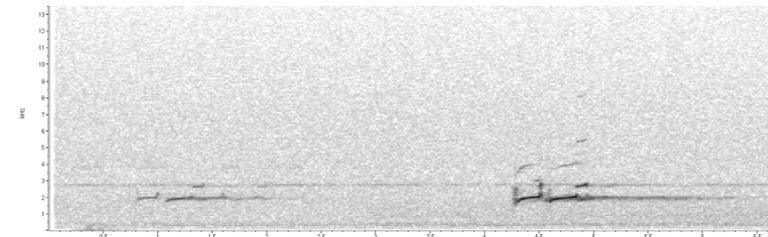
To study the potential attraction effect of photovoltaic panels on birds, nocturnal bird migration acoustic monitoring has begun in 3 areas where photovoltaic solar projects are planned (Dehesa Nueva del Rey in Toledo, Guillena in Seville, and San Pedro in Murcia). Wetlands are resting and feeding habitats for waterbirds, which they visually identify at night by the reflected light on the water surface. There are indications from other countries that photovoltaic panels might be mistaken for water surfaces during nocturnal migration, as they also reflect this light, potentially creating an attraction effect that could lead to collisions with the panels during migration. This hypothesis is referred to as the “lake effect.” By using sound recorders to capture bird vocalizations during these nocturnal flights and subsequently identifying the species using artificial intelligence tools, it is possible to determine the species and the relative abundance of birds that have flown over the area, thus allowing the evaluation of this potential attraction effect.

36 acoustic recorders were placed during the autumn migration as a first monitoring activity in 2023 and has provided the opportunity to acquire information on the migratory patterns of the target species during the pre-operational phase of each project. Additionally, 10 recorders were added during the spring migration as a pilot study and were installed in the already constructed La Asomada plant in Murcia.

This is a pioneering research project aiming to analyze at analyzing the potential impacts of photovoltaic plants, which have been poorly studied in Europe to date.



Graphical representation of a nocturnal flight vocalization (sonogram) of a Eurasian curlew.



Graphical representation of a nocturnal flight vocalization (sonogram) of a Eurasian curlew.





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Location of study areas for the lake effect hypothesis. La Asomada was sampled in the spring, unlike the other areas which were sampled in summer and autumn.

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**4 / Study areas**

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**36 / Acoustic recorders installed**

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**4 / Monitoring months**

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**3 / Obtained TeraBytes of recordings**

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**2 / Current use of AI tools for analysis**

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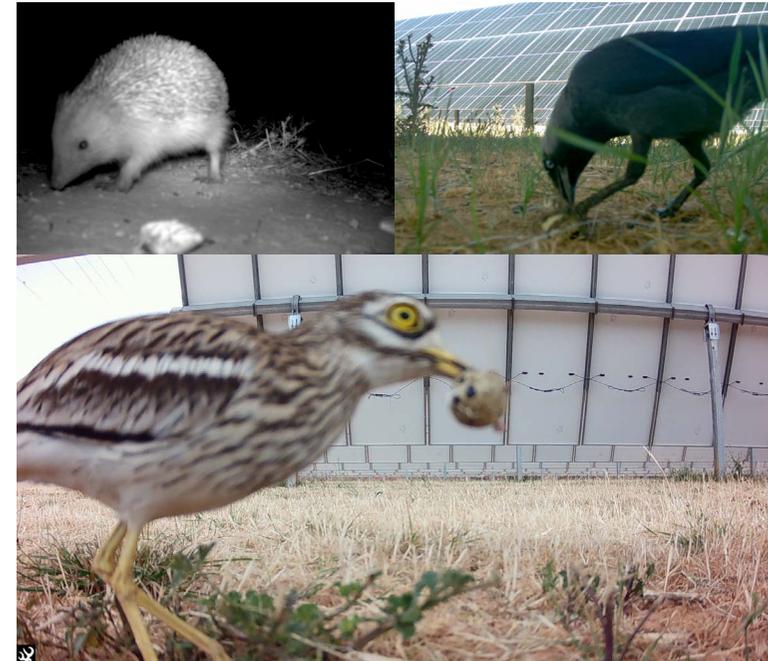


### Pilot test to evaluate the effect of photovoltaic solar plants on nest predation

In the spring of 2023, a **pilot experiment on nest predation rates within photovoltaic solar plants** (La Asomada, in Murcia) was conducted using artificial nests and camera traps that allow for predator identification. Initial results seem to indicate that there are no differences in predation rates between inside and outside the plant; however, the intention is to continue and expand the study to other photovoltaic plants and improve its design to obtain more robust results.



Example of an artificial nest used in the study (left) and a natural nest of the Eurasian stone-curlew (right). In each location 3 quail eggs were placed, one of which was filled with plaster to identify signs of predation. Additionally, camera traps were placed at 14 nests to complement identification through images. The nests were checked 12 and 23 days after placement.



Common hedgehog (top left), Western jackdaw (top right), and Eurasian stone-curlew (bottom right) identified as predators in this study.

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**55** / Artificially recreated nests

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**14** / Installed camera traps

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**23** / Monitoring days

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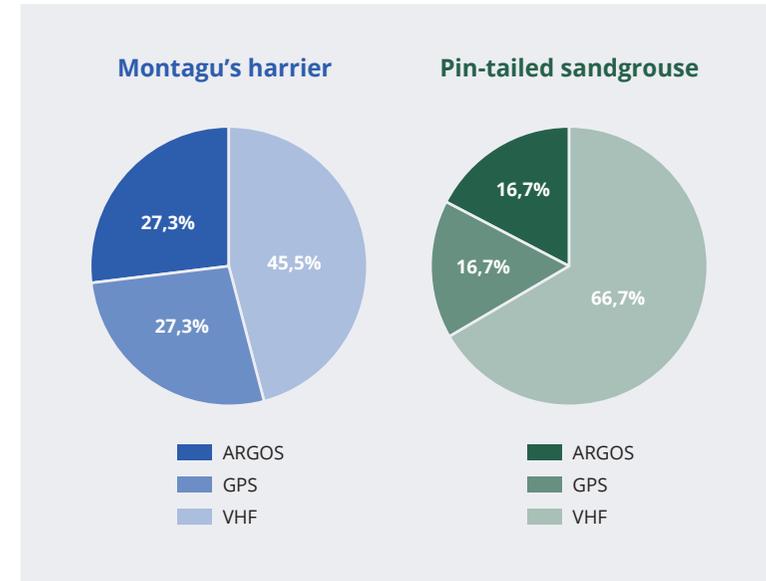
**3** / Identified predator species

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## Literature review of home ranges of seven steppe bird species

A **review process of existing scientific literature on the characterization and analysis of home ranges** of seven steppe bird species has begun in order to detect the level of existing knowledge. Understanding the home ranges of different species throughout their life cycles is relevant in assessing the spatial scale of the potential impacts of photovoltaic projects. In 2023, existing literature for four species has been reviewed, three of which have shown significant limitations in information regarding their home ranges.



Preliminary results on the frequency of use of different types of positioning devices in reviewed scientific studies for the Montagu's harrier (left, in blue) and for the Pin-tailed sandgrouse (right, in green). The types of devices vary in the method of obtaining and sending location data and are: GNSS (Global Navigation Satellite System; data obtained via satellites and sent through mobile networks or manual download; high precision and high data frequency); ARGOS (Advanced Research Global Observation Satellite; data obtained and sent via satellites; low precision and high data frequency); and VHF (Very High Frequency; data obtained and sent manually via fixed or mobile radiofrequency antennas; medium to high precision and low data frequency).





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## RESEARCH LINE



## Expansion of the research team

During 2023, Laura Solé Bujalance joined the research team of the Chair thanks to a **doctoral student contract**. Her thesis will focus on analyzing different interactions between solar photovoltaic plants and bird communities in agro-steppic environments.



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PhD student

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### Collaboration with other projects

During 2023, collaboration began with the **ELECTROSTEPPE** project “Evidence-based solutions for an ecological transition compatible with the conservation of Iberian steppe birds,” which ends in 2024. This is a competitive research project funded by the Ministry of Science and Innovation, led by the National Museum of Natural Sciences (CSIC) and the Institute of Research in Game Resources (CSIC-UCLM), where **4 researchers from the Chair** actively participate in the research team.

The overall objective of the ELECTROSTEPPE Project is to provide solid scientific evidence for the development of renewable energy projects in Spain that significantly mitigate negative impacts on populations of steppe birds of high conservation interest.



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Collaboration with external projects

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## Publication of scientific articles

Researchers from the Steppe Forward Chair have participated, along with other research entities, in the publication of **2 scientific articles** in international journals related to the Chair's objectives.



# 2

### Participation in two published scientific articles





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## RESEARCH LINE

PeerJ

### Temporal trends of land-use favourability for the strongly declining little bustard: assessing the role of protected areas

David González del Portillo<sup>1</sup>, Manuel B. Morales<sup>1</sup> and Beatriz Arroyo<sup>2</sup>

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<sup>2</sup>Instituto de Investigación en Recursos Cinegéticos (IREC, CSIC-UCLM-JCCM), Ciudad Real, Spain

#### ABSTRACT

The little bustard (*Tetrax tetrax*) is a steppe bird strongly and negatively influenced by agricultural intensification in Europe. Here, we use the little bustard as a model species to examine how favourability (relative occurrence likelihood of a species based on environmental characteristics, such as habitat availability) varies regionally with degree of protection in north-western Spain. The Natura2000 network is one of the main biodiversity conservation tools of the European Union, aiming to protect areas hosting species of conservation concern from unfavourable land-use changes. The network covers many landscapes across the continent, including farmland. Additionally, we examine the relationship between trends in land-use favourability and little bustard population trends over a decade in the Nature Reserve of Lagunas de Villafáfila, a protected area also in the Natura2000 network where active and intense management focused on steppe bird conservation is carried out. Favourability was much greater in Villafáfila than in both protected areas with lower degree of protection and in non-protected areas. Land-use favourability increased slightly between 2011 and 2020 both in and out of protected areas, whereas little bustard populations declined sharply in that period, even in Villafáfila. Spatial variations in little bustard abundance within Villafáfila depended on social attraction (increasing with the number of neighbouring males) but not significantly on small-scale variations in land-use favourability. These results suggest that land-use management in Natura2000 areas needs to be more conservation-focused, favouring natural and seminatural habitats and traditional farming practices to improve land-use favourability for little bustards and other steppe birds. Additional factors, such as field-level agricultural management or social interaction variables that may cause an Allee effect, should be incorporated in little bustard favourability models to improve their use in conservation planning.

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Academic editor  
James Roper

Additional Information and  
Declarations can be found on  
page 16

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OPEN ACCESS

**Subjects** Biogeography, Conservation Biology, Ecology, Zoology, Natural Resource Management  
**Keywords** Cereal steppes, Conspecific attraction, Farmland birds, Population trends, Nature reserves

#### INTRODUCTION

Land-use change is among the main causes of biodiversity loss (Diaz et al., 2019) due to an associated decrease in habitat suitability for many species (Thuiller, 2007). In many places today, land use in agriculture is becoming more intensive to increase yield and income.

**How to cite this article** González del Portillo D, Morales MB, Arroyo B. 2024. Temporal trends of land-use favourability for the strongly declining little bustard: assessing the role of protected areas. PeerJ 12:e16661. <https://doi.org/10.7717/peerj.16661>

Article co-led by the Autonomous University of Madrid and the Research Institute on Game Resources (IREC, CSIC-UCLM-JCCM) and published in the journal PeerJ, where David González del Portillo (technician) and Manuel B. Morales (coordinator) associates of the Chair participated as co-authors.

### Temporal trends in land-use favorability for strongly declining little bustard: assessing the role of protected areas.

The little bustard (*Tetrax tetrax*) is a steppe bird strongly and negatively influenced by agricultural intensification in Europe. Here, we use the little bustard as a model species to examine how favourability (relative occurrence likelihood of a species based on environmental characteristics, such as habitat availability) varies regionally with degree of protection in north-western Spain. The Natura2000 network is one of the main biodiversity conservation tools of the European Union, aiming to protect areas hosting species of conservation concern from unfavourable land-use changes. The network covers many landscapes across the continent, including farmland. Additionally, we examine the relationship between trends in land-use favourability and little bustard population trends over a decade in the Nature Reserve of Lagunas de Villafáfila, a protected area also in the Natura2000 network where active and intense management focused on steppe bird conservation is carried out. Favourability was much greater in Villafáfila than in both protected areas with lower degree of protection and in non-protected areas. Land-use favourability increased slightly between 2011 and 2020 both in and out of protected areas, whereas little bustard populations declined sharply in that period, even in Villafáfila. Spatial variations in little bustard abundance within Villafáfila depended on social attraction (increasing with the number of neighbouring males) but not significantly on small-scale variations in land-use favourability. These results suggest that land-use management in Natura2000 areas needs to be more conservation-focused, favouring natural and seminatural habitats and traditional farming practices to improve land-use favourability for little bustards and other steppe birds. Additional factors, such as field-level agricultural management or social interaction variables that may cause an Allee effect, should be incorporated in little bustard favourability models to improve their use in conservation planning.

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Land Use Policy 128 (2023) 106592

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: [www.elsevier.com/locate/landusepol](http://www.elsevier.com/locate/landusepol)

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### Addressing the challenge of photovoltaic growth: Integrating multiple objectives towards sustainable green energy development

Virgilio Hermoso<sup>a,b,c,\*</sup>, Gerard Bota<sup>b</sup>, Lluís Brotons<sup>b,c</sup>, Alejandra Morán-Ordóñez<sup>b,c</sup>

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**ARTICLE INFO**

**Keywords:**  
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Planning  
Landscape  
Margins  
Objectives  
Trade-offs

**ABSTRACT**

Photovoltaic production is growing globally thanks to climate change mitigation efforts. However, this growth is seldom planned which can lead to conflicts with other land uses, mostly agriculture and biodiversity conservation. There is, therefore, urgent need for adequate planning to minimise potential conflicts. We demonstrate how to identify priority areas for photovoltaic development to meet projected targets for 2050, as well as critical areas for the maintenance of different types of agriculture and biodiversity conservation, using Catalonia (NE Spain) as a case study. We tested three planning scenarios simulating alternative photovoltaic development models: setting targets at the whole regional scale or splitting those targets across counties distributing them equitably by county energy demand or area available for photovoltaic development. Photovoltaic targets could only be achieved when setting targets at the whole of Catalonia scale, although leading to heterogeneous distribution of development efforts and associated impacts on agriculture and biodiversity across counties. Setting targets for each county based on energy demand was far from achieving the regional photovoltaic development target, driven by the limited land available in some highly urbanised counties, where energy demand concentrates. On the other hand, setting targets based on area available within each led to the most equitable distribution of potential impacts of photovoltaic development, while also approaching the regional photovoltaic development target. Adequate planning of photovoltaic development will be key to ensure that photovoltaic development does not flourish at the expenses of other land uses, like maintenance of agricultural production or biodiversity.

**1. Introduction**

The urgent call to mitigate the impacts of climate change (IPCC, 2022) and halt ecosystem degradation and biodiversity loss (IPBES, 2019) are triggering environmental policies globally, with a focus on reducing greenhouse emissions, while promoting sustainable development and biodiversity conservation. Europe has developed and updated several of such policies in the last five years. For example, the European Green Deal (EC, 2019) has set ambitious emission reduction targets by 2030 (-55% compared to 1990 levels) across many sectors (industry, energy, transport and farming) with a vision of a fast transition towards climate neutrality by 2050 in line with the goals set by the Paris Agreement (UNFCCC, 2015). Some of the actions to achieve these goals include the promotion of both sustainable mobility and food production, a reduction in the use of natural resources by transitioning towards a circular economy, the development of a power sector based largely on renewable sources or the restoration of habitats with high climate change mitigation potential. The European Union (EU) Biodiversity Strategy for 2030 (EC, 2020) or the new Forest Strategy for 2030 (EC, 2021) constitute fundamental pillars of the European Green Deal, in recognition of the fact that biodiversity loss and climate change are tightly interlinked (Pörtner et al., 2021). Any effort directed at increasing nature protection and reversing ecosystem degradation will also play an important role in mitigating, and adapting to, climate change (nature-based solutions; Cohen-Shacham et al., 2016).

However, the rapid implementation of some of these actions, supported by financing mechanisms set by the European Commission to fight climate change (e.g., Next Generation funds) or reduce the EU's energy dependency on Russia (e.g., REPowerEU Plan; EC, 2022), is leading to potential conflicts and trade-offs between the objectives of the

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0264-8377/© 2023 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Article led by the University of Seville and the Forest Science and Technology Centre of Catalonia, with the participation of the Center for Ecological Research and Forestry Applications (CREAF), published in the journal Land Use Policy, where Gerard Bota (coordinator) associate of the Chair participated as co-author

### Addressing the challenge of photovoltaic growth: Integrating multiple objectives towards sustainable green energy development.

Photovoltaic production is growing globally thanks to climate change mitigation efforts. However, this growth is seldom planned which can lead to conflicts with other land uses, mostly agriculture and biodiversity conservation. There is, therefore, urgent need for adequate planning to minimise potential conflicts. We demonstrate how to identify priority areas for photovoltaic development to meet projected targets for 2050, as well as critical areas for the maintenance of different types of agriculture and biodiversity conservation, using Catalonia (NE Spain) as a case study. We tested three planning scenarios simulating alternative photovoltaic development models: setting targets at the whole regional scale or splitting those targets across counties distributing them equitably by county energy demand or area available for photovoltaic development. Photovoltaic targets could only be achieved when setting targets at the whole of Catalonia scale, although leading to heterogeneous distribution of development efforts and associated impacts on agriculture and biodiversity across counties. Setting targets for each county based on energy demand was far from achieving the regional photovoltaic development target, driven by the limited land available in some highly urbanised counties, where energy demand concentrates. On the other hand, setting targets based on area available within each led to the most equitable distribution of potential impacts of photovoltaic development, while also approaching the regional photovoltaic development target. Adequate planning of photovoltaic development will be key to ensure that photovoltaic development does not flourish at the expenses of other land uses, like maintenance of agricultural production or biodiversity.

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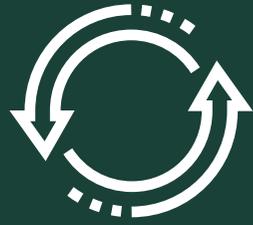
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# TRANSFERENCE 2023





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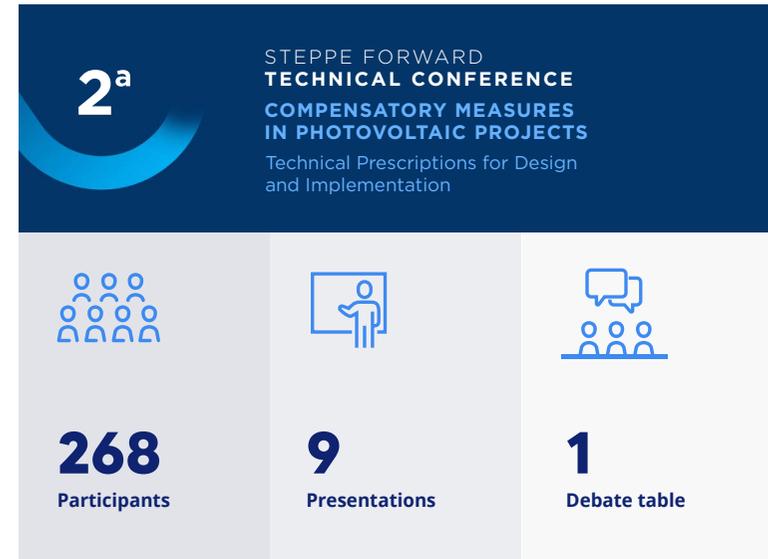
## TRANSFERENCE LINE



### Celebration of the 2nd Steppe Forward Technical Conference

The **2nd Steppe Forward Technical Conference** was held in Madrid. These technical conferences were initiated in 2022 with the aim of being an annual meeting point for various stakeholders (administrations, energy sector, scientific community, environmental consultants, etc.) to transfer and discuss relevant aspects related to photovoltaic development and biodiversity conservation.

This year's event was titled "Compensatory Measures in Photovoltaic Projects: Technical Prescriptions for Design and Implementation at Different Scales," featuring **9 presentations and 1 high-level technical and scientific panel discussion**. The event was a great success, with **268 attendees**, who highly appreciated the logistics and theme of the day.



From left to right: Manuel B Morales (Coordinator of the Steppe Forward Chair), Yago Mancebo (General Director of TotalEnergies), Irene Aguiló (General Director of Biodiversity and Forest Management of the Comunidad de Madrid), Fidel Rodríguez (General Director of FUAM) and Gerard Bota (Coordinator the Steppe Forward Chair).





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From left to right: Javier Sáenz ( ), Yago Mancebo (General Director of Total Energies), Hugo Morán (Environment State Secretary), Gerard Bota (Coordinator of the Steppe Forward Chair) and Manuel B Morales (Coordinator of the Steppe Forward Chair).

### Participant Profile Types (%)

#### Speakers:

- Scientific Community
- Administrations
- Environmental NGOs

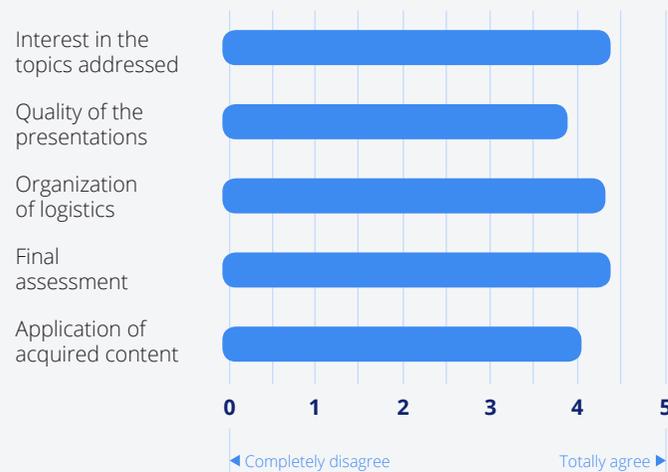


#### Attendees:

- Environmental Consulting
- Industrial Sector
- Administrations
- Scientific Community
- Environmental NGOs



### Assessment of the Workshop by attendees



### Number of attendees by origin





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## TRANSFERENCE LINE



### Technical field visit between the three entities of the Chair

For the second consecutive year, a **technical field visit** was conducted. This year, the visit took place in Catalonia to learn about **the implementation of compensatory measures aimed at steppe birds in the Segarra-Garrigues** irrigation project. The CTFC acts as the scientific entity responsible for coordinating and scientifically evaluating the monitoring of compensatory measures in this Segarra-Garrigues irrigation canal project. Their implementation model, based on adaptive management measures through continuous reassessment of their effectiveness, will serve as inspiration for implementing compensatory measures in photovoltaic projects for TotalEnergies technicians. The event was supported by personnel from Aigues Segarra-Garrigues and Infraestructures.cat, the entities responsible for implementing the compensatory measures.



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### Creation of the Observatory of scientific literature related to photovoltaic solar energy and biodiversity

With the aim of providing a quick search and consultation tool to facilitate access to existing scientific knowledge on the topic **a specific web repository of scientific bibliography** has been created for technicians in both the public and private sector. This repository gathers all scientific literature published to date worldwide on the impacts and benefits of photovoltaic solar energy on different components of biodi-

versity, as well as the mitigation measures applied to minimize the negative impacts. Currently, this Observatory contains **180 articles**, and the **goal is to update it regularly** with new advances in knowledge on the subject worldwide. The tool includes search features, a **brief summary of the main results and conclusions**, as well as a link to the original publication.



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**RESULTADOS**

Titulo de la publicación	Región	País	Contexto	Componente	Tema	Enfoque	Año
Multicriteria Decision Analysis of Suitable Location for Wind and Photovoltaic Power Plants on the Iles-pagos Islands	América del Sur	Ecuador	Regional o escala global	Iniciativas de conservación	Mitigación	Empírico	2023
Developing conservation systems to support biodiversity on solar farms					Mitigación	Revisión	2023
Green or red? Environmental challenges from photovoltaic technology					Impacto	Revisión	2023
Addressing the challenge of photovoltaic growth: Integrating multiple objectives towards sustainable green energy development	Europa	Spain	Regional o escala global		Mitigación	Empírico	2023
The use of solar farms by bats in mosaic landscapes: Implications for conservation	Europa	Hungary	Agricultura / Bosque / Herbazal	Quilómetros	Impacto	Empírico	2023
Solar Energy-driven Land-cover Change Could Alter Landscapes Critical to Animal Movement in the Continental United States	América del Norte	USA	Regional o escala global	Mantener	Impacto	Empírico	2023
Valuation of pollination services from habitat management: a case study of utility scale solar energy facilities in the United States	América del Norte	USA	Regional o escala global	Servicios ecosistémicos	Impacto	Empírico	2023
Predicting patterns of solar energy buildout to identify opportunities for biodiversity conservation	América del Norte	USA	Regional o escala global		Impacto	Empírico	2023
Mapping photovoltaic power stations and assessing their environmental impacts from multi-sensor datasets in Massachusetts, United States	América del Norte	USA	Regional o escala global		Impacto	Empírico	2023
Of Miocene miobenthic and miotrochids: The population genetic structure of a species impacted by solar energy development	América del Norte	USA	Océano	Plantas	Impacto	Empírico	2023
Renewable energies and land use changes in the South of the Iberian Peninsula: a geographical interpretation of the national energy policies	Europa	Spain / Portugal	Regional o escala global		Impacto	Empírico	2023

Example of a list of scientific articles that meet the search criteria set by the user.

**Resumen de resultados**

We examined opportunities for pollination services from pollinator-friendly utility-scale solar facilities adjacent to 42 million hectares of pollination-dependent crops in the continental United States at high resolution of 1 ha. Creating pollinator habitats at the 217 utility-scale solar facilities in these states could support adjacent 80,000 hectares of high pollinator dependent crops, which could potentially generate a pollination value of \$120 to \$264 million USD.

Example of a summary sheet of an article

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### Attendance at conferences and workshops

The Chair has participated in **1 scientific conference and 1 technical workshop**.

Some of the provisional results to date within the framework of the Chair were presented at the **1st technical workshop of the Steppe Bird Research Group (GIAE)**. In the workshop held in December 2023, **2 presentations** were given, one on migration patterns of the Little Bustard and the other on the literature review of vital areas of steppe bird species.

Additionally, the Chair was represented by Gerard Bota (coordinator) at a technical training workshop organized by BiodiversityNode and Naturgy titled "Compensatory measures and agricultural management programs for the conservation of steppe birds."



**1**

Technical sessions



**1**

Scientific meeting

**MADRID**

1st GIAE Conference  
**December 14-15, 2023**

**MADRID**

Compensatory measures and agricultural management programs for the conservation of steppe birds  
**December 13, 2023**



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# OUTREACH 2023





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## UTREACH LINE

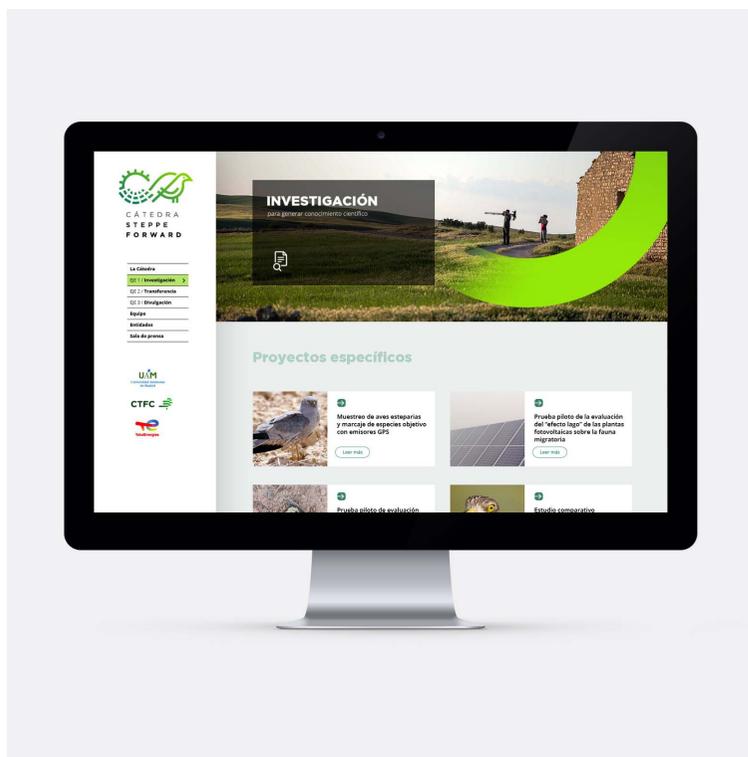


### Website update [www.steppeforward.eu](http://www.steppeforward.eu)

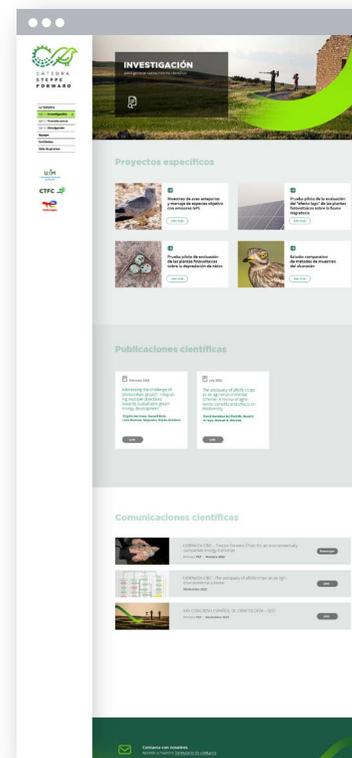
An update on the format and content of the website that has been carried out, including new sections. During 2023, **the website received 5,800 views from 1,400 users from 10 different countries.**

#### Country of origin of users:

- 884 ● SPAIN
- 131 ● UNITED STATES
- 105 ● FRANCE
- 232 ● OTHERS (Finland, Netherlands, Austria, Ireland, Germany, Portugal, and China)



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## UTREACH LINE

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**TRANSPERENCIA**

La transparencia es un pilar fundamental de la confianza y la credibilidad. En Catedra Steppe Forward, nos comprometemos a ser transparentes en todos nuestros procesos, desde la gestión de los recursos hasta la ejecución de los proyectos.

**Jornadas técnicas**

**1ª JORNADA TÉCNICA STEPPE FORWARD: BARBECHOS AMBIENTALES EN ZONAS ESTEPARIAS**

Manuals y guías de buenas prácticas

Banco de publicaciones científicas

Observatorio de bibliografía científica relacionada con la energía solar fotovoltaica y la biodiversidad

Comunicación y transparencia

UAM, CTFC, TotalEnergies

**TRANSPERENCIA**

**1ª JORNADA TÉCNICA STEPPE FORWARD: BARBECHOS AMBIENTALES EN ZONAS ESTEPARIAS**

22 NOVEMBRE 2022

TOLDO

Se ha celebrado en Toledo la 1ª Jornada Técnica Steppe Forward. Esta jornada de trabajo ha sido el primer paso de un proceso de colaboración que permitirá a los participantes de las regiones de Castilla-La Mancha y Aragón compartir conocimientos y experiencias en el campo de la gestión ambiental de las estepas.

Se han presentado y debatido los resultados de los trabajos realizados por los participantes, así como los planes de trabajo para el futuro. La jornada ha sido un éxito y ha permitido establecer un canal de comunicación directa entre los participantes de las diferentes regiones.

Se han presentado y debatido los resultados de los trabajos realizados por los participantes, así como los planes de trabajo para el futuro. La jornada ha sido un éxito y ha permitido establecer un canal de comunicación directa entre los participantes de las diferentes regiones.

Videos de las ponencias

Algunos datos de la jornada

1ª JORNADA TÉCNICA STEPPE FORWARD: BARBECHOS AMBIENTALES EN ZONAS ESTEPARIAS

116 participantes

10 ponencias

1 sesión de trabajo

100% de satisfacción

**DIVULGACIÓN**

La divulgación es un pilar fundamental de la transparencia y la credibilidad. En Catedra Steppe Forward, nos comprometemos a ser transparentes en todos nuestros procesos, desde la gestión de los recursos hasta la ejecución de los proyectos.

**Videos**

generar energía limpia y conectar la naturaleza

Se cree para avanzar hacia un futuro sostenible

El futuro de las estepas: prácticas de barbechos, proyectos forestales y conservación de aves esteparias

**Descargas**

Portfolio

Resumen de actividades 2022

**Noticias**

Oficia de Turismo Abolida en el marco de la Castilla

Primer Jornada Técnica para el Impacto de la Agricultura de Conservación: Cadenas de Valor y Sostenibilidad de los Grupos de Valor de la Sostenibilidad

Resumen de la Castilla en el 25 Congreso Español de Climatología

Presentación de la 1ª Jornada Técnica Steppe Forward: Barbechos Ambientales en Zonas Esteparias

La UAM, el CTFC y TotalEnergies se unen para crear una alianza para el futuro de las estepas: prácticas de barbechos, proyectos forestales y conservación de aves esteparias



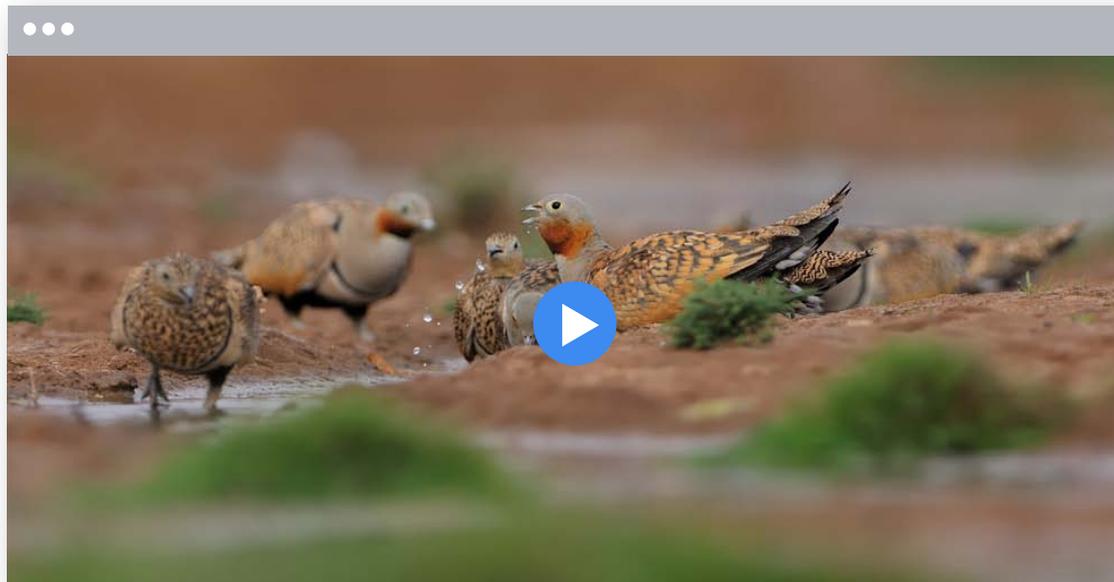
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## UTREACH LINE



### Creation of outreach videos

Two new outreach videos have been produced, one on the 1st Technical Day of the Chair and the other on the milestones achieved in 2022.



[Link](#)



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Additionally, all presentations from this 1st Steppe Forward Conference have been added to the website in video format, accessible through the following link:

Videos de las ponencias

<p><b>Bienvenida</b> Jose Luis Escudero / Junta de Castilla-La Mancha Arturo Velasco / TotalEnergies</p>	<p><b>Presentación</b> Manuel B. Morales / UAM Gerard Bota / CTFC</p>	<p><b>Impactos de la energía fotovoltaica</b> Julia Gómez Catasús / Universidad Rey Juan Carlos</p>
<p><b>Valor de los barbechos en el contexto de los paisajes agroesteparios</b> Juan Traba / UAM</p>	<p><b>El barbecho en la nueva PAC</b> Jose Maria Garcia de Francisco / Secretaría General de Agricultura y Alimentación, MAPA</p>	<p><b>El barbecho y la gestión agraria en las DIAs de proyectos fotovoltaicos</b> Begoña de la Puente / Dirección General de Biodiversidad y Recursos Naturales, Comunidad de Madrid</p>
<p><b>Importancia de la gestión agrícola de los barbechos ambientales</b> David Giralt / CTFC</p>	<p><b>Importancia de la gestión adaptativa de barbechos ambientales</b> Santi Mañosa / Universitat de Barcelona</p>	<p><b>Medidas compensatorias del Canal de riego Segarra-Garrigues</b> Carme Bernat Visa / Aggies Segarra-Garrigues</p>
<p><b>Modelos de aplicación Life Estepas de la Mancha</b> Ernesto Aguirre / Fundación Global Nature</p>	<p><b>Mesa Redonda Jornada Técnica Steppe Forward</b> David Serrano (Moderador) / EBD-CSIC Antonio Aranda / Consejería de Desarrollo Sostenible, Junta de Castilla-La Mancha Eladio Garcia de la Morena / Biodiversity Node María Álvarez Delgado / TotalEnergies Deborah Herrera / TotalEnergies Ana Carricondo / SEO-BirdLife</p>	<p><b>Clausura Jornada Técnica Steppe Forward</b> Manuel B. Morales / UAM Gerard Bota / CTFC</p>

1ª

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JORNADA TÉCNICA  
STEPPE FORWARD

**BARBECHOS AMBIENTALES EN ZONAS ESTEPARIAS**

Importancia, gestión y modelos de implantación como medida compensatoria de proyectos fotovoltaicos

29 NOVIEMBRE 2022  
TOLEDO

**Mesa redonda**  
David Serrano, Estación Biológica de Doñana - CSIC  
Antonio Aranda, Consejería de Desarrollo Sostenible, Junta de Castilla-La Mancha  
Eladio Garcia de la Morena, Biodiversity Node  
María Álvarez Delgado, TotalEnergies  
Deborah Herrera, TotalEnergies  
Ana Carricondo, SEO-BirdLife

Link

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ENERGÍA

### PLANTAS SOLARES Y BIODIVERSIDAD: EL RETO DE UNA TRANSICIÓN SOSTENIBLE

*Las energías renovables son claves para responder a los retos climáticos, pero la instalación de elementos como plantas solares abren nuevos potenciales problemas. Estudiar sus efectos en la biodiversidad y planificar bien qué se hace resultan, por ello, fundamentales.*

Artículo  
Gerard Bota  
Manuel B. Morales

26 JULIO 2023

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COLABORA

DESTACAMOS

**POBREZA ENERGÉTICA: LA POBREZA INVISIBLE**  
Más allá de las carencias económicas, es una realidad que afecta a millones de personas en todo el mundo.

**CÓMO REHABILITAR Y HACER MÁS EFICIENTE TU CASA**  
El 60% de las edificaciones españolas se consideran ineficientes desde el punto de vista energético. ¿cómo hacer algo?

**NOVE PREGUNTAS SOBRE LA EOLICA MARINA EN ESPAÑA**  
La eólica marina tiene potencial, contribuye a la lucha contra el cambio climático de una manera respetuosa y sostenible.

La llamada urgente de la comunidad internacional para mitigar los impactos del cambio climático y detener la degradación de los ecosistemas y la pérdida de biodiversidad ha propiciado, a nivel mundial, la puesta en marcha de políticas ambientales centradas en la reducción de las emisiones de gases de efecto invernadero. Al mismo tiempo, la comunidad internacional, a través del Panel Internacional sobre Biodiversidad y Servicios de los Ecosistemas (IPBES) ha puesto sobre la mesa la necesidad de detener la actual pérdida de diversidad biológica y los beneficios asociados que presta a la humanidad, lo que necesariamente obliga a un desarrollo sostenible de cualquier actividad productiva y, por tanto, compatible con la conservación de la biodiversidad.

La energía solar fotovoltaica tiene uno de los mayores potenciales de mitigación del cambio climático entre todas las fuentes actuales de **energía renovable** y se ha convertido rápidamente en una de las tecnologías más baratas para la generación de electricidad en todo el mundo. Sin embargo, el desarrollo de proyectos solares fotovoltaicos a gran escala (los denominados **Utility-Scale Solar Energy**) pueden estar asociados a una amplia gama de impactos ambientales a lo largo de su ciclo de vida, siendo la ocupación del suelo uno de los principales.

El resultado puede ser una **pérdida neta de hábitat** para las comunidades biológicas allí presentes, con el consiguiente riesgo de desaparición local de muchas poblaciones, a veces de especies amenazadas. Sin embargo, y a diferencia de otras fuentes de energías renovables, si existe una correcta planificación territorial y gestión de las instalaciones de generación de energía fotovoltaica, así como una adecuada compensación de los impactos locales, estas pueden ofrecer oportunidades y beneficios a determinados componentes de la biodiversidad.

Las zonas de estepas naturales y cerealistas se encuentran entre los ecosistemas más frágiles y afectados por la actividad humana del mundo. Los ambientes esteparios imponen fuertes presiones de selección sobre los organismos debido a las



## Publication of an outreach article

A **outreach article** focused on current political and social topics has been published in the Ethic magazines, accessible through the following link:

Link



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